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(See page 499 for Contents).

*As some of the arrangements and specialties described in this Journal may be the subject of Letters Patent the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.*

Edited by **NORMAN EDWARDS.**

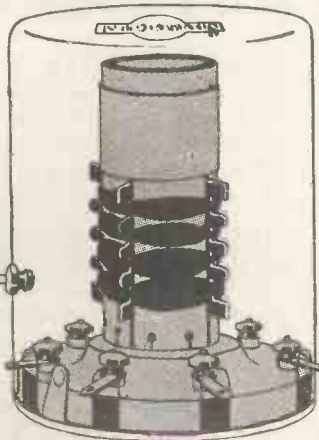
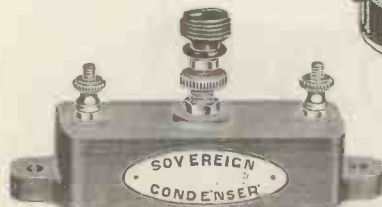
Technical Editor: **G. V. DOWDING, Associate I.E.E.**  
Radio Consultant-in-Chief: **P. P. ECKERSLEY, M.I.E.E.**  
Scientific Adviser: **J. H. T. ROBERTS, D.Sc., F.Inst.P.**

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# Modern Wireless

Vol. XIX. No. 78.

BRITAIN'S LEADING RADIO MAGAZINE

June, 1933

## *A Set Introduced by P.P.E.—New Wavelengths for Europe—An A.T.B. Design.*

THE principal set which we describe in this month's issue of MODERN WIRELESS is a special design introduced by our Chief Radio Consultant, Mr. P. P. Eckersley. This set is the result of much careful deliberation on the part of the technical staff, and we confidently put it forward as one of the finest and most up-to-date battery designs it is possible for the amateur to build.

The set has undergone special locality tests by our Scientific Adviser, Dr. J. H. T. Roberts. Readers will notice that Ferrocart coils and "Class B" amplification are two of the outstanding features of this receiver.

A business-like chassis design has been chosen, and the set, as a whole, represents the last word in constructional efficiency. The range of reception of the "Ferro-B" Four, as we have entitled this receiver, is very remarkable; while it will be noted that the maximum output is round about 2 watts.

### *Concerning the "A.T.B." Three*

ANOTHER receiver of interest to the general amateur is also described in this issue. It is a simple three-valver, which we have called the "A.T.B." Three, for, as the title indicates, the circuit incorporates automatic tone balance. This ingenious and inexpensive scheme enables the quality of reproduction to be retained throughout the operating range of the set, for, no matter whether local or the most distant stations are being received, the balance of high and low notes is strictly preserved, with the result that speech and music are always perfectly clear, even when reaction is pushed to the very limit.

Short-wave enthusiasts will be particularly interested in "The Secrets of the High K/c's." This is a special article by our contributor, Mr. Geoffrey Eltringham. Short waves are becoming increasingly important and increasingly interesting, especially during the summer months, and we strongly recommend this practical article as a particularly timely and useful contribution for the benefit of short-wave readers.

### *A Voice Known to Millions*

THOUSANDS of people recently learned with great regret of the death of Mr. J. C. Stobart, the B.B.C.'s Educational Director. Mr. Stobart, readers will remember, initiated the famous New Year "Grand Good-

night," and it is no exaggeration to say that his voice was known to millions of listeners in every part of the English-speaking world.

Mr. Stobart was born in 1878 in Dorset, where his father was a rector. He passed through Rugby School with a double scholarship to Trinity College, Cambridge, where he took his degree of M.A. in 1904. After lecturing there on Ancient History, he entered the Board of Education and served until 1924, and in 1925 he was appointed a permanent official of the B.B.C., taking charge of its educational department.

### *Arranged "Good Cause" Appeals*

MR. STOBART was not only responsible for the chief part of the building-up of the cultural side of broadcasting from 1924 to 1929, but he also had charge of the B.B.C.'s religious services, prepared the weekly Epilogue, and the arrangement of its Good Cause appeals.

With his passing, one of the real pioneers of British Broadcasting disappears from the scene; but his devotion to his work, and the influence he had on broadcasting in general, will undoubtedly leave a permanent effect upon the policy of the B.B.C., and will serve to keep his name alive as no other memorial could.

### *The New Wavelength Plan*

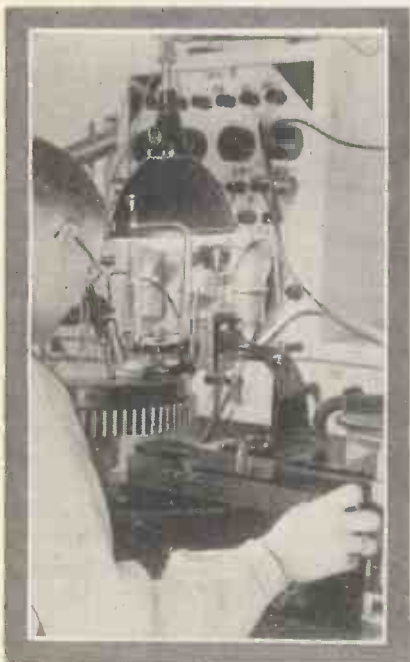
AS we go to press with this issue of MODERN WIRELESS we understand from our special correspondent at Lucerne that the delegates to the wavelength conference are "hard at it." Which means, we hope, that a revised Prague plan is being successfully hammered out.

We are informed that the delegates have been told that they must face up to the necessity of agreeing to "sacrifices"—and that a nine- to ten-kilocycle wavelength separation is more or less inevitable, as well as definite "power limits," if the new plan is to prove successful.

From our correspondent we understand that only requirements essential to a national broadcasting service will obtain serious consideration at the conference. Whatever the ultimate result of the Lucerne discussions, the new plan—good or bad—will be put into force on January 1st, 1934.



# RADIO TO-DAY



*Herr Hitler has seized on radio as an important implement for the development of German culture, and below are some interesting details of broadcasting methods under the new regime.*

*By A. A. GULLILAND.*

in the wax, and there is no "scratch" or any other noise which would betray the fact that the broadcast is not an original one. On the other hand, when the wax record has been played once or twice it loses quality rapidly.

The German broadcasters, therefore, record important speeches, etc., simultaneously on two wax records. One is kept and sent to the factory for pressing; the other is used for immediate reproduction. The big wax discs can be used several times,

German stations. Some of them were direct broadcasts; many of them were first recorded and then broadcast shortly afterwards, or later in the day.

### *Second Time Better*

The reason for recording a political speech first and then broadcasting it from records is an important one. The broadcaster is quite sure of "getting the speech over" without undesired interference, and if this occurred during the actual speech,

**T**HE German broadcasting stations are making increasing use of sound-recording to "can" items for broadcasting. In Britain the B.B.C. use the Blattnerphone, which records sound on steel tape. This system has certain disadvantages which decided the German engineers to use the orthodox gramophone recording method.

A steel band Blattnerphone record cannot be transported as easily as a gramophone record. As far as I know, the Empire representative of the B.B.C. did not take Blattnerphone records with him, but disc records.

### *Disc or Tape*

The Blattnerphone is inexpensive in use, but one only has one single record, and if a duplicate is to be made it can only be done by playing off the first record and recording again. This means that quality will probably not be as good as when pressing records of the usual type.

Anyway, the Germans decided to spend the extra money, and to use wax discs. These discs can be reproduced immediately after they have been cut—i.e. immediately after sound has been engraved upon their surface. This is the usual practice in Germany.

The quality is excellent, as the geared pick-up follows the soft groove



This special portable cabin is employed for the broadcasting of outside events, to which the Germans are very partial. The upper picture shows the apparatus used for soft-wax recording.

as, after each recording, they are cleaned and then present a smooth surface. They get thinner after each procedure, and so can only be used a limited number of times.

### *Repeated Speeches*

Special apparatus is used by all the German broadcasting companies, and it certainly is a sign of the quality of this apparatus that a number of gramophone recording firms are now using the same make.

The listener dislikes a recorded programme. I am with him in most cases, but there are cases where it really does not matter if the programme is recorded or not. For instance, a political speech.

I have heard large numbers of political speeches broadcast by the

it is possible to eliminate the disturbing noise and the listener gets the speech without the scratching of the knife which tried to cut the cable. This just for one example.

I have found the recorded programmes—especially the speeches—even better balanced than the original. The engineer has time to use his controls, and he knows what comes next, which he does not in the case of the original.

### *Bottled Oratory*

The Germans have instituted a novel feature into their schedules—the repeat programme. A programme broadcast yesterday is repeated at a later date from records.

This is annoying to the listener who permanently has his set switched

# IN GERMANY

on, for then he may, in the case of a political speech, hear this as many as three times during the course of the day. But from the point of view of broadcast propaganda, this system is excellent.

The man who was not able to listen-in at noon gets the speech of the day in the afternoon or in the evening. As things quieten down in Germany, the number of political speeches broadcast will decrease, but the manner of procedure will remain. One often wonders what would happen if the broadcasters had not the means of recording and perfectly reproducing a programme.

### *Improving Hitler!*

There is one case I remember which struck me as rather amusing. The German Chancellor, Herr Hitler, addressed the German people, and the address was repeated three times during the following day.

Herr Hitler had spoken so rapidly that it was found difficult to follow each single word. He was, therefore,

The Hamburg short-wave broadcaster for O.B.'s is mounted on the car shown in the circle, which generally carries recording apparatus.

For the immediate re-broadcasting of political speeches, etc., the Germans are using the apparatus shown, the pick-up being geared so as not to injure the soft wax. Once played the records are useless, so generally two records are made in parallel.

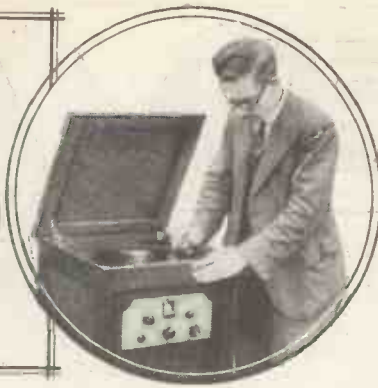


requested to repeat the address more slowly, and that is the secret solution to the mystery that those people who listened-in on the following day heard a different version from those who had heard the original!

The Minister for Propaganda, addressing the youth of Germany at a Bismarck commemorative meeting in Berlin.



# "M.W.'s" RECORD REVIEW



How do you choose your gramophone records? By price, or make? Our expert helps you to discriminate in this choice and draws your attention to some records which you will want to add to your collection.

WHEN you have decided upon the title of a record you mean to buy, what is the next factor to be considered? Is it artist, or price, or make, or what? Many people are inclined to disregard any other consideration, and are led into a process of unimaginative buying which leads into a hotch-potch collection in which interest is apt to wane.

### A Vital Point

There is a most vital point which should be settled. It is this: are you satisfied that the song or piece is being performed by a *suitable* singer or orchestra? Our familiarity with wireless programmes proves that anything can be sung or played by almost anybody, but as we are building a library for enjoyment in years to come, let us be sure that we are on the right track from the beginning. Every piece has its best vehicle of expression, and if this vehicle be wrongly chosen, its appeal is greatly diminished. There are, of course, some exceptions. Certain music may have been written for piano, but become known to all as a military band masterpiece—e.g. Chopin's Funeral March. Again, medleys may be quite properly and brilliantly played by performers entirely unsuited to perform the complete work. Here may be a laudable effort to popularise good music by giving a series of dainty titbits, but medley practice is a law unto itself!

### For Example

Most assuredly lasting pleasure and satisfaction is in store for everybody who settles this point correctly. So don't buy a record of Mendelssohn's "Spring Song" as a "musical" saw solo—you'll hate both "Spring Song" and saw in a very little while! This

may seem an exaggeration, but if the example given is non-existent, remember that people do equally strange things, just for lack of this discrimination which is so very well worth while.

### The Lighter Side

"Light" music is difficult to choose when one is buying for "keeps," but here are some which may be safely recommended. Modern Russian music is usually best in small doses, but *A Russian Fantasy*, played by Livschakoff's Dance Orchestra, is an extremely good mixture. On Decca F3471.

Clocks seem a popular theme just now, and two attractive and very light numbers are played by Dol Dauber's Orchestra on H.M.V. B4371. They are *The Clock in the Black*

*Forest* and (old favourite!) *The Clock is Playing*. Few people were proof against that very good musical play, *Maid of the Mountains*. The Commodore Orchestra revive the best melodies delightfully on Winner 5544.

Columbia have contributed very generously this month, but mostly in the Military and Brass department. They have three really great records in this class. First, the Grenadier Guards in a medley, *Marching With Sousa*, DX455. (Even the P.B.I. will like this!) Then a very fine performance of Strauss's *Radetsky March* (with Berlioz's *Rakoczy March* on the other side) on Columbia DB1037. The first is one of the very best.

### Massed Bands

Lastly, another of those Regal-Zono Massed Brass Band masterpieces (MR876). The tunes are *Blaze of Glory*—happily titled indeed—and *Festjubil* (or Jubilee), a German holiday in martial music. Here are three records with a strong tonic in each.

As I said above, medleys have their uses, and may fill odd moments very pleasantly. Here are two, admirably played, and full of melody—*Fledermaus Fantasy* as played by the Bohemians on Columbia DB1082, and *From A to Z* on Parlophone R1467. The Pavilion Orchestra run through some popular airs of the masters and the organ takes a hand very effectively. If you are interested

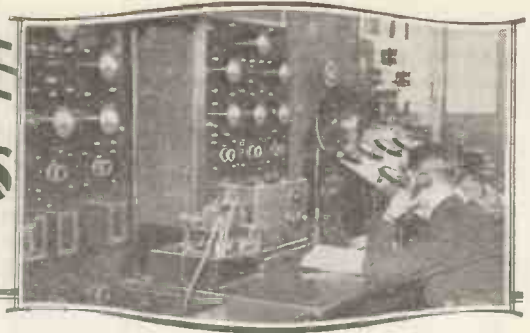
(Continued on page 559)



EIGHTEEN MICROPHONES, six in each of the three studios, may be used to make one record in the H.M.V. studios at Abbey Road, N.W. From a central control all these microphones can be blended for recording dramatic sketches, etc.

# SECRETS OF THE HIGH K/c's

By GEOFFREY ELTRINGHAM



WHY is it that of two short-wave sets made from the same design one will bring in American stations night after night, while the other will be hard put to it to find more than a trace of their carrier waves?

Why is it that one can sometimes lash up a short-wave circuit roughly and get excellent results, then rebuild properly in permanent form only to find that the magical something has departed, leaving a quite mediocre performance behind?

These are things which happen to all of us who do much work on the fascinating ultra-high frequencies, and to very many constructors they are apt to remain insoluble mysteries, adding an annoying element of chance to their short-wave efforts.

It shall be my endeavour in this article to give the underlying secrets of some of the more important sources of these discrepancies, and help the constructor to reduce his short-wave work to something of the same basis of exact science which obtains in broadcast procedure.

## L.F. Amplification

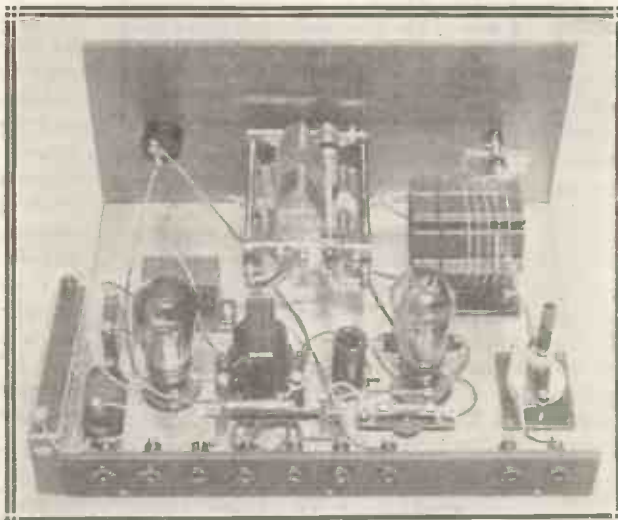
With so much for preamble, let us make a start by considering that very puzzling business of the effect of varying amounts of L.F. amplification. In the very early days it was noticed that when the desired transmission was accompanied by a good deal of background noise the use of any considerable amount of L.F. magnification seemed to bring up the "background" out of all proportion, so that the desired signal was well-nigh smothered. Hence it was often said that L.F. amplifiers magnified loud sounds more than weak ones.

More accurate knowledge of the behaviour of such amplifiers later

The "High K/c's" are, of course, the high frequencies used in short-wave work. In this practical review by a well-known experimenter are embodied scores of really helpful hints and suggestions—the outcome of a wide experience in radio's most fascinating field.

showed that this idea was a fallacy, or at least was an incomplete statement of the case, and so a rather important fact was lost to sight. This is simply that the effect originally noticed is based to a large extent on a characteristic of the ear, whereby it tends to be more impressed by loud sounds than by weak ones.

## STILL THE MOST POPULAR TYPE



In spite of the developments in short-wave H.F. amplification, most short-wave enthusiasts still pin their faith to receivers of the detector and L.F. type, relying upon the proper exploitation of reaction amplification for their results.

Consequently, if we take a mixture consisting of a weak signal and rather stronger miscellaneous noises and magnify them up equally in a distortionless amplifier, we are apt to reach a point at which the louder noises make such a powerful impression on the ear that they dominate the desired signal so completely as to make it unintelligible. Conditions may become still worse if we carry matters to

such an extreme that the louder noises blast the output valve and the amplifier is no longer distortionless.

Here, then, we have a by no means unimportant rule for those who want the best from their short-wave receivers: avoid the use of an excessive amount of low-frequency amplification when "background" noises are prominent.

A volume control is probably the best way of dealing with the matter, and its use in a judicious manner will enable such an over-all volume level to be obtained as will ensure maximum intelligibility for the desired signal. It is true that careful adjustment of reaction will generally serve the same purpose, but since this usually involves careful retuning after each readjustment the method is apt to prove somewhat fiddle-some.

Mention of reaction brings us to what is perhaps the most important of all the various sources of the differences in performance of short-wave sets. Despite the development of methods of H.F. amplification which achieve a certain measure of success on short waves, it is still true that the great majority of short-wave receivers depend for their efficiency upon the proper exploitation of reaction amplification.

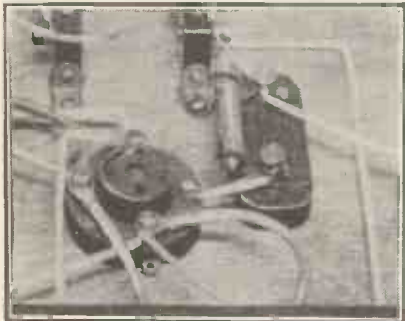
## Reaction

In all such sets everything depends on being able to extract the maximum boost from this form of amplification. It is quite on the cards that some little alteration in the reaction arrangements in a receiver of this sort will yield an incredible gain in over-all sensitivity.

The point to grasp is this: reaction amplification of a telephony signal is only really effective in the normally very narrow region just short of the point where the circuit

commences to oscillate. It is this region we must study and seek to keep under control so that we may exploit it to the full if we are to get the full results our circuit can give us.

**TRY DIFFERENT VALUES**



It is often possible to improve reception by trying different grid-leak values. Two megohms is not necessarily the most satisfactory value for a short-wave set.

Our first requirement is to see that the circuit is stable when in this condition, so that it may not tend to burst into self-maintained oscillation when "triggered" by a strong atmospheric, for example.

This will always happen, of course, if "over-lap" is present to any appreciable extent, for reasons that will be obvious when it is remembered that over-lap means that once self-oscillation is started the reaction condenser must be moved back an appreciable distance from the threshold point before it will stop again. If this effect is at all prominent, good results are impossible; but I think this is a matter too well known to require further emphasis.

**Important Region**

Instead, let us confine our attention for a while to that important but neglected region just short of the oscillation point. It is here that we must be able to work if we are going to achieve those long-distance feats which bring such a pleasant glow to the heart of the true enthusiast, yet it is just here that so many short-wave sets fail.

I believe that it is no exaggeration to say that the great majority of short-wave receivers, as made and used by the home constructor, do not succeed in obtaining the full amplification which can be got if reaction can only be made fully progressive right up to the threshold of oscillation.

**What Often Happens**

What one usually finds is that as reaction is brought up the desired signal becomes faintly audible, grows a little stronger, and then, just as the transmission seems on the point of

becoming loud enough to be intelligible, the circuit goes into oscillation, usually with a bit of a "plop." The carrier wave is then immediately heard at full strength and becomes weaker directly any further increase is made in the strength of reaction.

If the converse, or "Don't do it," method is used we start with the set oscillating, find what appears to be quite a nice juicy carrier, and then slacken off reaction until oscillation just ceases. This occurs with some suddenness and then the circuit is found to be some little way below its maximum sensitivity condition, so we start to squeeze up the reaction once more, only to go through the cycle of phenomena described in the previous case.

**The First Step**

Now, this state of affairs is all wrong, and it must be corrected as the first step on the road to real success. Before I tell you how to set about it, however, I must make it clear that in all this I am not reflecting on the abilities of the capable people who provide the designs from which the home constructor builds his short-wave sets. My point is that no matter

*"It shall be my endeavour to help the constructor to reduce his short-wave work to something of the same basis of exact science which obtains in broadcast procedure."*

how well the designer may have done his job, there yet must always remain for the short-wave constructor a process which can best be described as "hotting-up" his particular model.

The designer, you see, cannot know exactly what types of components or valves you are going to use, what kind of aerial or earth you have, and a host of other individual matters. Hence all he can do is to produce a sort of generalised design of the best possible kind.

**Effect of Variations**

If you copy it faithfully you can be sure in most cases of definitely satisfactory, and even very good, results, depending upon the quality of the design. The inevitable variations in your wiring, choice of components, and so on, nevertheless, make it impossible for you to feel certain that your model is as good as that of the next fellow who works to the same design.

What I am trying to do in this section of my article is to tell you how to set about the hotting-up process so successfully that you may be sure

that your set is not merely as good as that of the next man, but probably quite a bit better. In doing this I hope I shall also be able to help possessors of older sets, and sets made from less efficient designs than those of "M.W." to do a bit of modernising and improving.

**Correct Control**

Coming back to this question of reaction, here is the way a really well-trained short-wave set should behave: as you increase reaction a telephony transmission should become first of all only a little louder, then as you reach the important zone of maximum sensitivity it should increase much more rapidly in strength.

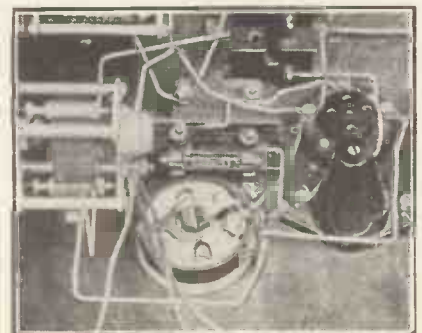
As you arrive at the threshold of oscillation the transmission should come up to a maximum with a rush, and on pressing reaction a trifle further you should be able to get a sort of flickering effect on tuning a little bit either side, as though the carrier wave were struggling to make itself audible. This dithering effect should be quite a stable condition, and the set should be capable of holding this adjustment indefinitely without breaking into actual oscillation.

**Detector Valves**

Here, then, is our ideal. Now let us see how we can achieve it. First we must set to work on the operating conditions of our detector stage, and try to get them as near perfection as we can, a matter of far greater importance in short-wave receivers than is realised by experimenters accustomed to the comparatively simple requirements of broadcast sets.

Take, for example, the matter of the choice of the detector valve itself. In a broadcast receiver almost any "H.L." or "H." valve will give acceptable results, but for short waves we must definitely seek out one

**DETECTOR GRID POTENTIAL**



A potentiometer for controlling the grid voltage of the detector valve does frequently assist in obtaining smooth reaction, but it is not a panacea for all reaction ills.



## Getting the Best Results on the Short Waves

which will make it easy for us to get the desired reaction characteristics. I personally always use, and strongly advise, one of the "special detector" types of somewhat lower impedance.

Next, the question of the grid-leak value. The usual figure of 2 megohms is generally given simply because it is a good average value which suits the average valve. Don't assume, however, that you have an average valve when working on short waves; the inevitable small variations between one valve and another are greatly exaggerated by short-wave requirements.

### A Set of Leaks

If you are seriously interested in getting the best results possible on the high k/c's. it is well worth while to provide yourself with a set of leaks ranging up to perhaps 6 megohms and try them out with care.

Just one word of warning here; let your choice fall upon one of the better makes of leak known to be quiet and free from any tendency to produce frying-pan obligato effects!

Now I am going to give you a hint which I expect will make the modernists smile: I often use a filament rheostat on the detector stage of my own short-wave sets! It may sound very old-fashioned, but it is a fact that I have thereby been able to get excellent results from several specimens in my valve collection which otherwise simply refuse to give the necessary super-smooth reaction effects. Just the merest trifle of filament current reduction does the trick.

### Concerning Potentiometers

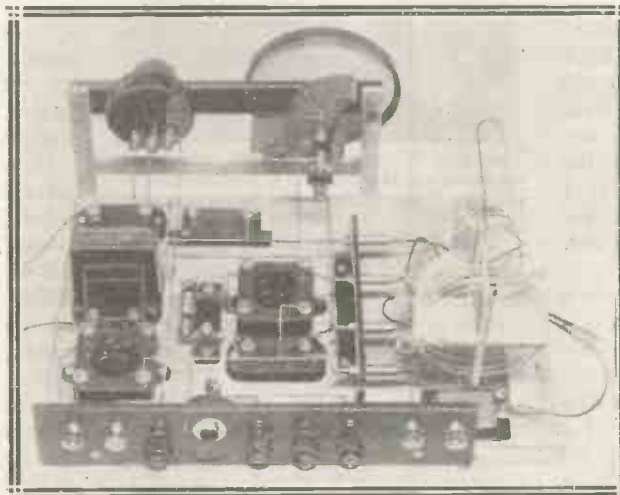
Many people imagine that a potentiometer controlling the grid voltage of the detector valve is a panacea for all reaction ills, but I must issue a warning in this connection. It has been my experience that while a potentiometer does enable almost perfect reaction to be obtained in very nearly any set, nevertheless, it tends to cover up troubles which ought really to be rooted out by more drastic methods.

My point is this: to get the best from the majority of detector valves the potentiometer slider must be somewhere near the positive end of its travel. If we have to take it far along towards the negative end before the desired progressive reaction effect is obtained, we shall no longer be getting the best possible rectification.

Consequently, if the other conditions of our detector stage tend to produce bad reaction control, we may apparently overcome them by running the slider along towards the negative end, but we should not let this lull us into thinking that all is well.

We may actually be obtaining definitely inferior results from the detector valve, and it may well be that it would pay us to attack the problem from quite a different angle.

### GOOD LAYOUT IS ESSENTIAL



Various schemes are used by short-wave experimenters in their efforts to achieve the highest degree of efficiency. In the particular set shown above the distance between the reaction and tuned coils can be varied. A potentiometer control of detector H.T. voltage provides the final adjustment.

A long experience of work on the high k/c's. has convinced me that the proper place to concentrate that attack is the plate circuit of the detector. It is here, I believe, that the difficulties really arise, and here they can most effectively be remedied.

As I see it, the problem is really all bound up with the choke or other high impedance inserted here for the purpose of diverting the H.F. component of the detector's plate current through the reaction circuit when required. The difficulty is really that this choke has a two-fold duty to perform, and it is extraordinarily

awkward to design one which will do both its jobs properly.

The first requirement is that it shall offer a reasonably uniform and "peakless" impedance to the various frequencies covered by the receiving circuits and so enable the reaction circuit to function properly over the required tuning ranges. In practice this usually means that its inductance and self-capacity will both be low, a point which will be familiar to those who have ever examined a typical short-wave H.F. choke.

### Stray H.F. Currents

Unfortunately, this generally makes it comparatively inefficient at its second job, which is to exclude stray H.F. currents from the L.F. amplifying circuits. Here, I believe, we locate one of the most important sources of variations between different short-wave sets, different assemblies of the same circuit, and so on.

In my experience such stray H.F. currents can produce all sorts of mischief, a point which will be confirmed by all who have noticed how threshold howl, hand-capacity effects, and so on, can often be alleviated or even cured by connecting a fair-sized fixed condenser between plate and filament of the output valve!

Now, to exclude H.F. currents really effectively we want a choke which offers a high impedance not merely to the ultra-high frequencies, but also all the miscellaneous stray frequencies like atmospherics and so forth, and this is difficult to do with any single component.

### Separate Components

I myself have found it very much easier and safer to split up these two functions between separate components, and I strongly advise this procedure to all who want to eliminate the element of chance from their short-wave work. It has certainly enabled me to make sets for the ultra-high k/c's, with a far greater assurance of achieving the expected results than ever before, and I believe it is of much greater importance than is realised.

## How to Avoid Overlap Troubles

What I do nowadays is to insert in the detector plate circuit first of all a suitable impedance for short-wave reaction purposes, and then back this up with a really good mixed-frequency excluder, such as one of the better types of all-wave H.F. chokes, with a by-pass condenser down to the filament circuit.

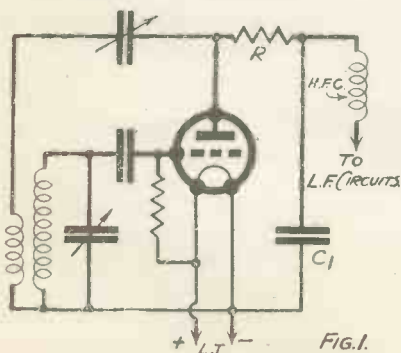
I show my favourite arrangement in Fig. 1, wherein the reaction impedance proper takes the form of a resistance  $R$  of about 5,000 ohms (not critical, but should not exceed 7,500 ohms, or L.F. amplification will suffer). Following this comes a good all-wave H.F. choke (H.F.C.), with a fixed condenser  $C_1$  shunted down to the filament circuit. A suitable capacity for this is .0005 mfd., although .001 mfd. is also worth trying in cases of unusual difficulty.

### No Threshold Howl

With this arrangement, plus attention to the other points I have mentioned, I have never failed to get good reaction and freedom from threshold howl. Indeed, I am getting so sure of good results on the strength of this one device that I now commonly omit the potentiometer for the detector altogether, so rarely is it needed.

Just one more point, and then we will leave the more obvious aspects of the reaction question. This final tip is to be cautious with the use of resistance coupling between the detector and the first L.F. stage of a short-wave receiver, I would not go so far as to say that resistance coupling makes it impossible to get good reaction on short waves, but it

### STOPPING STRAY H.F.

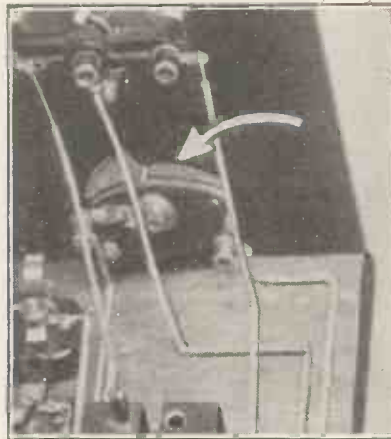


In this arrangement the resistance  $R$  is employed in place of a short-wave H.F. choke, but an all-wave choke is joined in series with the L.F. amplifier to exclude stray H.F. currents from the L.F. end.

does unquestionably make it more difficult to get rid of over-lap effects.

Probably the tendency is too slight to be noticed on broadcast wavelengths, but matters are otherwise on short waves, where we are hoping to extract the last fraction of an ounce of benefit from intensive reaction amplification. We simply cannot afford to give anything away here.

### PANEL CONTROL



The use of a series aerial condenser mounted on the panel is a good method of shifting "flat spots" due to resonances.

The difficulty arises in this wise. The ease with which a detector valve goes into oscillation usually depends on the plate voltage. The higher the voltage the more strongly the valve tends to oscillate.

### Voltage Drop

Now, the voltage on the plate of a resistance-coupled detector depends first on the initial voltage applied from the H.T. battery, and secondly on the voltage drop across the anode resistance. If the plate current decreases, the voltage drop is also reduced, and so there is a rise in the plate voltage.

This is exactly what happens when the detector goes into oscillation, for the plate current of a grid-condenser type rectifier always falls when this happens. That means, in turn, that the actual plate voltage will rise a little, and so the valve will immediately oscillate more strongly than it should, and to stop it we shall have to turn the reaction condenser back some distance beyond the point at which oscillation began. In other words, we have got a condition of over-lap.

It may not be serious, especially if the anode resistance be of not too high a value (not more than 50,000 ohms), but the risk is sufficient to make me prefer a transformer for, at any rate, the first stage.

If you don't want to use transformers in both stages, then I suggest you put your resistance coupling in the second stage. This is contrary to the rules for ideal L.F. amplification, but I believe it is the lesser evil.

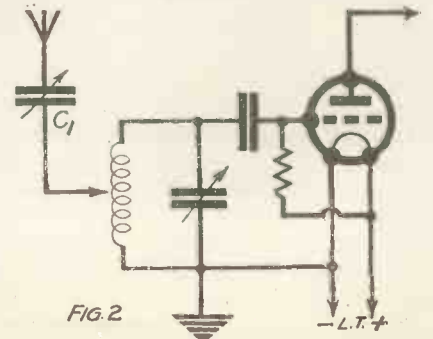
### Aerial Coupling

Now let us turn to the subject of aerial coupling, another fruitful source of variations in results, even in the same set used on different aerials. We are all familiar with "flat spots," i.e. places on the tuning range at which it is impossible to get the set to oscillate. Few short-wave experimenters realise that results can be spoiled over considerable parts of the dial by what I will describe as incipient flat-spots which do not actually prevent us from getting the set up to the verge of oscillation.

It might seem that these were harmless, but in practice they most definitely are not. When they are present, they produce areas on the dial at which we have to increase the setting of the reaction condenser heavily. The result is to upset our tuning, so that stations go shooting about over the dial in a manner which makes it very difficult to tune them in properly.

The usual cure is to provide means of weakening off the aerial coupling  
(Continued on page 560)

### ELIMINATING "FLAT SPOTS"



This is the theoretical arrangement for the aerial series condenser method of eliminating "flat spots" referred to by the author. It does not, however, necessarily counteract the effect of a lengthy earth lead.

# THE "CATKIN"

## A SURPRISING VALVE DEVELOPMENT

THE modern radio valve has become a piece of electrical mechanism of remarkable efficiency. It is capable of giving tremendous amplification, huge power outputs, and is surprisingly long-lived.

But in one particular it is more vulnerable than it need be, though it must be entered in its favour that even that vulnerability is not very serious. We refer to the mechanical side of the valve.

### Greater Mechanical Strength

Valves have to be rigidly constructed to overcome such undesirable properties as "microphony," to provide constancy of performance, and to enable the valve to withstand normal household treatment. But greater mechanical strength *can* be given to the electrode assembly, and to the bulb itself, and this has, in fact, been provided by two well-known valve concerns in their new "Catkin" valve.

A radio valve has to supply an electronic emission; it is not intended as a source of illumination. Why, then, need it have a glass bulb? The answer is that it need not, and it has been supplied by Messrs. Marconi and Osram.

The "Catkin" valve is a peculiar-looking affair, completely enclosed in metal. It is practically all metal, and to all intents and purposes it is unbreakable.

The valve is developed from the old C.A.T. class of transmitting valve, in which the anode was the outside container, enabling it to be air-cooled, the vacuum being inside the anode.

### Completely Screened

In the "Catkin" valve the anode is again the outside container as far as the vacuum is concerned, but outside the anode, and insulated from it, is an earthed, perforated metal shield.

Full details of an important advance in the progress of radio technique.

robust but completely screened, and its appearance is likely to enhance modern chassis set designs.

At first the Marconi and Osram "Catkins" will be of the indirectly heated A.C. type, and it is intended eventually to withdraw the glass types in all ranges, substituting the "Catkins" throughout.

Much greater electrode rigidity and higher efficiency are claimed as possibilities for the "Catkin" construction, and though the new A.C. types at first will have identical characteristics with the "glass" A.C. valves, they will be improved as

the all-metal design, and see exactly how the greater efficiency claims are based.

In the first place, the output valve will score in having its anode air-cooled so that a smaller anode can be used, and greater power be dissipated without overheating than is possible with the "vacuum-surrounded-anode" type.

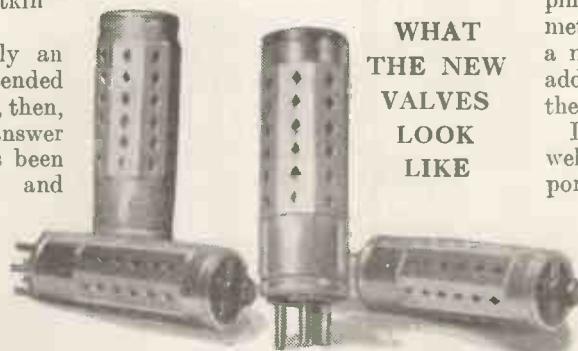
### Essentially Rigid

The "Catkin" electrode assembly is essentially rigid, for the electrodes are held inside the anode by stamped mica distance pieces. The heater and cathode construction is identical with that employed in the glass enclosed M.H. series.

The grid is supported as in ordinary valves on two nickel rods, but the supporting "pinch" is naturally different from the glass affair in the M.H. valves. In the "Catkin" the pinch can be described as a piece of metal crimped round the wires over a mica insulating collar. This gives added rigidity over the method where the electrodes are held in glass.

Lead-in wires to the electrodes are welded to the lower ends of the support rods, passing through the pinch and being melted into the circular seal at the bottom of a glass collar on which the anode envelope is supported. This allows greater electrode lead separation than in the normal M.H. types, with the result that the inter-electrode capacity is reduced and in addition a much higher degree of insulation is achieved.

The first mains "Catkins" can be substituted in any set using the M.H. class of glass envelope valves, for the characteristics are identical. Later models will appear, however, with greatly improved characteristics, for the method of construction enables greater efficiency to be obtained if desired. Battery "Catkin" valves will also appear in due course.



WHAT THE NEW VALVES LOOK LIKE

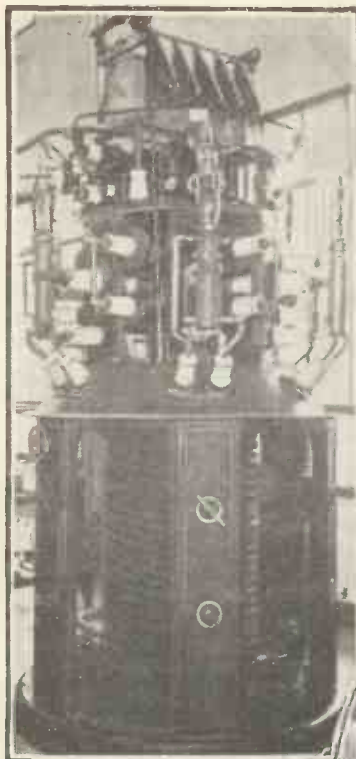
Unlike the conventional valve with its glass bulb, the "Catkin" has an all-metal case and is, to all intents and purposes, unbreakable. Moreover, the metal construction affords complete screening, and the anodes are air-cooled.

the "glass" types die out in the Marconi and Osram ranges.

Thus we shall first of all have a complete range of indirectly-heated A.C. "Catkins," corresponding to the present M.S.4B., V.M.S.4, M.H.4, and M.P.T.4, the new valves retaining the same classification, with the term "Catkin" after it.

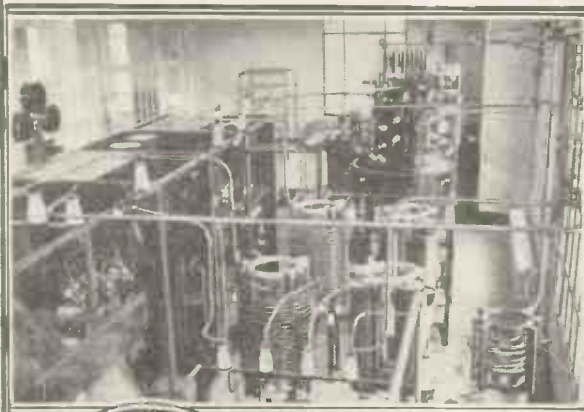
Now let us look more deeply into

# BROADCASTING



One of the amplifying units at Radio Paris is shown above, the water-cooling pipes being visible in the lower section of the unit.

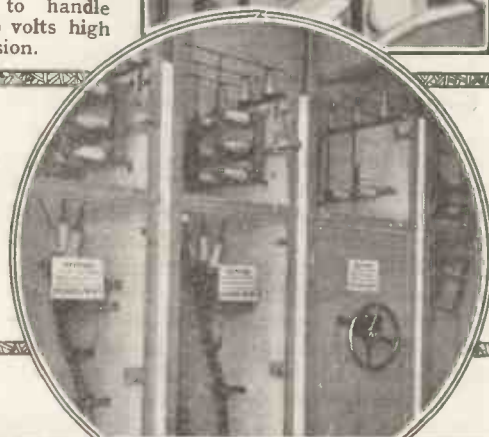
To the right is one of the mercury vapour valves used for the high-tension supply of the Paris long-waver.



Above and to the right are close-ups in the transmitting-room, showing the elaborate insulation and adequate spacing necessary to handle the 12,000 volts high tension.



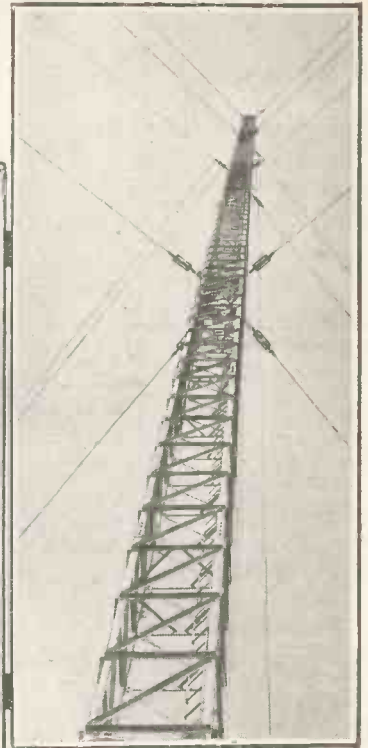
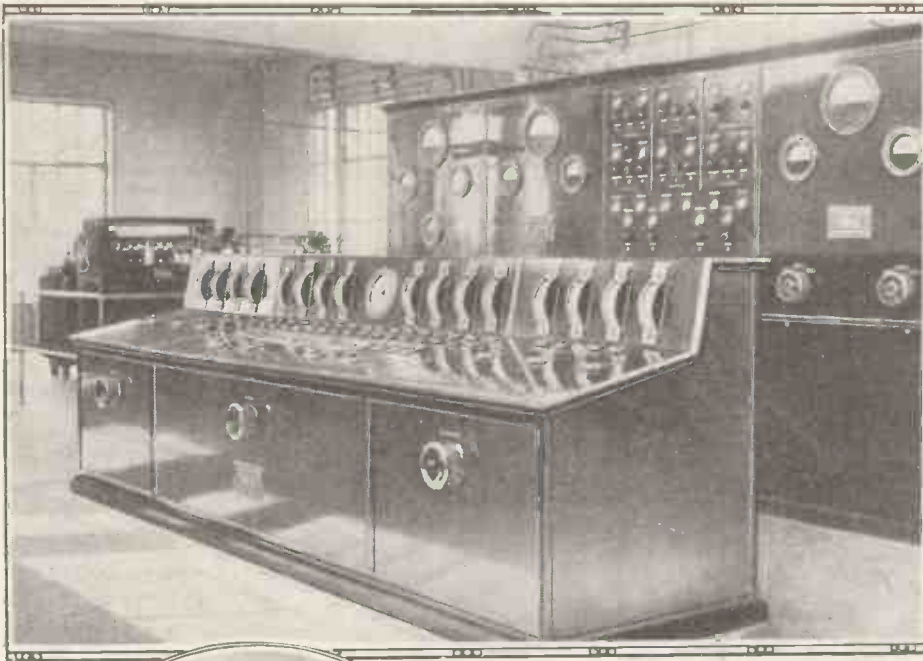
The notices outside the protective wiring say "Danger de Mort!"



Radio Paris transmits on 1,725 metres, with a power of 75 kilowatts. This exterior view of the station shows the main lead-in—or rather lead-out; whilst to the right is the grand staircase by which visitors enter the transmitting rooms.

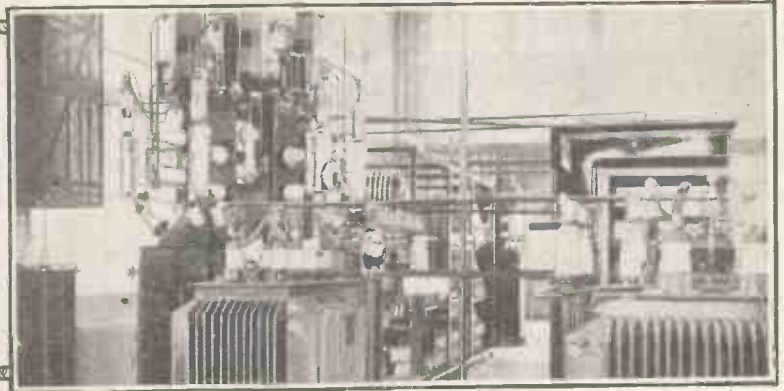
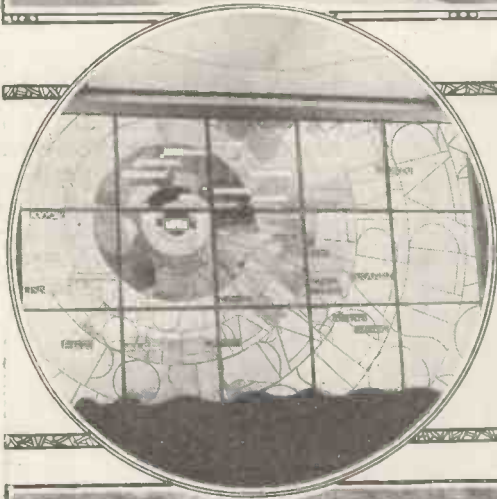


# FROM PARIS



ON 328.2 METRES

Some photographic impressions of Poste Parisien.



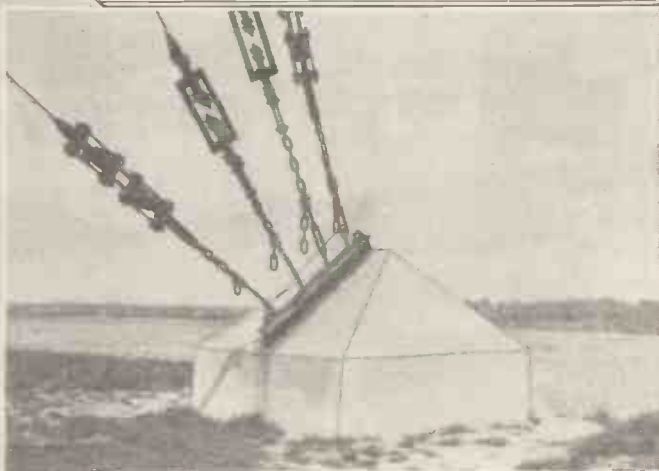
The power of Poste Parisien is 60 kilowatts.



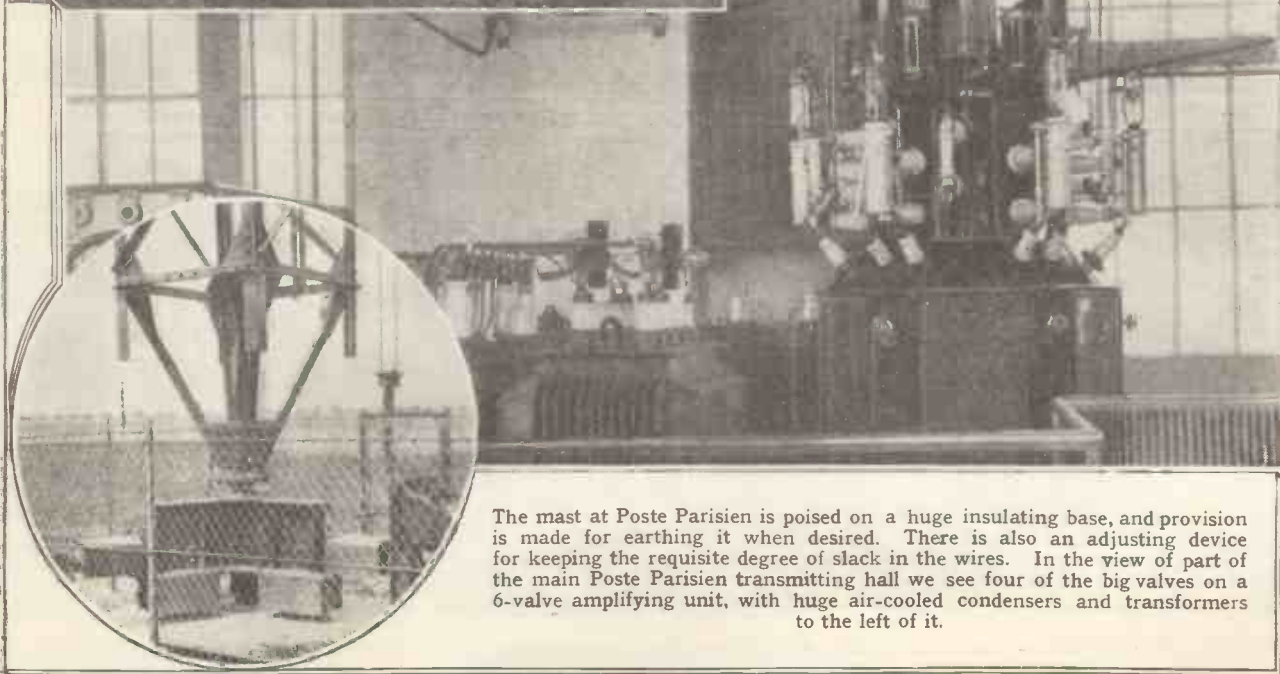
Above the picture of the water-cooling tank is a stained-glass window representing Europe's chief radio stations.

## THE PARIS MEDIUM-WAVER

One of the most entertaining foreign stations which can be received easily in this country is Poste Parisien (on 328.2 metres), representative views of which are given on this and the preceding page. It is situated near Les Molières, in the Chevreuse valley, some nineteen miles from the heart of the city of Paris.



To support the high steel masts the halyards are arranged as shown to the left, and anchored to a huge concrete block as depicted above. It will be seen that the French engineers, like those of the B.B.C., believe that the best broadcasting service for a great city is provided by a high-power station erected in open country right away from the houses.



The mast at Poste Parisien is poised on a huge insulating base, and provision is made for earthing it when desired. There is also an adjusting device for keeping the requisite degree of slack in the wires. In the view of part of the main Poste Parisien transmitting hall we see four of the big valves on a 6-valve amplifying unit, with huge air-cooled condensers and transformers to the left of it.

# MODERN WIRELESS PRESENTS

## The FERRO B Four

### A FERROCART AND "CLASS B" RECEIVER DE LUXE

### Introduced by

### P.P. ECKERSLEY M.I.E.E

(CHIEF RADIO CONSULTANT TO MODERN WIRELESS)

CIRCUITAL DEVELOPMENT

by

**G.V. DOWDING**  
ASSOCIATE I-E-E

LABORATORY CHECK AND CALIBRATION

by

**A. JOHNSON RANDALL**

*Locality Tests by*

**D<sup>R</sup>. J.H.F. ROBERTS**

**E. inst. P.**

CONSTRUCTIONAL DESIGN AND DESCRIPTION BY

**K.D. ROGERS**



WRITING as one who is frequently consulted to give his opinion on the excellence or otherwise of "commercial sets"—i.e. sets intended to be sold to the public, I am glad to be able to give sincere approval to the "Ferro-B" Four.

The set is designed on the basis of both modern knowledge and modern components. The new Ferrocarts coils, allowing the coil to have a small R/L value for a given bulk, and "Class B" amplification are both adaptations of technique to meet modern demands.

At the demonstration of the set given to me, I was struck by the high degree of selectivity coupled with adequate reproduction of the "top" frequencies.

The home constructor is, in my opinion, given the opportunity to possess a set which, battery operated, is not in any major particular inferior to a manufactured set, and is in many particulars a definite improvement on existing sets designed for home construction or for direct sale.

## INTRODUCTION

By P. P. ECKERSLEY,  
M.I.E.E

—(Signed) P. P. ECKERSLEY.



G. V. DOWDING,  
Associate I.E.E.,  
"M.W.'s" Technical  
Editor.

THERE are four main sections in the design of a radio receiver. First come the considerations necessary when the proposed performance of the set is discussed, then follows the development of the circuit required to give that performance. Thirdly, we have the practical design of the receiver to decide, and, lastly, but closely wrapped up in the last-mentioned, comes the choice of the components to be used.

Naturally the cost of the set has to be borne in mind during the whole of the foregoing deliberations, and financial considerations will largely control the final design. But performance is the main thing to be aimed at when a new set is contemplated, and everything must come subservient to that after definite receiver characteristics have been decided.

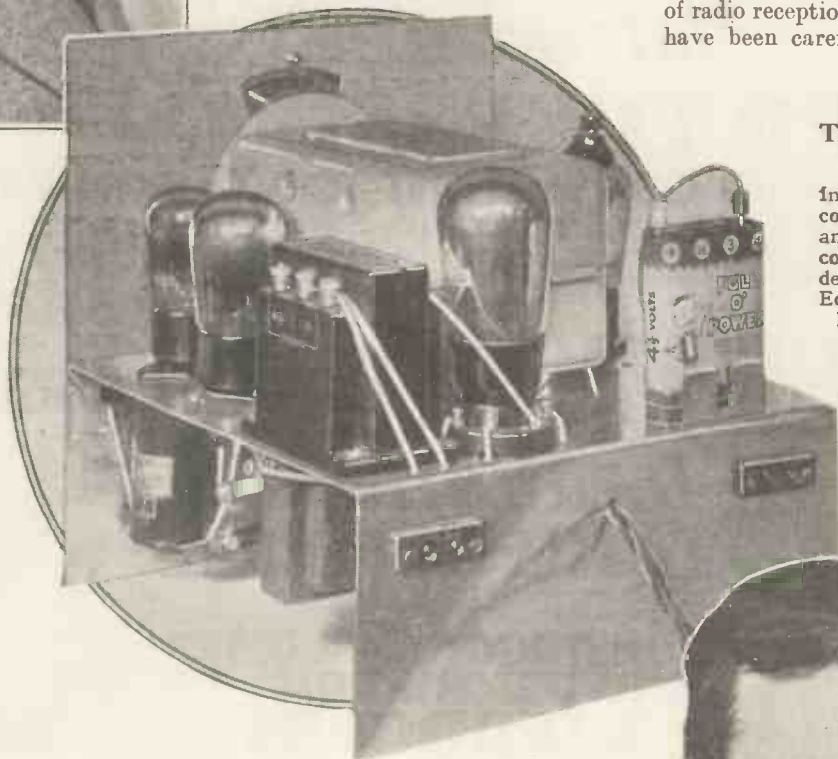
### Deciding the Design

It is no easy matter to fix the particular performance of any set, for the multitude of ways in which various qualities (such as selectivity and sensitivity) can be introduced

into a design complicates the matter very considerably.

It is one thing to say that we will design a set that will be selective to a certain degree, and which will be sensitive enough to do certain things, but it is quite another to fix these features so that they will satisfy the demands of ease of operation and economy of construction and running.

Finally, it has also to be remembered that the design (in the case of radio journals as well as manufacturers) is not merely a matter of personal taste, it has to appeal to large numbers of the public.



### THE "FERRO-B" FOUR

Incorporating Ferrocart coils and "Class B" amplification, this is the complete set exactly as demonstrated to P. P. Eckersley in the "M.W." Research Laboratories.

As a starting point the designer can consider his personal likes and dislikes, but he must as far as possible place himself in the position of the probable constructor. It would, however, be ridiculous to expect one man to carry the whole thing through, and yet please a large majority of readers.

With every set we publish the likely needs of all sorts of readers are carefully considered, and suggestions and criticisms from all sections of the staff are taken into account.

The main bulk of the work falls, naturally, on the Research Department, which is responsible for the main features of the design; but before the set is

placed on the stocks the technical-editorial and query staffs are combed for suggestions, for they are directly in touch with the public (especially in the latter case), and can offer very valuable criticism.

### Right Up to Date

We are also fortunate in being able to draw on the vast experience of P. P. Eckersley and Dr. J. H. T. Roberts, and in the design of the "Ferro-B" Four full use has been made of all the resources of our staff and associated consultants.

During the last few months a number of important developments has been introduced in the science of radio reception, and these advances have been carefully combed with a



P. P. ECKERSLEY, M.I.E.E., our Chief  
Radio Consultant.



view to combining those most suitable into a really hot-stuff battery receiver.

The question of cost has been kept well in view all the time, but it has been felt that it would be unwise to sacrifice efficiency on the altar of blind economy, and results have been placed in the forefront of our several aims with regard to this set.

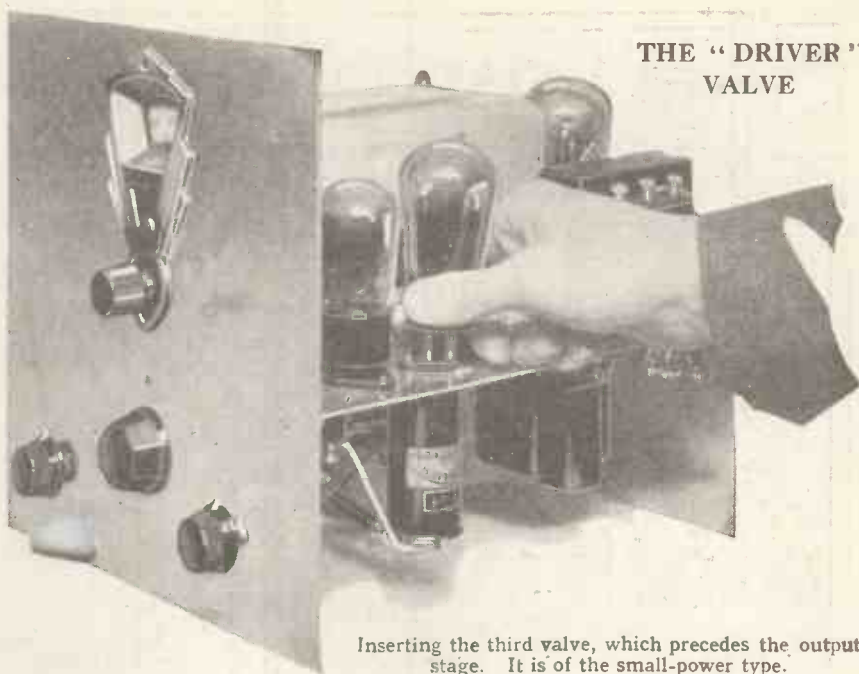
Not that the cost is high when the possibilities of the receiver are considered, but they are naturally a little higher than in the cases of some of the four-valvers that can be designed, with a much lower performance.

**Low Current Consumption**

Two of the most recent advances in radio reception have been incorporated in the "Ferro-B" Four, namely, "Class B" amplification and Ferrocart band-pass tuning. The net result is exceptional selectivity, combined with a sensitivity and power output that are amazing, and with an economy of running that will be very dear to the hearts of all battery set owners.

As is now fairly well known, the use of "Class B" makes a very great difference to the cost of running a set, for with this type of amplification the anode current consumption of the receiver is kept down to a very low average, being proportional to the strength of reception.

This is of the greatest importance to the battery user, and is one of the strongest features of this remarkable design, though the maximum power



**THE "DRIVER" VALVE**

Inserting the third valve, which precedes the output stage. It is of the small-power type.

available from the set is a matter of some 2 to 2½ watts A.C.

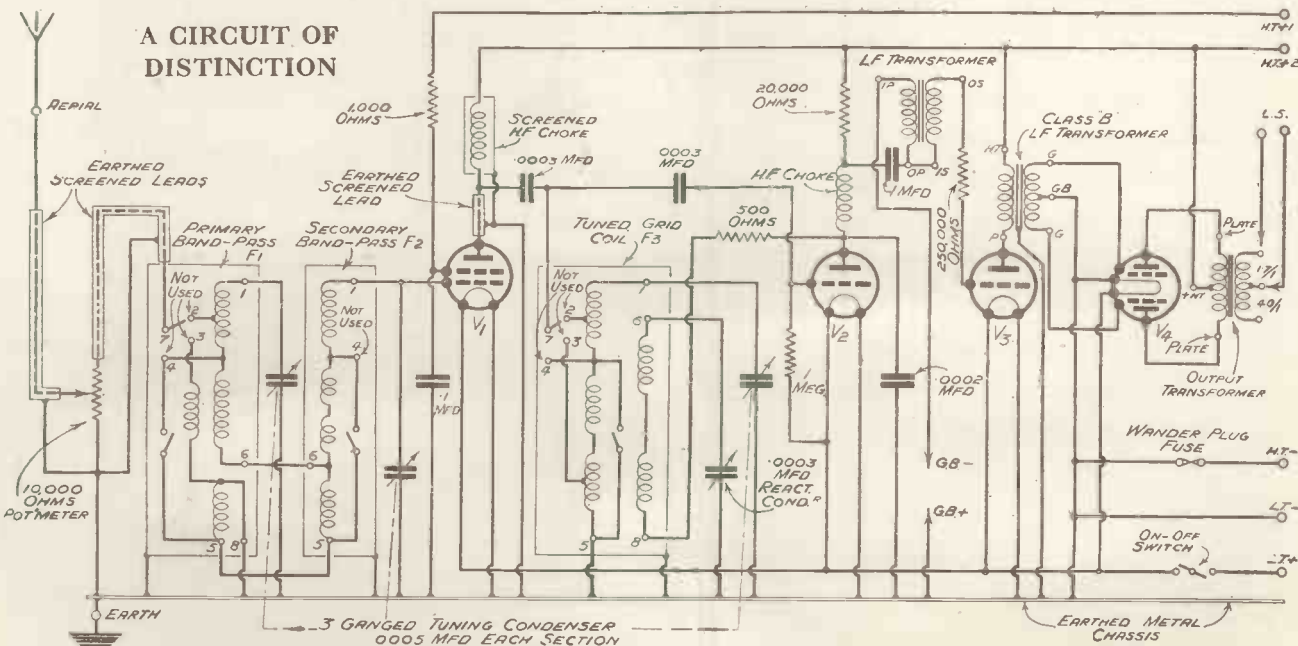
At this output (only reached on the loudest peaks of reception) the anode current consumption is, of course, rather large, but the whole point of the operation of "Class B" is that during intervals in the programmes, and during softer passages of music when the output is only a fraction of a watt, the consumption is very much less.

Using the "Ferro-B" for normal listening, an output of some 1,000

milliwatts at peak strength is quite sufficient, and this means an average anode current of something round about 10-12 milliamps. for the whole set. During intervals, when no modulation is on, the current drops to about 8 milliamps.

**Economical to Run**

The "Ferro-B," then, is economical to run, the above figures showing that our statement that the question of running costs has been kept well to the fore in the design of the receiver is correct.



Every applicable modern development in reception technique finds a place in the design of the "Ferro-B" Four. Large, undistorted volume is provided by the "Class B" output stage, high stage-gain is furnished by auto-transformer L.F. coupling, and Ferrocart coils endow the set with ultra-selectivity and sensitivity.

# A STAR SET BY STAR DESIGNERS

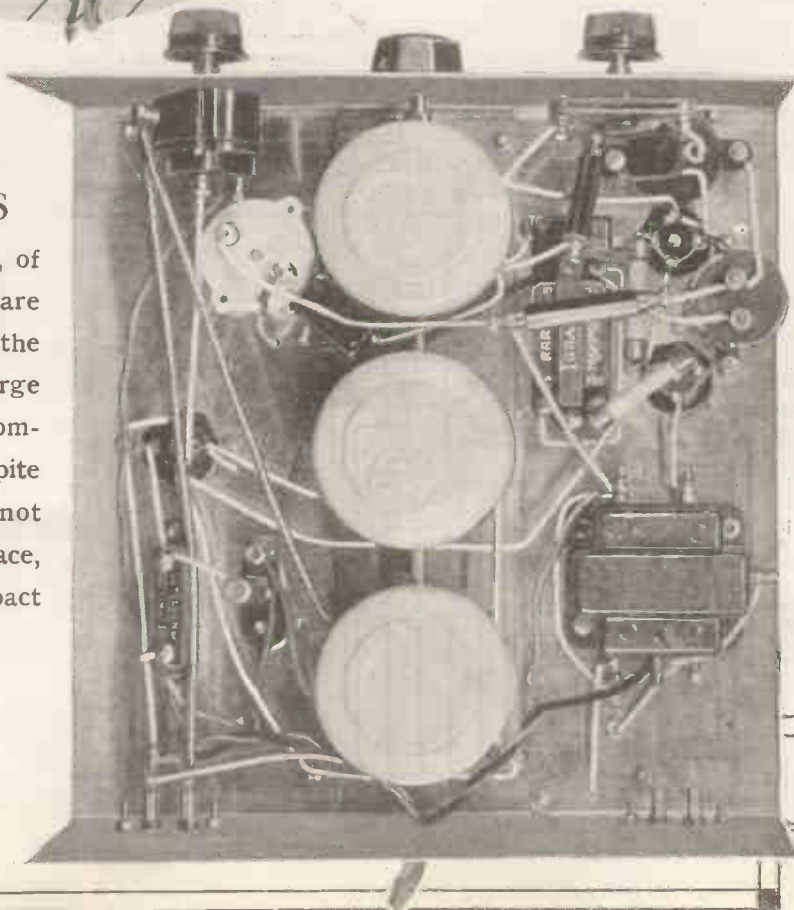
FOR THE HOME CONSTRUCTOR

## SINGLE-KNOB TUNING AND FEW CONTROLS

A three-gang tuning condenser is employed, two sections of which control the band-pass coil, the third section being wired across the tuned-grid coil. Apart from the tuning control, there are three knobs—one for on-off switching and volume control, one for wave-changing, and the third for reaction adjustments.

## COMPACT AND EFFICIENT COILS

The three "canned" coils, of the new Ferrocart type, are accommodated below the chassis together with a large number of the other components. These coils, in spite of their efficiency, do not take up a great deal of space, and so assist in the compact design of the receiver.



Sensitivity and selectivity have been looked after by the most careful choice of components, resulting in the inclusion of Ferrocart band-pass coils in the S.G. and detector tuning circuits.

The L.F. side of the set is adequately looked after as regards amplification and power output by the "Class B" circuit, which enables the fullest strength to be obtained from every station the set can pick up, and those who build it will find that the number of stations available is very large.

### Layout Considerations

This, briefly, is the main outline of the "Ferro-B" Four, and the decision to use the schemes mentioned was a vital step in the commencement of the design. The main scheme and components, therefore, are first class, and the next step was to make sure that these were used in the best possible manner.

No matter how efficient a circuit may be on paper, it is quite easy to ruin it by bad design, so the question of the practical application of the circuit was the next big step that had to be considered. With this is included the choosing of the remainder of the components, especially the tuning condenser.

This latter component has to be very carefully considered where Ferrocart coils are concerned, for it must be free from any form of mechanical back-

lash or whip, if the circuits are to be properly matched over the whole of the tuning range.

When this component had been picked, the question of the other parts was considered, and then that of the actual layout of the receiver. Ferrocart coils are extremely efficient, so that it is possible to get a very big stage-gain from the screened-grid valve if care is taken to screen the set properly. This was a main point which had to be considered when the question of the layout came up.

The result, as can be seen, was to build the set on a metal chassis, so that the fullest screening could be obtained between the input and output sides of the H.F. valve. To accomplish this it is essential that the wiring be as short as possible everywhere, and to achieve this the chassis was made fairly deep so that the



A. JOHNSON-RANDALL, who was responsible for the laboratory check and calibration of the "Ferro-B" Four.



Dr. J. H. T. ROBERTS, F.Inst.P., "M.W.'s" Scientific Adviser, conducted special locality tests with "M.W.'s" great new receiver design.

Ferrocart coil unit could be mounted underneath the "base-board," with the variable condenser above.

This method results in extremely easy and short wiring between the coils and the condenser, and in addition results in improved screening. Chassis mounting valve holders assist as well, with the consequence that the majority of the wiring is carried out under the baseboard, thus giving a clean and finished appearance to the top.

### Screened Leads

A little separately screened wiring was necessary, from the aerial to the volume control, and thence to the first coil, and from the H.F. S.G. choke (which is screened) to the anode terminal of the S.G. valve. This completed the screening precautions necessary.

The construction of a set using a metal chassis is not nearly so difficult as it looks if aluminium is used, since this is quite easily drilled. There is no need, however, to do your own drilling should you be rather diffident about making a good job of it, since arrangements have been made for the correctly

drilled chassis, with holes suiting the components used by the designer of the set, to be supplied commercially.

### Chassis Details

If components alternative to those originally used are employed the drilling of the commercial chassis will not be accurate, and it will be necessary to construct the chassis at home, or to alter the drilling of the commercial one wherever the alternative parts are used. This commercial chassis, by the way, is of iron, finished in dull grey, making the set look particularly workmanlike.

Should the chassis be built at home, it is best made of two sheets of 18-gauge aluminium, one for the panel, measuring 10 in. square, and the other (bent twice at right angles) measuring 14½ in. × 10 in. This latter sheet forms the baseboard and back of the chassis, and the bent edge that is bolted to the panel is about ½ in. deep.



K. D. ROGERS, Chief of the "M.W." Research Dept. He handled the constructional design work connected with the new set.

## A Chassis Design, But Easy to Construct



So sensitive is the "Ferro-B" Four that the reaction control need be used only for the very distant stations.

The photographs show how the chassis appears when finished.

When mounting the various components care must be taken that they are screwed down in the correct order, for in certain cases the presence of one component will mask the nut and bolt of some other part on the other side of the chassis. A case in point is the triple coil assembly, which is mounted below the variable condenser and covers the screws holding the condenser in place.

Thus it is essential for the tuning condenser to be mounted *before* the Ferrocart coils are placed in position. Again, it is necessary to mount the coils before fixing the "Class B" valve holder (which is not of the chassis-mounting type).

### Points to Note

This is necessary because one of the four bolts holding the coils comes under the valve holder. Incidentally, this screw should be countersunk into the chassis (it is placed with the screw head on the upper side of the baseboard, by the way) so that there is no danger of the head fouling any of the "works" of the valve holder and causing a short circuit.

The 1-mfd. fixed condenser is of the round type and the case is enamelled. To ensure that the case comes into efficient contact with the chassis, and is therefore earthed, the enamel under the mounting tags should be scraped away before the condenser is mounted.

The rest of the construction is easy and perfectly straightforward. There is one point in the finishing of the wiring that is worth mentioning, however, and that is the method of earthing the screened sleeving over some of the wire. The sleeving used

is the Goltone spiral copper-covered type and the covering easily unwinds. All that has to be done, therefore, is to solder unwound strips of the sleeving together and then to take a length of the copper strip from the sleeving covering the wire running from the aerial terminal to the potentiometer and connect it to the earthed side of the potentiometer.

### The Panel Controls

This is the only connection from that terminal, for the other end of the same length of sleeving has its screen covering connected to the earth wire running from the earth socket to the filament of the S.G. valve holder, and also to the chassis. This is clearly shown in the wiring diagram of the underside of the chassis.

The reaction condenser on the panel is not insulated from the panel, but the potentiometer is by means of the bush supplied by the makers for that purpose. It is essential also to bend back the labelling tag on the centre terminal of the potentiometer, so that it cannot make contact with the

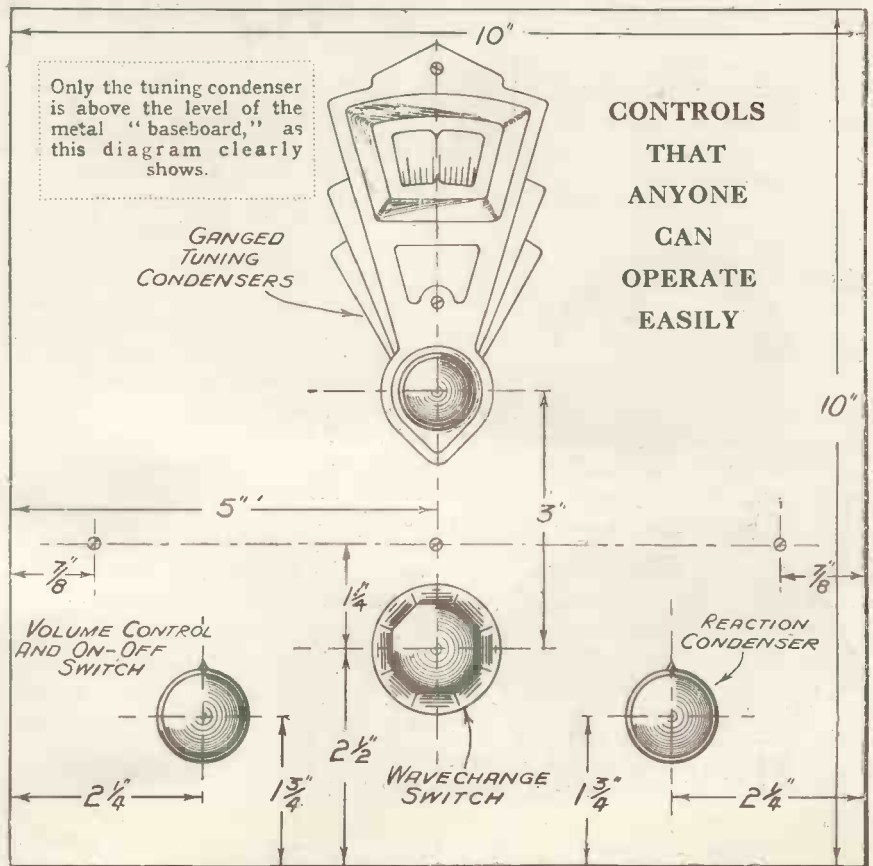
panel, otherwise a short circuit of the potentiometer will occur.

### Simplified Switching

This volume control acts as a radio input reducer, and with it is incorporated the filament on-off switch, thus reducing the number of panel controls. The switch comes into action for the "off" position on turning the volume control knob hard over to the left, so that the volume is reduced to the limit before the set is turned off.

The S.G. choke is of the screened type in order that there shall be no possibility of feed-back between the choke winding and other parts of the circuit, such as the grid wiring of the screened-grid valve, thus producing a tendency towards instability.

A parasitic-stopping resistance is connected in series with the reaction winding to prevent trouble with the control on the long waves. Without this resistance there is a tendency for the reaction control to have two oscillation positions, one at which oscillation appears to commence at



PANEL LAYOUT

some high frequency, and then a later point at which the true long-wave regeneration commences.

If this state of affairs were allowed to persist it would be impossible to receive long-wave stations that required reaction, for before the reaction could be increased to the required amount (long before the true oscillation point was reached) the set would go into parasitic oscillation, and all "signals" on the long waves would be lost. This is a feature that is inherent in the design of the coils, and has nothing to do with the practical conception of the set.

**Ensuring High Efficiency**

It must be realised, however, that it does not cause any loss of efficiency in the tuning system provided steps are taken to prevent the parasitics.

Screening-grid decoupling has been included in the "Ferro-B" Four, and the first L.F. transformer has been parallel-fed. This transformer feeds into the "driver" valve, which in turn is transformer-fed through the special "Class B" driver transformer to the "Class B" valve.

An H.F. "stopping" resistance is connected between the first transformer and the grid of the "driver" valve, to make sure that no H.F. is fed into the L.F. stages of the set.

With a receiver using high-efficiency coils there is always a danger of H.F. being fed through the detector into the L.F. stages, unless special precautions are taken to obviate it.

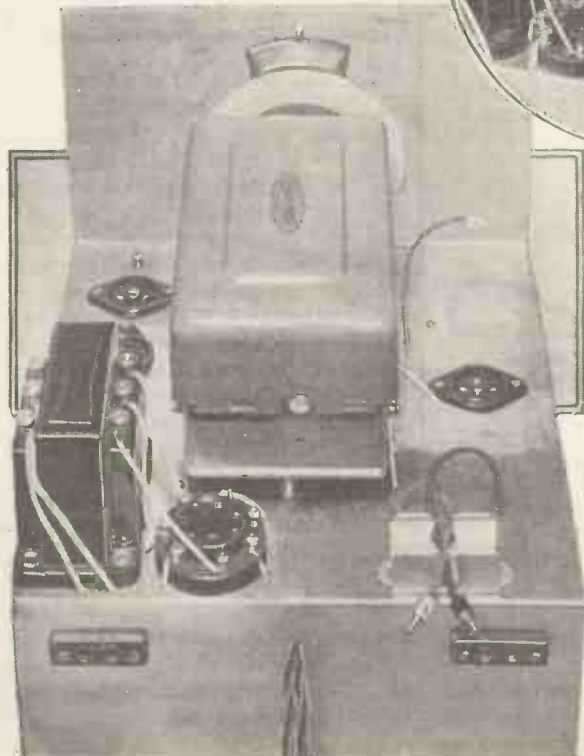
The operation of the "Ferro-B" Four is like that of any other battery set as regards H.T. adjustment and tuning, but the trimming of the variable condenser sections must be carried out very

**FOR THE  
"FERRO-B" FOUR**

**LOUDSPEAKER.**—B.T.H., W.B., R. & A., Marconiphone, Blue Spot, Ferranti, H.M.V., Ormond, Celestion, Rola, Amplion.

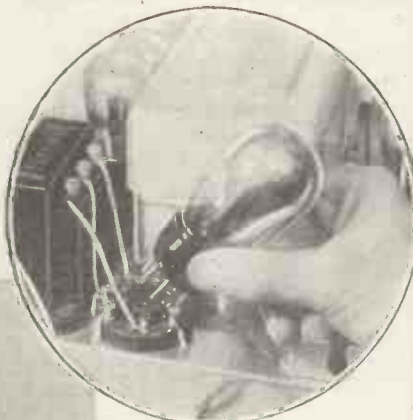
**BATTERIES.**—H.T. 120 volts Super Capacity: Siemens Full O'Power, G.B. to suit "Driver" valve (4.5 to 6 volts): Siemens Full O'Power. L.T., 2 volts: Exide, Ediswan, G.E.C., Pertrix, Lissen, Oldham, Block.

**AERIAL AND EARTH EQUIPMENT.**—Goltone "Akrite," Electron "Superial," Graham Farish "Filt" earthing device.



**THE 7-SOCKET VALVE HOLDER**

For the "Class B" valve a special 7-socket valve holder has been produced, with spacing such that it is impossible to insert the valve incorrectly.



carefully if the ganging is to hold over the whole of the medium and long wavebands.

**Valves and Their Positions**

This being the case, we will go into the setting of the receiver fairly minutely, so that there shall be no chance of constructors not getting the really fine results the set is capable of giving owing to wrong preliminary adjustments.

First, check over the wiring of the set, taking particular care to see that none of the insulating

**VALVE TYPES AND MAKES**

Make	S.G.	Det.	L.F.	Output
Cossor ..	220S.G.	210H.F.	215P.	240B.
Mullard ..	P.M.12	P.M.1H.L.	P.M.2D.X.	P.M.2B.
Marconi ..	S.22	H.L.2	L.P.2	—
Osram ..	S.22	H.L.2	L.P.2	—
Mazda ..	215S.G.	H.L.2	P.220	—

sleeving has slipped or been damaged, allowing a short circuit between any of the leads and the chassis. Next, insert the four valves; an S.G. in V<sub>1</sub>, H.L. type in V<sub>2</sub>, small power valve in V<sub>3</sub>, and the Cossor "Class B" (240B) valve in V<sub>4</sub>.

**Voltages to Use**

If an L.P.2 valve is used for V<sub>3</sub>, the bias battery need be only 4½ volts, but if the "driver" valve is a little "larger" than the L.P.2 it may need as much as 6 volts bias. This can be determined when the set is working, and to make sure it is best to use a 9-volt battery if a valve other than the type mentioned is used.

For H.T., 120 volts are required, and the battery should preferably be of the super-capacity type. It is not advisable to use a mains unit with the set unless you are quite sure that the regulation of the unit is good enough for "Class B" operation.

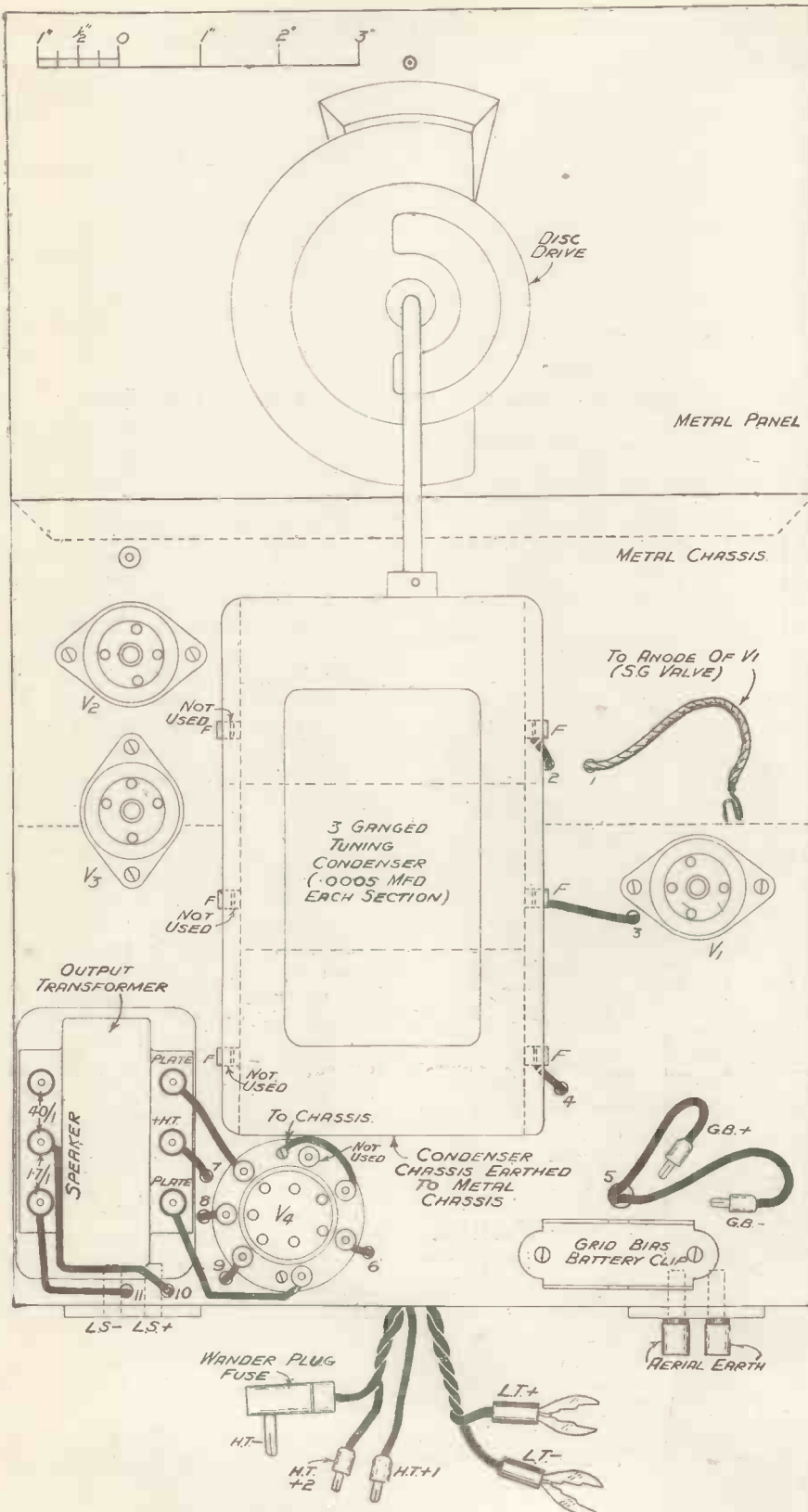
The full H.T. is applied to the H.T. +2 flex, and from 70 to 80 volts on the screen of the S.G. valve (H.T. +1). The output transformer is tapped with ratios of 40 and 1.7 to 1, so that it can be used either with ordinary high resistance loudspeakers, such as the moving-iron types or the moving-coil variety, which have input transformers on them, or it can be used with moving-coil speakers of the low resistance type, with no input transformer on them. For the former cases the 1.7 to 1 ratio is required, and for the latter the 40 to 1.

Connect the speaker and aerial and earth to the requisite sockets on the back of the chassis, connect up to the L.T. battery, and the set is ready for the first test.

**Preliminary Steps**

To switch on, all that is necessary is to start to turn the volume control knob to the right, when the switch will snap over. Continue turning till the control is full on, and then turn the tuning to somewhere between 0 and 30 or 40 degrees, searching for a medium-wave station.

As the coils are not marked as to the wavelength range positions, it is of value to know that the coils are on "medium" when the wave-change switch is set with the flat of the spindle



minimum that will give loudspeaker audibility. Now screw up the trimmer nearest the panel till loudest results are obtained. Reduce volume by the volume control, and then adjust the middle trimmer, finally doing the same with the third.

By this time the station will be pretty loud, so it is best to tune-in a distant station, somewhere below 25 degrees on the dial if possible, and to repeat the process, using reaction as a means of sharpening the tuning, and reducing the volume as before by the volume control.

### Trimming Hints

It should be borne in mind throughout this trimming business that quite sharp tuning points should be found for the trimmer nearest the panel, and for the middle one; while the third will probably be not quite so sharp. This will not, however, be "flat" in any way, and care must be taken that the trimming is done systematically and slowly.

### ABOVE THE CHASSIS

There are few components visible owing to the fact that most of the wiring is at a lower level, under the metal "baseboard." Home constructors who have never previously employed chassis construction will be amazed at the ease with which "factory-built" appearance is achieved.

The aim is to get the set trimmed with the absolute minimum of added trimming capacity, otherwise the efficiency of the coils will be impaired, and the trimming over the whole of the two wavebands will not hold properly.

With the trimming adjusted there is nothing else to be done except to adjust the bias for the "driver" valve to the highest voltage that is consistent with good power output. Probably the value can be 6 volts or more with some of the small power valves, though 4½ volts is about right for the L.P.2.

### Remarkable Range

This adjustment is easily carried out, but the set should be switched off while the grid-bias plug is being changed. With the bias set the "Ferro-B" Four is ready for everyday use, either for big volume reproduction or for distance getting.

The range of reception is remarkable, and it will be found that a very large number of programmes can be tuned in with the greatest of ease. On locality tests the set showed

horizontal. It is necessary to turn the set up or to remove the switch knob to see how the spindle runs, for the coils are mounted on the underside of the baseboard.

The local station will do as a test at first, and on tuning it in the

volume control should be reduced until the station is at quite low strength. Then slack off the three trimmers on the right-hand side of the condenser.

Adjust the tuning of the station again, and reduce the volume to the

the greatest promise, and we feel sure that in the hands of home constructors it will give a performance that will in every way uphold the very high opinion that we have concerning it.

**Thorough Tests**

Locality testing is an interesting, if prolonged, section of the work of the technical staff. Commercial receivers all have to undergo searching practical tests in all sorts of districts before they can be deemed as fit for the general market.

And if commercial receivers are thus tried, why should not similar tests be applied to home constructor designs?

The answer is that, so far as we are concerned, they are.

One set design cannot please everybody, but it can suit a large number of people if it is properly conceived and thoroughly tested. And to make sure that it will pass the multitudinous tests that will be applied to the

all "hotted-up" receivers wherein the accurate duplication in the hands of constructors is particularly important.

The "Ferro-B" Four falls into both of the latter categories; it is an important design, and is distinctly "hot" in its capabilities. So, to make sure that it could be built by

anyone, we not only made several models in the Research Department, but applied very strict locality tests. In addition, we applied what we rather disrespectfully call the double "Aunt Annie" test.

Here I must hasten to add that the term is no reflection on MODERN WIRELESS readers, even if the tests

**BELOW THE CHASSIS**

Care should be taken to smooth the edges of the holes in the chassis through which insulated wires pass, to prevent the insulation being cut. In the wiring diagram on the right it will be noticed that these holes are numbered for identification purposes.

various models built by readers all over the country, the receiver has to be given as many different tests as possible before it is passed out for publication.

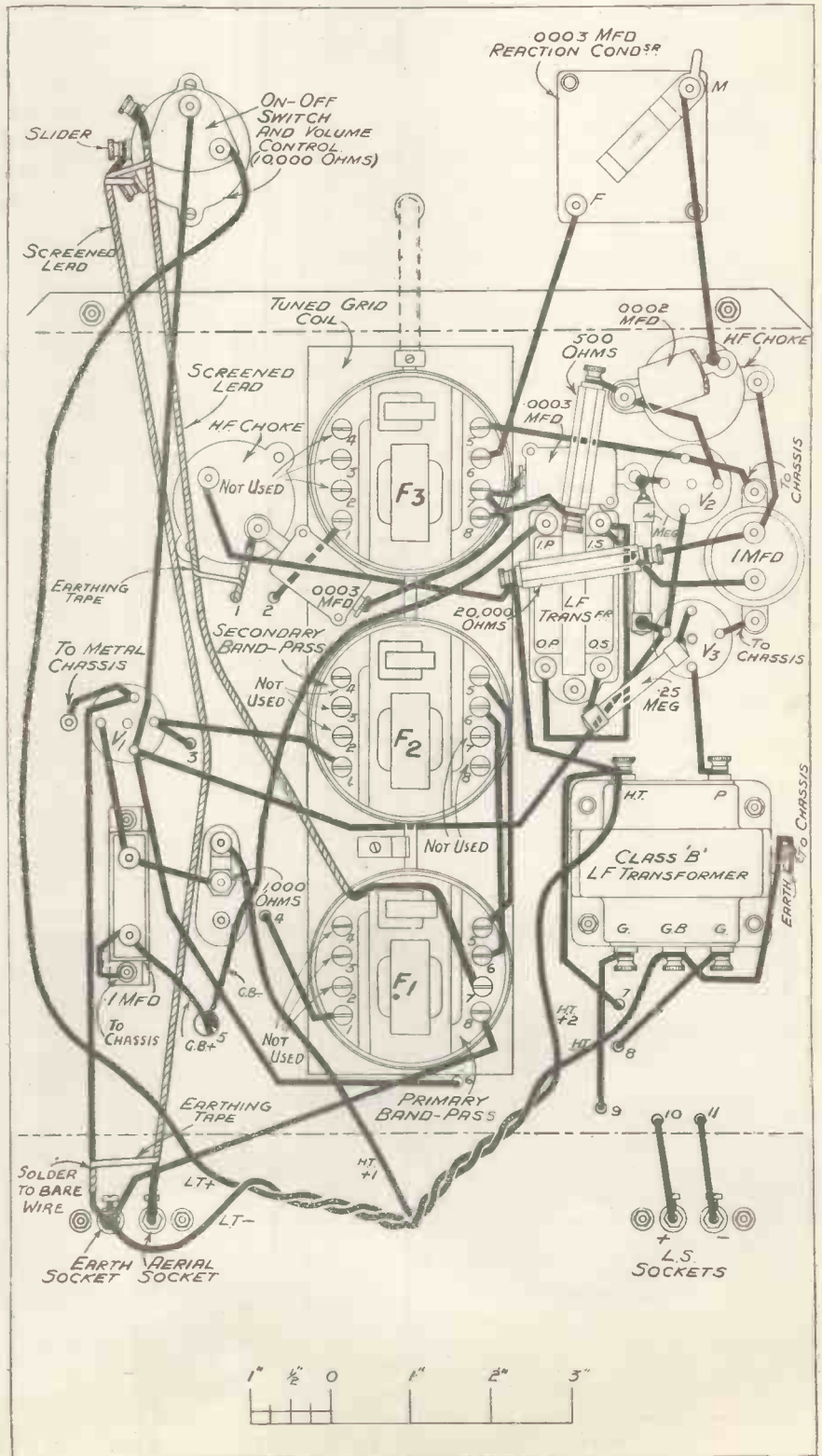
After construction, then, laboratory calibration checks of various types are applied, and on passing these we are ready for the next stage. If the set does not pass, it is carefully examined to see why it has failed, and it is corrected in any faults it may contain, or else the design is scrapped in favour of another.

**Tried in Different Localities**

On the lab. tests being O.K. the set is tried in one or two different local areas for general behaviour. Then one of two things is done.

Either the original set is taken on tour round wide areas of the country by a member of the technical staff, and given all sorts of aerial locality tests, or else several models are made, and distributed to different members of the staff who carry out the tests on the various models.

In any case, at least two models are made of all important designs, and of



do concern the practicability of construction and operation of the receiver.

Rather is the term one of those blunt abbreviations that are so dear to the technical mind. In polite and more accurate parlance it would be "tests for ease of constructional

he hands it to us for check, whereupon we see how near he is to the original design in construction, and, still more important, in results.

I need hardly add that the single "A-A" test is one of operation only, the construction having been done,

tabulated list of results and remarks concerning these tests; suffice it to say that if the set had *not* satisfied the demands made upon it you would not be reading about it here.

The operation on the close-by London stations was a revelation.

**EASILY OBTAINED COMPONENTS FOR THIS HARD-TO-BEAT RECEIVER**

Component	Make used by designer	Alternative makes of suitable specification recommended by designer	Component	Make used by designer	Alternative makes of suitable specification recommended by designer
1 Metal chassis ready drilled (see text)	Magnum	—	1 Screened H.F. choke	Bulgin H.F.9	Wearite
1 Cabinet	Peto-Scott Radiophone	—	1 H.F. choke	Lewcos M.C.	Telsen, Lissen
1 .0005-mfd. three-gang condenser with disc drive	—	—	3 Chassis-mounting valve holders	W.B.	—
1 .0003-mfd. reaction condenser	Graham Farish	Ready Radio, Telsen, Keystone	1 "Class B" valve holder	W.B.	—
1 .0003-mfd. fixed condenser	Dubilier 865	Telsen, T.C.C.	1 L.F. transformer	Igranic "Parvo"	R.I. Parafeed
1 .0002-mfd. do.	T.C.C. type M	Dubilier, Telsen	1 "Class B" driver ditto	Sound Sales type 2P.X.B.	R.I. D.Y.37, Benjamin
1 .0002-mfd. do.	T.C.C. type M	Dubilier, Telsen	1 "Class B" output transformer	Ferranti O.P.M.12(c)	—
1 .1-mfd. do.	Telsen small type	Dubilier, T.C.C.	1 Wanderfuse	Belling-Lee 1028	—
1 .1-mfd. do.	Dubilier 9200	T.C.C., Telsen	2 Twin socket strips	Belling-Lee 1047	Bulgin P.30
1 Combined 10,000-ohm potentiometer and on-off switch	Bulgin VS32	Wearite	4 Wander plugs	Goltone	Bulgin, Belling-Lee, Chix, Igranic
1 1,000-ohm resistance with vertical holder	Graham Farish "Ohmite"	—	2 Accumulator spades	Belling-Lee	Ditto
1 1-meg. grid leak with wire ends or terminals	Dubilier 1 watt	Igranic, Tunewell, Graham Farish "Ohmite"	1 Bias battery clip	Bulgin No. 2	—
1 .25-meg. ditto	Dubilier 1 watt	Ditto	1 Anode connector	Belling-Lee	—
1 500-ohm resistance with wire ends or terminals	Graham Farish "Ohmite"	Dubilier 1 watt	3 yds. insulating sleeving	Goltone	Wearite
1 Set of Ferrocart coils	Colvern F1, F2 and F3	—	5 yds. 18-gauge tinned copper wire	Goltone	Wearite
			1 yd. single screened sleeving	Goltone	Lewcos
			Flex, screws, etc.		
			Metal for chassis if home-made		
				2 sheets 18-gauge aluminium, 10 in. x 10 in. and 10 in. x 14½ in. respectively.	

duplication, and operation by non-technical home constructors." Naturally, when referring to such tests we cannot, however polite we feel, go through all that, hence the impolite abbreviation.

The test consists, simply, of giving the diagrams and photos of the set,

**AS SMALL AS A SPEAKER!**



and it consists of getting some non-technical person to connect up the batteries and get a set going, including ganging the tuned circuits, until he is satisfied that he is getting the best out of the receiver. We then check up as before.

When we are satisfied that the set can be properly copied in construction and performance from our diagrams and brief details (most important this!), the locality tests are preceded with.

The "Ferro-B" Four was taken by Dr. J. H. T. Roberts on a prolonged tour of the country, covering

The extreme compactness of the "Ferro-B" Four is well illustrated here.

with the components and brief details, to a non-technical member of the staff. He then gets on with the building of it, and after he has got the set working to his satisfaction,

from within five miles of the London transmitters, to the wilds of Wales and Cornwall, and to the flat pastoral of Norfolk and the East Coast.

It would be boring to give you a

With a short aerial (25-30 feet) it was possible not only to separate the two stations, but to get a good gap between them on which foreign stations could be received. With a longer aerial it was found useful to insert a preset condenser in the lead-in (the maximum value of the condenser being .0003-mfd.) in order to increase the gap between the stations.

**Remarkable Results**

At ten to fifteen miles a huge gap between the stations was found, the London transmitters covering only a very few degrees of the tuning dial. The Midland Regional was clear of the London stations in all these tests, and came in at excellent strength.

At no point during the locality tests did the set fail in daylight to provide at least three or four alternative British stations, besides numerous foreigners, while it must be realised that during the West of England tests the West Regional station was not working.

After dark the number of stations the "Ferro-B" Four can account for is almost embarrassing. They snap in one after the other as the dial is turned, the high sensitivity of the set providing a punch that is amazing.

The "Ferro-B" Four is the culmination of much experimental work; and we can recommend it for your construction with the greatest confidence.



# FAULTS I HAVE FOUND



by a  
**SERVICE  
ENGINEER**

**I**n these days of multi-valve super-sensitive receivers we seldom hear very much about blind-spots; those areas which are definitely bad for radio reception have been more or less "catalogued," and the unfortunate inhabitants are generally resigned to their fate.

Six or seven years ago the unsatisfactory operation of a set was more readily attributed to local conditions, and, in fact, the presence of a gas-holder or steel-framed building at close quarters to an aerial would always either enhance the virtues of a good set or provide an acceptable excuse for the vagaries of a bad one.

To-day, however, such an excuse is not likely to carry much weight; for one thing, the Regional scheme has ensured adequate reception of B.B.C. programmes in practically any corner of the kingdom, whilst the number of powerful foreigners that produce a field strength comparable with our own transmitters is considerable.

## Tell-Tale Portable

In spite of this, I have had several complaints of "blind spot" to investigate recently, and in one or two cases the complaint has been justified.

I always take a good portable receiver with me on expeditions such as these, for it is the only means of obtaining reliable evidence concerning the reception conditions in a strange locality. It also enables me to detect the limits of a blind spot—if such spot exists—and so gives some useful information which may

help to unravel the cause of the trouble.

## Chasing Programmes

A few weeks ago I received a complaint from a set owner in the West that he could obtain no signals at all on his new eight-valve superhet, and that he naturally suspected that the receiver had suffered damage in transit.

I should have suspected a broken valve or run-down battery.

It was obviously a severe case of "blind spot."

The next step was to put the portable in my car and, with it tuned in to Daventry's wavelength, to drive slowly down the road and wait for signals to materialise.

The road ran up a fairly steep hill, and the house of my unfortunate friend was about half-way up; at the top of the hill signals suddenly reappeared, and at no more than one hundred yards from

the crest were coming in at normal strength.

I turned round and drove down the hill again in order to find the other limit of the "blind" area.

This time the signals came through near the bottom of the hill, but were very weak and suffered considerably from local interference.

## Only an Ornament

I made inquiries of a radio dealer near by, and he gave me the interesting information that he had demonstrated, or tried to demonstrate, receivers in almost every house in that particular road, but without success. With the best of aerials and very sensitive sets no reliable transmission could be received.

I returned dolefully to present my unhappy report and to explain that, until the new Western Regional station was in full swing, the very excellent eight-valve superhet could do nothing more than enhance the beauty of the home.

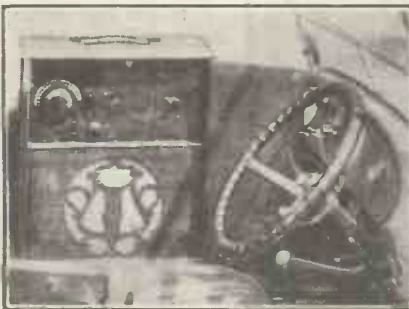
But my friend turned out to be a

## HIS EXPERIENCE AT YOUR SERVICE

*This series of really practical articles by a radio fault-finding expert will prove of the utmost value to our readers. In the course of his duties our contributor meets the most difficult and unexpected problems, and his solutions and experiences are remarkably enlightening.*

I called and examined the set and found that it was up to standard in every way, but, with the exception of a few weak Morse signals, it would not pick up any station, either British or foreign.

## TO TEST "BAD SPOTS"



"The next step to take was to drive slowly down the road and wait for signals to materialise."

After a good deal of hard thinking, I brought the portable into the house and switched it on; it behaved in the same way and, in fact, was so "dead" that in other circumstances

## "Gramophone Pick-Ups Sometimes Need Attention"

trier; when I left he was muttering something about kite aerials!

Mains-operated sets are renowned, amongst other things, for the very low power consumption and consequent economical running cost.

Now and again, however, I come across a case of complaint that the electric light bill has soared after the installation of an all-mains receiver; and such a complaint gives one "furiously to think."

### Question of Cost

The average mains consumption of a normal A.C. set is about 60 watts, which means that the user should get about ten hours' use for one unit of electricity.

It is extremely improbable that the set will be working more than ten hours per day on average—even when it is brand-new and still a domestic novelty—so that the maximum weekly consumption cannot exceed five units.

At 2½d. per unit this will mean a weekly running cost of a shilling.

Which does not account for a "soaring" electricity bill.

Investigation of these cases nearly always reveals either a genuine mistake or an equally genuine

In fact, the switch bogy at one time threatened to grow to such fearsome proportions that more than one manufacturer imported experts from the parent electrical industry to deal with the monster.

### SIMPLE SENSITIVITY TEST



If you suspect the sensitivity of your pick-up, a lot can be gathered from stroking the needle with the amplifier switched on, as fully explained in the text.

But even the efforts of these experts were not entirely successful, for, although they designed switches that were theoretically impeccable and which were silent in operation, they were not prepared for the use, misuse and lack of use that would be inflicted on their darlings by the general listening public.

And even today satisfactory switching is an urgent problem.

### Contact!

When it is considered that the switch contacts may precede valve stages that give an overall amplification of as much as 10,000, it is quite obvious that the

slightest variation of conductivity at these points will give rise to appalling noises at the loudspeaker end of the receiver.

The present-day switches will give perfect contact under normal con-

ditions, but, nevertheless, it is necessary for set-owners to take a few simple precautions if the perfect working is to be maintained.

The primary cause of trouble is lack of use. In very many cases the switch is set in the "Medium Wave" position and left there indefinitely.

### Switch Problems

This allows a film of dust and dirt to collect on the contacts which will cause uncertain contact and frying noises as soon as the switch is moved; this is easily prevented, if only the switch is used regularly, for the contacts are almost always "self-cleaning," and the rubbing motion of the contacts as they come into position will remove any dust before it assumes troublesome proportions.

It is also advisable to avoid violence when using the switch, as it is possible to strain the contacts and therefore cause them to lose their tension.

Apart from "routine" troubles of this type, however, I remember one of the first "pranks" of the "switch bogy" which caused a flutter in some of the research departments.

### Atmospheric Influence

One of the earlier switches employed spring contacts made of an alloy which was chosen more on account of its mechanical suitability than its electrical virtues; as soon as these switches got out the complaints about them started to pour in from the industrial areas only.

Investigation showed that the atmosphere in the industrial centres, having a comparatively high acid content, speedily corroded the contact surfaces and not only caused them to be noisy, but in a great many cases prevented any effective contact.

### Suspect the Pick-Up

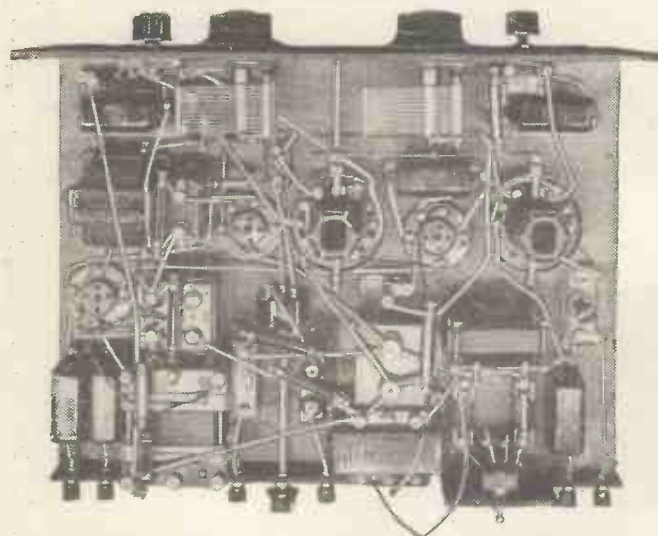
All such difficulties as this have, of course, been overcome, and the problems that remain are chiefly concerned with the careless operator, and the question of combining low self-capacity with mechanical strength and reliability.

Gramophone pick-ups sometimes need attention.

I would like to make the paragraph above look more like a text than it does; but the most I can do is to put it on its own, and hope that it will meet the eyes of all those who

(Continued on page 559)

### A TIP FOR D.C. MAINS USERS



Here is a typical set for indirectly-heated D.C. mains valves. If you have such a receiver and are troubled by valves burning out, you should test the filament current consumption.

exaggeration on the part of the complainant.

Wave-change switches have been the cause of a great deal of teeth gnashing on the part of set manufacturers.

# The WORLDS PROGRAMMES

## HOW WHEN AND WHERE TO HEAR THOSE FOREIGNERS—

**LA MARSEILLAISE**  
 Written and composed by Claude Joseph Rouget de Lisle 1792.  
 Con astina.  
 Arr. for male voices by [unintelligible]

**GOD SAVE THE KING**  
 Attributed to Henry Carey 1788

**Austrian Hymn**  
 Joseph Haydn 1782-1808

**The Belgian National Song**

**The Polish Hymn**  
 Allegretto (c. 1783)

**THE STAR-SPANGLED BANNER**  
 National Song of the United States  
 With spirit  
 Arr. by J. R. L.

**SÖNNER AF NORGE**  
 Den Norske Nationalsang  
 Norge Vainola

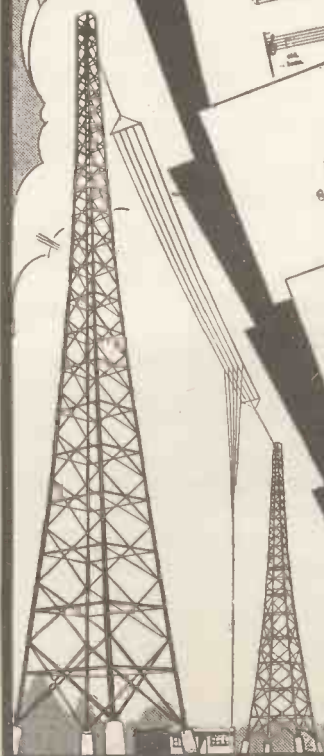
**THE MAPLE LEAF FOR EVER**  
 With spirit



**NAZI NEWS**—A scene in a German broadcasting station. As a means of distributing propaganda, radio has proved a powerful ally to the Nazis, whose enthusiastic broadcasts have formed a big part of recent German programmes.

### CONTENTS OF THIS SPECIAL SUPPLEMENT

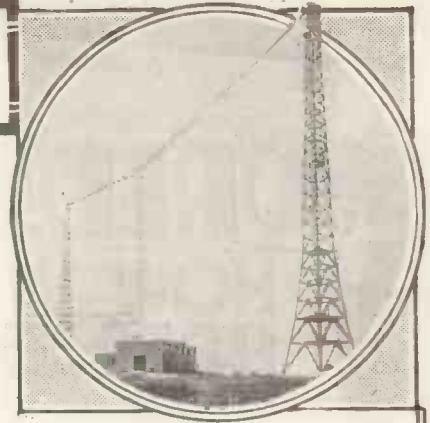
- Notes on Medium-Wave Listening.
- Programmes on the Continent.
- Frankfurt's New Station.
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- Distant Stations and How to Hear Them.
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- Those "Signatures."
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Which stations have been coming over best? How much fading has there been of late? What changes in power and wavelength are likely? You'll find all the latest listening news below.

NOTES ON

# MEDIUM-WAVE LISTENING



BRITAIN'S latest contribution to better broadcasting, the West Regional station at Watchet, Somersetshire, has made a very promising debut. Probably by the time these words appear in print it will have taken over the duties of Cardiff and Swansea completely, but in any case it has proved that the high hopes entertained of it were not misplaced.

Both locally and on the Continent the West Regional is acclaimed as a great asset to the concerts of Europe.

\* \* \*

It is not always that a new station is received with a chorus of praise—Falkirk was a notable case in point—but there seems to be no doubt that approval of the newcomer on 309.9 metres is virtually unanimous. Wales and the West Country are delighted, and the advent of the West National is now causing considerable comment.

This station cannot hope to score a success like its longer-wave brother; in fact, its shared wavelength (261.6 metres, with London

National) is likely to give rise to a good deal of adverse criticism.

\* \* \*

So far as general reception is concerned the promise of this being a good Summer for DX (long distance) seems in a fair way to fulfilment. There continues to be but little fading compared with what one might expect from the calendar, and the many stations that in the early Spring looked like giving good alternatives to British listeners have stood up to the long, warm days surprisingly well.

\* \* \*

In the upper part of the dial Lyons la Doua and Brussels No. 1 have been remarkably good, though the former could not be called consistent. Budapest has been good and Prague excellent, whilst Vienna, Florence and Beromünster have all, at times, been exceptionally well received.

Munich, too, has been an outstanding station, though not, perhaps, to the extent that might be expected from his great superiority in power as compared with Lyons, Brussels, Budapest, Vienna and Florence, none of which comes near the 60 kw. of Munich.

\* \* \*

Round about the centre of the dial there has been an equally good selection of foreigners, with perhaps Leipzig (389.6 metres), Poste Parisien (328.2 metres) and Breslau (325 metres) as the pick of the bunch. Milan, too (331.5 metres), has been well worth watching, even in daylight.

\* \* \*

On 345 metres Strasbourg has been providing something of a surprise by a display of power and regularity of appearance. Its power is only 11.5 kw., but like some of the other French stations it seems to deliver a punch which is out of all proportion to the power rating.

Cardiff, as such, will probably have disappeared from 309.9 metres by the end of May.

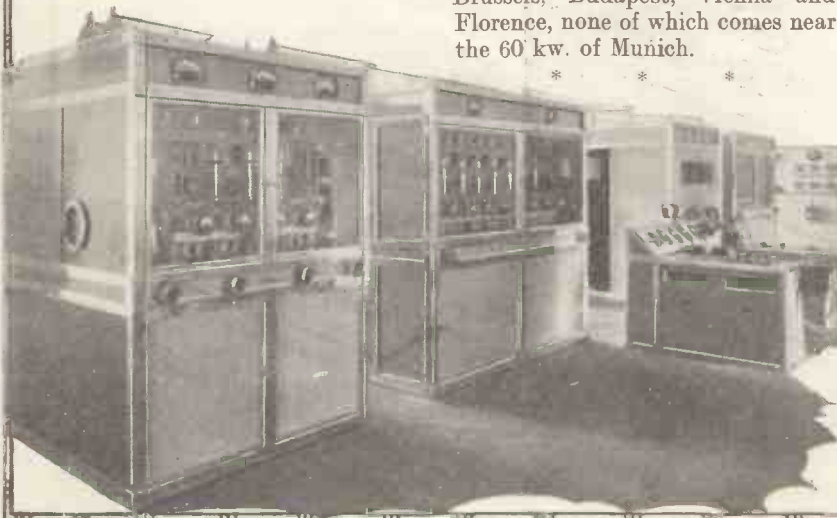
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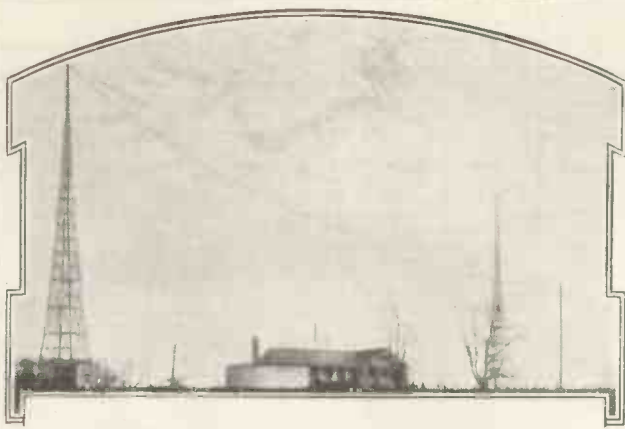
At the lower end of the dial there have not been many changes, and the long-distance flag has been kept flying by such stalwarts as Trieste (247.7 metres), Heilsberg (276.5 metres), Nürnberg (239 metres), and Fécamp (225.9 metres).

Keen ether searchers who have picked up a Budapest relay a little above the London National programme may like to know of Nyiregyhaza, Hungary, who is using 6.25 kw. on 267.4 metres.

\* \* \*

Both the Brussels stations are due to increase their power; Lisbon is expecting to have a high-powered station going in the autumn, and there is to be something of a "general-post" reshuffle of wavelengths as a result of the Lucerne Conference, so there is sure to be plenty of interest in the way of medium-wave broadcasting developments for a long time to come.





# PROGRAMMES ON THE CONTINENT

A selection of some of the "high spots" from last month's foreign programmes, proving that continental listening can provide plenty of entertainment—if you pick your programmes carefully.

**A**LTHOUGH the German broadcasting authorities are advising their listeners that the summer months will bring forth plenty of light dramatic entertainment, including selections from the comedies of Shakespeare, there is as yet very little of the summer atmosphere about European programmes as a whole.

Listeners in Belgium had a talk on summer walks in the countryside, and May Day was celebrated enthusiastically from most stations.

Nevertheless, my nightly travels "abroad" provided no little outstanding entertainment from the different countries.

## AUSTRIA

No one could have wished for a better musical programme than that provided recently from Vienna—and all in one day, too! A special concert of Johann Strauss' works was given by the famous Vienna Symphony Orchestra, and this was followed by an hour of Lehar's melodies.

The Vienna Symphony was heard again later in the evening in a programme designed to show their capabilities. As a really popular musical day I have rarely heard a better programme.

## DENMARK

Viennese melodies were popular last month, and Copenhagen was in the fashion with a programme of light waltzes and other tunes from the gay city. As a contrast Gracie Fields singing "Balloons" was included in a programme of bright gramophone records.

In view of similar experiments in England, I was interested to hear a concert by an unemployed musicians' orchestra. And very good it was.

## FINLAND

The month's European concert was provided by Lahti, which chose

its national composer Sibelius for relay to many of the capitals of

Europe. It was one of the best of these international affairs I have heard, and it was a pity that the B.B.C. did not join in the relay.

## GERMANY

Benito Mussolini's play, "The Hundred Days," which ran for some time at a London theatre, was given from the Hamburg studio in a special radio version. Mozart's opera, "Bastien and Bastienne," which was given a performance recently by the B.B.C., appeared in the Langenberg programme; while a very interesting programme for those who can understand German was a series of talks by various workers—miners of the Ruhr, dock workers of Hamburg, vineyard workers of Franconia, land



HITLER IN ACTION

The German Chancellor making one of his impassioned appeals to youth via the whole chain of German broadcasting stations.

workers of the Eastern frontier, and so on.

Some illuminating facts about labour conditions were brought to light.

May Day provided two big demon-

strations, at one of which Herr Hitler gave a rousing address which seemed a triumph of oratory even to those who could not understand what he was saying!

## HOLLAND

The organ in the Hilversum studio was put to good use recently when a programme by Reginald Foort was transmitted to Dutch listeners. Layton and Johnstone were familiar figures in the Hilversum programme, too, and were, as usual, well worth listening to, especially as they have not been heard in British programmes for some time.

Huizen provided a very good mixed programme in honour of H.R.H. Princess Juliana's birthday, a programme to which I tuned by mistake, but heard out to the end.

## IRISH FREE STATE

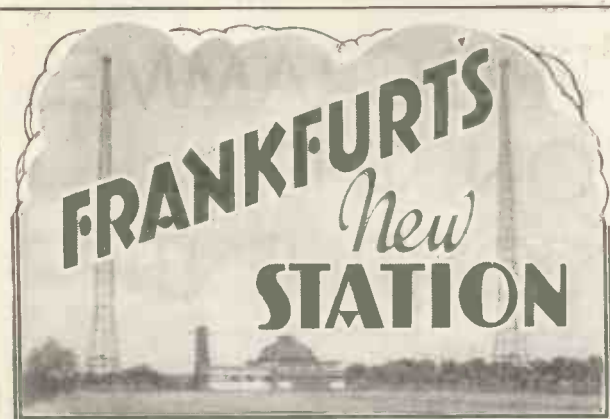
Among the many interesting programmes from Athlone during the past month, I must mention a pleasant half-hour I spent listening to the Dublin Banjo Club's programme. Banjo performances are always enjoyable, and this was no exception.

## ITALY

"Viktoria and Her Hussar," with that bright tune "Mausie" which everyone was whistling a short time ago, was the choice of the Turin station for its light musical show of the month. A very pleasant evening.

In general, the month's programmes were well up to standard, and must have whetted the appetites of many listeners who have had no previous experience of "distant listening for pleasure."

COSMOPOLITE.



The German station at Frankfurt-am-Main is now a confirmed giant of the ether. These details of the apparatus are set out by Dr. Alfred Gradenwitz.

THE present high-power-station building programme of the German Postal Department comprised the erection of a powerful broadcasting transmitter at Frankfurt-am-Main to take the place of the old one, the audibility of which, by the adoption of a much shorter wave—259 metres, Leipzig's old wavelength—was bound to be greatly impaired.

The new transmitter was installed by the Lorenz people at the old place, the suitability of which had been confirmed by special radiation tests. Expenses were further cut down to a minimum by using the old 100-metre iron towers for the antenna, a new station building being erected, while the antenna coupling cabin was put on top of the old transmitter building.

Three-phase current at 50 cycles and a tension of 5,000 volts is supplied by two cables from the Frankfurt Municipal Electricity Works to feed the new transmitter, one of the cables serving as stand-by; while the tension is reduced to 380 volts by transformers likewise provided in duplicate. This is the tension at which all the machinery—motors, ventilators, etc.—is operated.

**High Voltage**

Apart from the high anode tension (11,000 volts), which is converted by a mercury vapour rectifier, all the direct current tensions required, viz., the heating tension of 35 volts, the grid bias of 400 volts, the 2,000-volt anode tension, etc., are generated by machine sets provided in duplicate. A very straightforward switch-board, taking up nearly the whole longitudinal wall of the machine hall, serves to switch in the various machines.

Green signalling lamps, provided for each machine, are lighted to inform the operator at a moment's notice of any breakdown that may have occurred, thus enabling it to

be remedied without any undue inconvenience to listeners.

The conductors leading from the machinery to the studio are carried in cable ducts at a man's height, arranged in a very straightforward way.

**At The Desk**

The tensions actually supplied are surveyed from the control desk in the midst of the transmitter hall, the operator having in front of himself a number of instruments indicating the exact magnitude of the various tensions.

Instruments for informing him of the amount of water used in

cooling the big water-cooled 40-kw. valves, of the intensity of the antenna current, and the actual length (and any variation) of the radiated transmitter wave, are likewise provided. In fact, the operator is enabled to exert a safe supervision, avoiding many a breakdown liable to occur.

About twenty signalling lamps on the control desk will tell him the exact place where a breakdown may, in spite of all this, have occurred, while a horn at the same times gives an acoustic signal. Who never, for example, the cooling water of any tension has failed, or a valve has become disabled, a special lamp will thus be lighted.

The transmitter is arranged in a semicircle around the control desk and is made up of six closed high-frequency stages, which are thus perfectly screened from one another.

The high frequency generated in the first stage is in the second, third and fourth stages amplified to about 150 watts. The first two stages are operating on double the transmitter wave, thus avoiding any reaction of the output energy upon the controlling frequency, the actual wavelength not being produced before the third stage.

**Six H.F. Stages**

Low frequency is supplied to the high frequency on the grid of the fifth stage, this stage being modulated by altering the high frequency at the rhythm of the low frequency. While the high frequency thus controlled is in the terminal stage amplified to the output energy, this is not yet fit for radiating from the aerial; any objectionable upper harmonics having first to be eliminated by passing the high

frequency through an accurately calculated filter circuit.

In view of the high output energy, which in the present case is 25 kw., the antenna must, of course, be arranged at some distance from the transmitter building.

Provision had, of course, to be made for disposing of the heat produced in converting the 11,000-volt D.C. tension into high-frequency oscillations. In fact, metal parts of the valves would not be slow in melting if not kept at normal temperature, for which reason the valves are cooled by distilled water, about 600-800 litres per hour, which is cooled in turn by another water circulation only comprising ordinary water, re-cooled in a cooling tower close to the transmitter building.

The cooling water, of course, cannot be supplied direct to the anodes at the high D.C. tension (11,000 volts), but must be passed through insulating porcelain tubes, which, while soft, are wound around porcelain drums and are only baked afterwards. The water-cooled valves are provided in duplicate, any damaged valve being, at a moment's notice, switched off and replaced by the stand-by.

**Cooling Plant**

A large switch is provided to this effect, which, being operated by a hand wheel in the transmitter hall, will throw in all tensions required, while defecting at the same time the cooling water.

In a special room in the basement there are installed the pump and re-cooling plants supplying the distilled water at the pressure required for cooling the valves as well as raising the re-cooling water to the cooling tower.

An emergency lighting battery is switched in automatically if the mains tension should happen to fail, providing the necessary minimum of light until the breakdown has been remedied.

The modulation supplied from the studio is so low as to be just perceptible in the headphone, while being quite insufficient to operate a loudspeaker. An even greater amount of energy is required to transfer the modulation to the transmitter.

This is why the modulation supplied by the cable must be amplified in a cable output amplifier accommodated on the back wall of the transmitter hall, close to the control desk, where it goes on to the modulation amplifier proper, which is so designed that its output energy will suffice to modulate the transmitter.

The quality of modulation is, of course, being supervised continually by a moving-coil loudspeaker. Moreover, there are measuring instruments allowing the actual degree of modulation of the transmitter to be ascertained at any moment, one such instrument being—e.g. installed in the control desk.



The white rectangles on the control desk looking like writing pads are actually drum-dialled meters.

**WHEN TO LISTEN**

A good way of telling whether it is worth sitting up for American stations.

AMERICAN stations are still to be heard, and on good nights they are coming in with remarkable clarity and volume. No one, though, wants to sit up for America unless he has a reasonable chance of success. Is it possible to discover early in the evening whether

conditions are or are not likely to be favourable? There is no absolutely certain method, for conditions may change completely within an hour or so; for many years, though, I have made use of a system which works nine times out of ten. It consists in employing what I call reference stations.

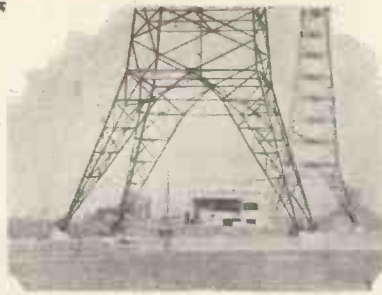
**CHOOSING THE STATIONS**

The most likely band of wavelengths for U.S.A. stations at present is that between about 220 and 280

metres. The reference stations should therefore have wavelengths within these limits. They should also be at a considerable distance, and their power should be comparatively small. If you notice atmospherics you can conclude at once that it is not worth while to sit up. When a test station is fading badly, then the wavelengths in its neighbourhood are probably not worth trying for Americans; should many be fading it is probably not a good night.

R.W.H.

Those long-wave stations that head lists of broadcasters are renowned for their consistent reliability. And this reliability is most marked during the summer months when these stations are particularly worth listening for.



On this page you will find up-to-date information concerning the stations and the conditions of reception on this important broadcast band, which will considerably aid your searching.

## AT THE TOP OF THE LIST

"It is practically inevitable that the wavelengths of all European broadcasting stations will undergo some change inside the 1,131-1,875 metre waveband," says an official B.B.C. statement with reference to the Lucerne Conference. And whatever that may mean, long-wave listeners have, in addition, several developments above 1,000 metres to look forward to.

watts it is easily the most powerful station now broadcasting in Europe, and as a large proportion of its native country should be visible from the top of its masts, there is no doubt that the Luxembourg listener is provided with a service many hundred times stronger than that available to any other nationality.

But foreign listening in Luxembourg must be a nightmare!

Union, Tifis, Kiev and Moscow, the respective wavelengths being 1,380, 1,304, 1,071.4, 1,034.5 and 1,000 metres. All these stations are rated at 100 kilowatts.

In addition to the foregoing, Russia is represented on long waves by Tashkent (1,171.5 metres), Minsk Kolodistehi (1,107 metres), and Moscow Popoff (1,101 metres). So

if it were not for the great distance involved the European long-wave listener would certainly always be able to hear a Soviet programme when fancy dictated. No other country has anything to compare with this array of high-power transmitters.

Probably we ought not to grumble about the amount of atmospheric interference we get in this country, but it must be admitted that it has certainly been a bit of a nuisance at times during the last few weeks. Not so much at night as when attempting long-distance during the day. But there have been plenty of other times when reception has been remarkable for range and reliability.

For instance, there is Kalundborg, who has for so long successfully relayed the Copenhagen programmes on 1,153 metres, with only 7.5 kilowatts in the aerial, but with an audience in every country in Europe. This has always been a popular station with the British listener, and now that the power is to be increased tenfold (the new station may be in operation before these words are read), it is likely that Kalundborg will make a huge host of new friends.

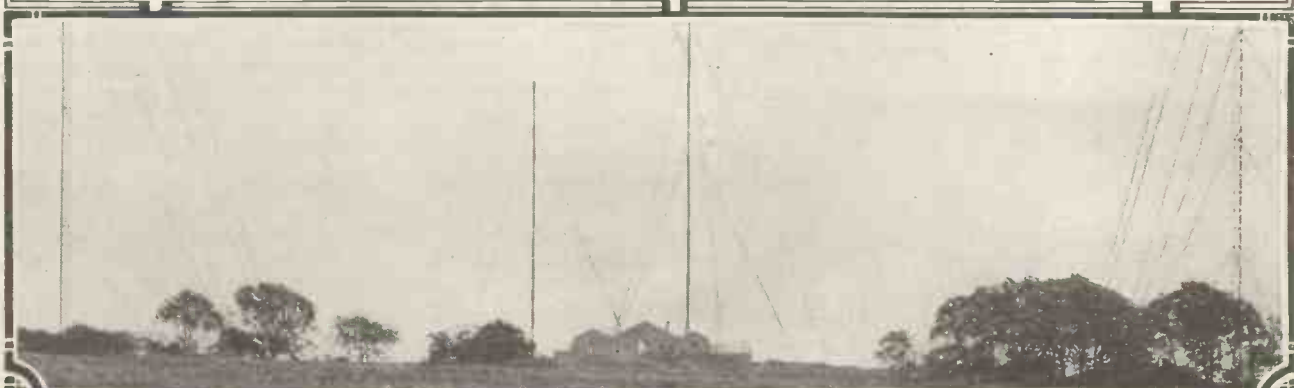
Luxembourg, on 1,191 metres (or as near that wavelength as expediency will allow), improves upon acquaintance. With its 200 kilo-

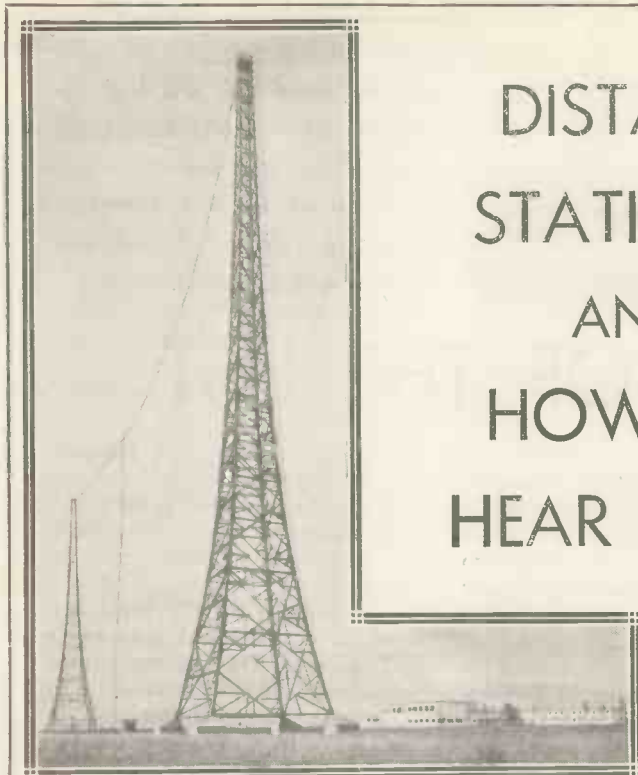
### YOUR FRIEND ABROAD

Why not send him "Modern Wireless" every month to keep him in touch with all the latest radio news and developments? Post his name and address with 17s. to the Subscription Department, Amalgamated Press Ltd., The Fleetway House, Farringdon Street, E.C.4, and "M.W." will be sent every month for a year.

In response to inquiries about the Russian stations, and disregarding what may happen as a result of the Lucerne Conference on wavelengths, the situation can be summed up by saying that there are eight of them in all on 1,000 metres and above.

Five of these are of really high power, namely, Novosibirsk, Trades





# DISTANT STATIONS AND HOW TO HEAR THEM

Tips and station news about receiving programmes from far-off countries of the world.

## LESS CURRENT—GREATER STRENGTH

**M**ANY long-distance sets nowadays incorporate the variable-mu valve, and I have come across a good many cases in which this excellent valve was unable to do itself justice and was at the same time wasting a considerable amount of high-tension current simply because the screening grid potential was too high.

If you care to make the experiment of using a potentiometer to regulate the screening-grid potential, you will find that if you increase the voltage beyond a certain point the amplification actually falls off, though the current increases rapidly.

You will discover also that you can reduce the screening-grid voltage quite considerably from the best setting of the potentiometer without any very great falling off in amplification, though there is a distinct reduction in the current passing. The plate voltage can also be brought down and a big saving effected in this way without spoiling the magnification.

If you are not satisfied with your variable-mus, make sure that you are not giving them too high a voltage on their screens, and try also the effect of varying the plate voltage.

During the next few months the "best times" that I gave last month should prove fairly reliable as

a guide to the short-wave stations that one may reasonably expect to hear at any particular time of day. Of conditions there is little to be said.

The fact of the matter is that during the summer, whether conditions are good or bad, most of the short-wave stations of the world will be heard at some time or another.

As I have remarked before, one of the outstanding charms of short-wave work is the frequency with which it springs surprises on one. It is the easiest thing on earth to hold on to a station that one imagines to be "super-DX," and to find, later, that it is G S F, Daventry!

Conversely, however, one may tune-in something that sounds very much like a "local" and find that it is a South American or an Australasian. This brings us to a point that cannot be made too strongly—that it is well worth the while of any enthusiastic short-wave man to calibrate his receiver or to equip himself with a heterodyne wavemeter. The latter

is only a separate short-wave detector built with special care over the rigidity of the coils, condensers, etc., not to mention the invariability of the L.T. and H.T. supplies.

A few more detailed suggestions about calibration will be found under the heading of "On the Short Waves" this month.

## STATIONS BEING LOGGED

Among the more "unusual" stations that readers are logging nowadays, the following are worthy of mention: Y V 1 B C (Venezuela) on 49.08 metres, late at night; Y V 11 B M O (Venezuela) on 48.95 metres, likewise; Heredia, Cos a Rica, on 19.9 metres (week-ends only, most of the evening from 7 p.m. onwards); Quito (Ecuador) on 47 metres, in the small hours; and J I A A, Tokio, on 19.36 metres, round about mid-day.

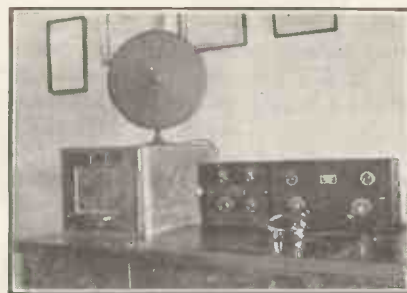
It will be seen from the above that conditions appear to be rather bright for South America of late. This is borne out by the fact that the South American "hams" have been coming over well on both the 20- and 40-metre bands during the late evenings.

Those who get a special thrill from the reception of amateur telephony (perhaps through labouring under the delusion that it is put out on very low power!) might do well to listen for the "Yanks" in the 20-metre band during the late afternoons and early evenings.

Telephony is becoming very popular in the States, and certainly some of them make a very good job of it.

I was surprised myself to hear a Canadian amateur—V E 3 H E, of Toronto—putting across some really excellent phone a few days ago. It was received at a steady R6 on one valve.

## FOR CHECKING OUTPUT



To keep a check on the quality of transmissions from the Kansas State Agricultural College (K S A C), this super-heterodyne receiver has been installed.

## EUROPEAN STATIONS

The only new-comer in the world of European stations appears to be Poznan, Poland, working on 31.6 metres; but he will be ancient history by the time this paragraph appears in print. When I first heard him the quality was not too good, and, to quote a correspondent of mine, "The programme consisted of



## NOTES AND NEWS FOR THE "DX" MAN

mouth-organ solos alternating with breakdowns."

"Programme-value," however, may definitely be said to be improving. Those of us who no longer find the charm of novelty in short-wave work still have no desire to give it up, and this may largely be attributed to the fact that one *can* (when fed-up with searching) tune-in an enjoyable programme, sit back in the chair, and listen to it in comfort.

The psychological effect of the knowledge that the programme is coming from the other side of the world may possibly contribute to one's enjoyment of it—I leave this to Dr Burt!

Whatever we may think about this, it is very encouraging to see the list of short-wave broadcasting stations growing quite rapidly. There are now very nearly a hundred between 12 and 100 metres. The vast expanse of kilocycles, it is true, makes it seem that they are very few and far between, but we need not worry so long as we know that they are all there, and that we can get most of them with a well-designed set.

### WHAT TO EXPECT

Long-distance reception of medium-wave stations during the last month or so has been so astonishingly good, that one is inclined to conclude that American, and other DX stations, will provide good signals through the summer months. That a variety of American programmes will be audible I have little doubt, but that signal strength will in any way approach that at present experienced I very much doubt.

There will be several new high-powered stations to search for—stations which will probably provide reasonably powerful signals in mid-summer. I think everyone must have read of the proposed high-powered W L W (Cincinnati) which will have a power of 500 kws., thus being one

of the most powerful *broadcasting* stations in the world.

I have put particular emphasis upon the word "broadcasting," for I have frequently observed that this station will be the most powerful station in the world. This is not so, for the transatlantic and similar telephone services use simply colossal powers, whilst the long-wave Malaba, Java, station employed—or employs, I'm not sure whether it still

### IN FAR-OFF VENEZUELA



A short-wave broadcaster at Maracay in Venezuela which works on a wavelength around 30 metres and has the call letters Y V R.

operates—3,600 kws. This station, by the way, was opened in 1919, and was the first really reliable link between Holland and the Dutch East Indies.

### GIANT SENSATION

W L W is not the only "giant" to cause a sensation in America at the present time. There is another, X E P N, at Piedras Negras, in Mexico. This latter station employs a power of 100 kws., and is now operating upon about 512.6 metres.

It is interesting to observe that Mexico came by this giant in almost the same way in which it came by the 75-kw. station X E R. The owner of X E P N was at one time the owner of a station (K T N T) in Muscatine, Iowa. Owing to his using K T N T to broadcast details of what the officials termed "doubtful cancer cures" and "using the transmitter as a personal mouthpiece," his licence was discontinued. In the case of X E R objection was taken of telling fortunes over the air.

It certainly appears as if the United States has little power to

stop the broadcasting of undesirable matter to U.S. citizens, for it seems to be becoming a custom to leave the States and build a high-powered station in Mexico. Where it will end it is difficult to say. Possibly the Mexican government will intervene—possibly not. In the meanwhile, the DX listener benefits.

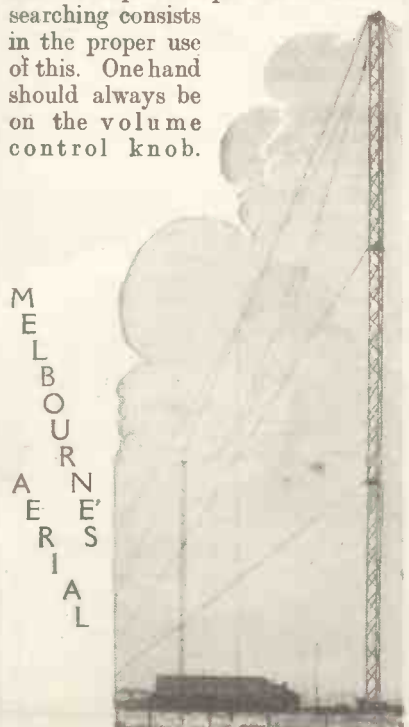
### HOW TO SEARCH

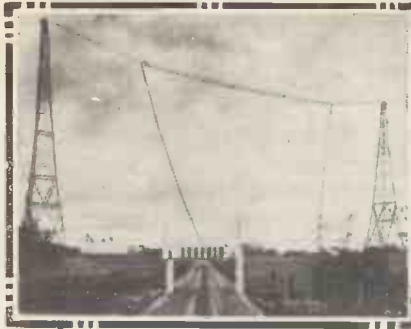
There is a great deal more in the art of searching for distant stations than many people realise. Even with the simplest of modern sets controlled by a single knob the skilled hand can often bring in with excellent volume stations which a novice or careless searcher completely misses as he runs round the dial.

When there are two tuning knobs, or when the set has a reaction control, the superiority of the skilled operator becomes much more marked. Perfection comes, of course, with practice, but there are a few simple rules for searching whose observation makes an immediate difference to the bag of stations obtained.

### SINGLE-KNOB SETS

The single-knob set (unless it is one of the very few types now available with automatic volume control) has always a volume control as well, and an important part of the art of searching consists in the proper use of this. One hand should always be on the volume control knob.





"The World's Programmes" foreign news service keeps you up-to-date with all the latest station changes, and puts you in touch with new transmitters as soon as they come "on the air."



# ITEMS FROM OVERSEAS

**EAST PITTSBURG.** Remarkably interesting aerial tests have recently been made at this station with aeri-als suspended from captive balloons. Most of the experiments were carried out on a 500-ft. aerial, with a feeder line about 1,000 ft. in length.

**DROITWICH.** An order has been placed with the Radio Communication Co. for two masts of the lattice steel type, similar to those supplied for the North, the Scottish, and the West Regional stations. They will be used for the new Midland Regional station which is to replace 5 G B next year.

**PULHAM, NORFOLK.** To aid in direction-finding, one of the new Marconi-Adcock anti-night effect D.F. installations has been fitted at the Pulham aerodrome.

**BERLIN.** Instead of a metronome, Berlin recently adopted the opening bars of "Volk an's Gewehr" ("People, To Arms") as an interval signal.

**RADIO EXCELSIOR, BUENOS AIRES.** The wavelength of the new short-wave station at Radio Excelsior (situated fifteen miles from Buenos Aires) is to be 30 metres.

**ALGIERS.** A new beam station has recently been provided for communication with France.

**THE HIMALAYAS.** Following the announcement that four St. Bernard monks are founding a hospice 15,000 ft. above sea level in the Himalayas, comes the news that Marchese Marconi has offered to equip it with short-wave radio.

**LISBON.** A new 20-kw. station is now being erected near

Lisbon, but with an eye to the future the authorities have arranged that it can easily be adapted to use 100 kw. if the necessity arises.

It is expected that the first tests from this new station will be heard in this country in a little over three months' time.

**BELGIUM.** When Professor Piccard makes his next adventurous ascent to the stratosphere he will have the expert assistance of The Rag Chewers' Club—a well-known short-wave radio association.

**PORT ELIZABETH, SOUTH AFRICA.** At an influential meeting held in connection with the proposal to augment the main South African broadcasting stations by a relay on the East Coast, Grahamstown was unanimously favoured as the best site.

It is almost exactly equidistant from Port Elizabeth and East London, and a station there of the type proposed would thus be able to serve a white population of approximately a quarter of a million.

**PRAGUE.** Some excellent gramophone concerts have recently been given by the Prague station on 488.6 metres.

**RADIO LUXEMBOURG.** Considerable confusion appears to have been caused by the fact that the lady announcer at this station pronounces its name very differently from her male colleagues, and it therefore sounds more like "Radio Stamboul" ("The Radio Istanbul"—or "Radio Stamboul" station, as it is sometimes called—is scheduled to work on 1,200 metres, and Radio Luxembourg on 1,191 metres.)

**ZEESEN, GERMANY.** The call-sign of the Zeesen short-wave station (which recently commenced to radiate its own programmes instead of relaying the parent station—following the precedent set by our own Empire short-wave station at Daventry) is D J C. A special German programme for North America is transmitted after midnight on 49.83 metres.

**CALCUTTA, INDIA.** Reports on the reception of the New Calcutta short-wave station which works on 49.1 metres, will be welcomed by the station director.

The name "Cossipore" (which is the actual site of the station) need not be used, but letters should be addressed to the Director, Short-Wave Radio Station, Calcutta.

**RADIO AGEN, FRANCE.** The new Radio Agen station has quickly been able to do its good turn to listeners, for when the Toulouse station was burnt down it was asked to step into the breach, and did so very efficiently, notwithstanding its comparatively low power.

**EIFFEL TOWER.** Time signals are given from the Eiffel Tower station on 2650 metres and 28.36 metres at the following hours: 07.56, 09.26, 19.56, and 22.26 G.M.T. (In the above, the first two figures stand for the number of hours, reckoned from midnight, and the second two figures for the number of minutes. This system is in constant use for times by radio, as it obviates the necessity for mentioning a.m. and p.m. Thus the first and the last groups of figures given above refer to 7.56 a.m. and 10.26 p.m. respectively.)

**POSTE PARISIEN.** An early morning review of the more interesting items in the day's newspapers was the happy idea recently hit upon by this popular French station, which works on a wavelength of 328.2 metres, immediately above the Breslau transmission.

**VIENNA.** The preliminary tests from the new station, situated at Bisamberg, just outside Vienna, have proved very successful.

**SALZBURG.** The Austrian broadcasting authorities are spending about £1,600 to relay concerts and opera performances to their listeners from the famous Salzburg Musical Festival during the months of July and August.

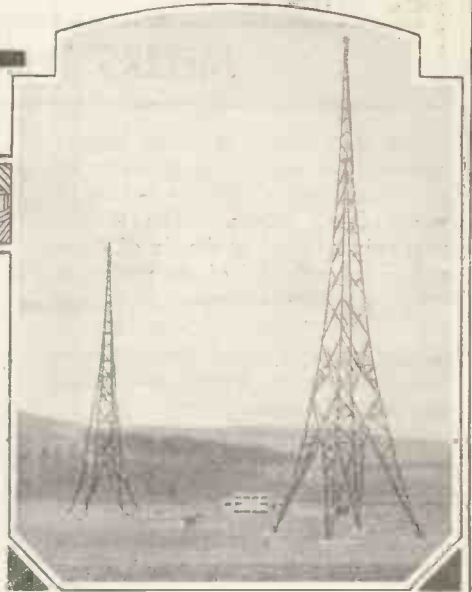
**PARIS.** The six notes which have recently been played by Poste Parisien as an interval signal are the opening of the air "Louise," by Gustave Charpentier.

**TOULOUSE.** So many messages of sympathetic appreciation were received by the Toulouse station authorities in connection with the recent fire that it was impossible to reply direct to them all.



# BEROMÜNSTER

## SWITZERLAND'S BIGGEST STATION



One of the best received of Continental Stations is Beromünster, the German-speaking Swiss broadcaster on the medium waveband. Let's go on a visit to the little village of Münster and see the giant transmitter.

I WAS met with a kindly reception at Berne when I explained that I wanted to visit Beromünster on behalf of British listeners. I was given an official letter and an introduction to Dr. Gerber, who is in charge of the transmitter.

### WHY BEROMÜNSTER?

Then we went on a 40-mile drive from Berne to the Beromünster station, through the winding streets of the small town of Münster, about a mile away from the station itself.

Beromünster is in the middle of one of the most important cheese-producing districts of Switzerland and it is so many miles out from any town (apart from Münster, which is so small that there are only a couple

"Why 'Beromünster,' I inquired, "if the name of the nearest town is Münster?"

"Because," explained my friend, "'Münster' means the same as your English 'minster.' Beromünster is the name of an old monastery at Münster and which has made this particular township famous above all the other Münsters in this part of Switzerland."

As a matter of fact, I had the opportunity of visiting the old Beromünster after seeing the transmitter, and my engineer friend and I had lunch in the monastery wine-house which is now open to the public. The monastery is now a rest house for priests.

While we were talking, I noticed

crete, and it was planned for us by an architect who has made his name in Zürich with those futurist flats which no doubt you have seen.

### MAINS POWER

"For your information, it is about 100 ft. long and 66 ft. wide. There is an underground part. There is no heavy machinery, all the power being taken from the mains and rectified by mercury arc rectifiers. This apparatus is downstairs, below the transmitter panels which are on a level with Dr. Gerber's office."

Dr. Gerber, in charge of this white-coated engineering staff, was kindness itself. He showed me the research section of the Beromünster station and dug out from his metal files a batch of reception reports which he has had from listeners all over Europe, and especially from England.

Then we went out to see the transmitter, which is not only British, but which is almost exactly like a B.B.C. Regional broadcaster.

### SLIGHTLY MODIFIED

There are the same five panels and a control desk of the kind used at the London and Northern and Scottish Regionals. All this apparatus is built up to a higher level than the stone floor, so that the engineer walks up three steps to a platform railed off from the rest of the transmitter hall.

Dr. Gerber went to great trouble to show me in what way the British engineers had modified this transmitter to suit Beromünster's local conditions, so that it is different from B.B.C. transmitters.



On a raised platform will be seen the transmission panels and control desk of Schweizerischer Landessender, the Swiss transmitter which uses a power of 60 kilowatts on 459 metres.

of hundred or so listeners living there) that I idly wondered why they must needs plant a big transmitter out in the wilds.

My engineer friend, belonging to the Telegraph Department which runs broadcasting in Switzerland, said that they chose the site midway between Münster and Sursee, because it is high and because an experimental transmitter there was found to be in an excellent centre for German-speaking Switzerland.

that the car was climbing all the way, and at the top of the plateau we arrived at the station, the two 400-ft. masts being a landmark.

### THE TRANSMITTER HOUSE

"A curious building," I commented, as my friend drove the car up into a garage built into the side of the transmitter house.

"Yes, but typical of New Switzerland, *nicht war?*" he said. "It is, as you can see, of reinforced con-

## METERS THAT KEEP A WRITTEN RECORD

For one thing, in these broadcasters, the final stage consists of two panels in which are banks of water-cooled valves. The B.B.C. uses only five out of the six of these valves on each side of the push-pull arrangement. At Beromünster they use all the valves. This is because of the different aerial arrangements which necessitate more power being put into the aerial system.

### FREQUENCY CONTROL

"The other panels are the same as at your Regional transmitters," I was told. "but your system of valve drive is different.

"None of your stations has an accurate oscillator valve in a separate panel. They use the ordinary valve drive, coupled to the transmitter through what I believe you call a 'trap' valve. This is suitable for working in England, no doubt, but here we must have a very accurate frequency control.

"I, and other authorities, had intended to use crystal drive, but your British engineers showed us a new and very accurate valve drive, designed to be used with these transmitters. We decided to use it. Here it is."

We went over to a grey steel panel standing at the side of the main transmitter and in the centre of which a light was glowing.

### COOLING THE VALVES

"Here is a separate little valve, working in a shielded and insulated 'oven,' driven entirely by batteries and of absolute laboratory accuracy in its constancy. It is an oscillator, of course, and it 'drives' the rest of the transmitter."

"How are the valves cooled?" I asked, seeing that there was no water tower or radiator at the back of the Beromünster building.

"We can't rely on a water tower for valve cooling, as we might sometimes be frozen out. Come down with me to the basement and see how it is done."

I went down to the lower storey and was shown the huge motor-driven fan which sucks air through a radiator on ground level. This

that is, they are a kind of valve filled with mercury vapour and in which the rectification takes place across the electrodes in the vapour.

"We take our power, of course, from a high-voltage A.C. supply. Cables from three sources supply power, so that if one set of wires is struck by lightning we can change over to another to prevent a breakdown."

### MAGNET-OPERATED SWITCHES

I saw the magnet-operated switchboard which changes over the transmitter's rectifier from one set of A.C. cables to another. At the base of this switchboard are ingenious meters which give a written record of the power consumed every day. A pen operated by the meter armature traces a graph over a paper drum.

I commented on the fact that there were no landline amplifiers at Beromünster.

"No," said the station chief. "We only have this one small amplifier at the side of the modulating stage. The programmes are provided for us on special landlines which the Post Office have fitted between Beromünster and the studios at Zürich and other places.

### PROGRAMME DISTRIBUTION

"We do not have anything to do with that end of the business here, and the switching between the studios at Zürich, Berne, Lucerne and so on is done at the control room under the jurisdiction of the programme company. Our only job is to broadcast what is sent us on the landlines."

I think you will agree that Beromünster makes a success of its job!

A. A. S.

## LOOK OUT FOR

the very special

## WORLD'S PROGRAMMES

Section

## NEXT MONTH

JULY "MODERN WIRELESS"

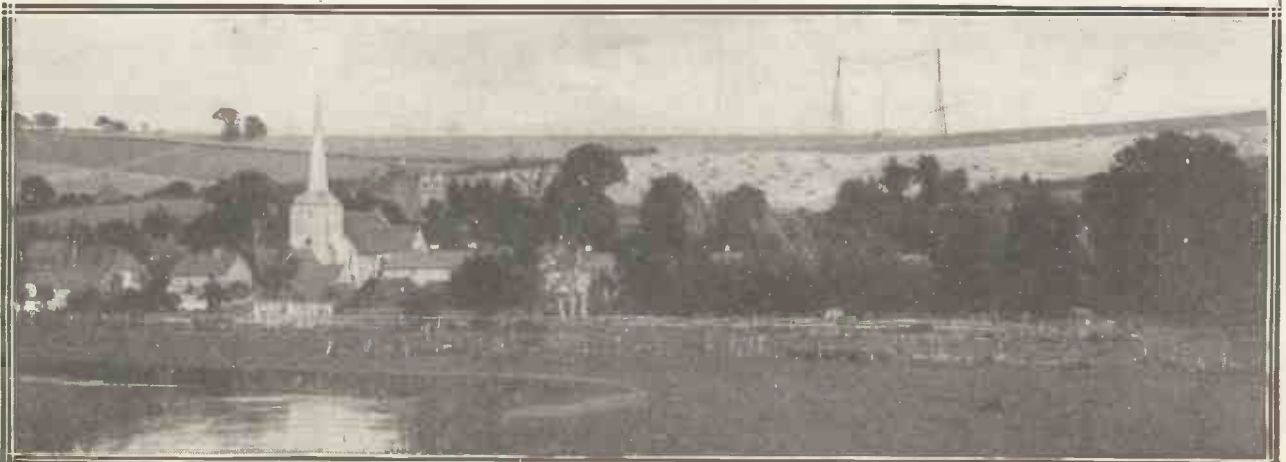
On Sale July 1st

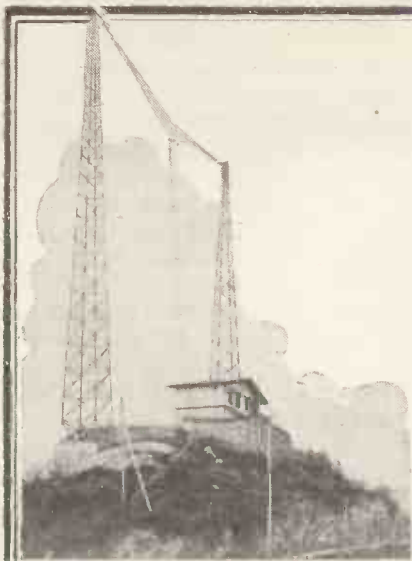
radiator is nearly ten feet high! The fan was switched on for my benefit and I was taken round to a little room on the exhaust side to withstand the full blast of it!

On this side of the fan, incidentally, are large "bottles" the height of a man, and holding the valve-cooling water under air pressure. If the fan were to break down the water could still be pumped under pressure through the cooling system for a sufficient time to give the engineers a chance to repair the motor.

"In my opinion, the rectifiers are the most interesting part of our transmitter," said the station chief.

"They are mercury arc rectifiers—





# STATION SITUATION

For your greater enjoyment and better understanding of long-distance listening, we offer you each month the latest information about the broadcasting stations of the world.

**BERLIN.** The physical jerks transmissions which take place on 1,635 metres at 6.15 a.m. are now repeated at 8.15 a.m. (except on Sundays) for the benefit of city and other workers who keep later hours.

**TOKIO.** So popular have the Army Broadcasts from Manchuria proved that the authorities have decided to continue them indefinitely.

**RABAT.** Owing to the prevalence of radio "piracy" in Morocco the authorities have instituted a round-up in conjunction with the wireless dealers.

**GERMANY.** The political situation in Germany has been reflected very strongly by developments on short waves, where many changes have taken place amongst the German amateurs licensed to transmit.

**RADIO STRASBOURG.** At a recent meeting of the company responsible for this station it was revealed that the subsidy received from the French Government had been reduced considerably of late.

**PARIS.** The tenth French Radio Exhibition is arranged to take place from September 6th to 17th.

**COSSIPORE.** Tests from the new Calcutta short-wave transmitter at Cossipore have been satisfactory, and enormous distances have been covered, according to even the earlier reports on reception.

**ROCKY POINT, NEW YORK.** There are no less than eighteen different transmitters—or at least eighteen different call-signs and wavelengths—allocated to the Rocky Point station.

**BANDOENG, JAVA.** As an interval signal, this station, which is situated in the Dutch East Indies, uses three notes which sound like a motor-horn, on his short-wave transmission.

**BELGRADE.** Yugo-Slavia recently decided on Government control of the Belgrade and Ljubljana stations.

**DUBLIN.** It has been decided to reopen the Dublin station as a relay, whilst the

high-powered Athlone retains the original Dublin wavelength of 413 metres.

At the time of writing the new Dublin wavelength has not been decided upon, but it will probably be somewhere between 200 and 230 metres. The power will be  $1\frac{1}{2}$  kilowatts.

**PARIS.** The Director of the Paris LL station recently announced that the

transmitter to work simultaneously with the present Osaka station on a different wavelength. The idea is to give alternative programmes, on the lines of Eckersley's Regional Scheme.

**MILAN.** The site of the second Milan station recently put into operation is at Vigentino.

**LUXEMBOURG.** Most of the power at this already famous long-wave station is generated by two 790-h.p. Diesel engines.

**RADIO-NATIONS, GENEVA.**—This short-wave broadcaster which is run by the League of Nations is situated at Prangins, near Geneva, and its receiving station in the neighbouring village of Colorex.

**LEIPZIG.**—A new interval signal has been recorded on a gramophone for use by the Leipzig station, on 389.6 metres. It is taken from the main theme of the Bach fugue, and is founded on the letters of the composer's name.

**SCHWEIZERISCHER LANDESENDER.** This German-speaking Swiss station, which works on 459 metres, has recently made some announcements in Italian. These Italian-language broadcasts are from the new Lugano studios which have been built in connection with Tessin, Switzerland's latest station that serves the Italian-speaking population.

**"THE WORLD'S PROGRAMMES"**

is the only foreign-programme feature which gives a complete and detailed list of all station changes and their latest news.

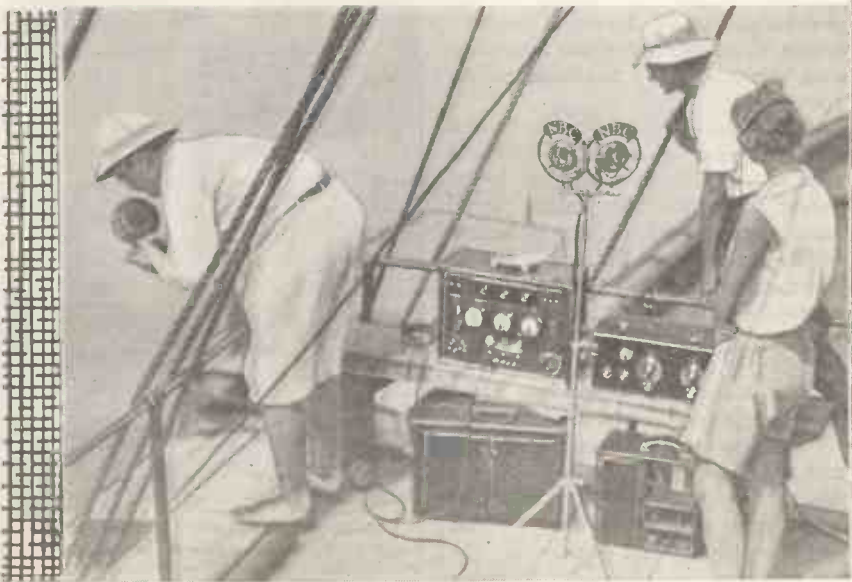
The JULY issue of  
**"MODERN WIRELESS"**

will contain another big illustrated "World's Programmes" supplement—the finest foreign-station feature in radio journalism.

On Sale Saturday, July 1st

wavelength of 33 metres is not authorised for general broadcasting, but only for experimental transmissions.

**OSAKA.** The Japanese radio authorities have purchased a 10-kw. Marconi



# AN AMERICAN STATION YOU CAN HEAR!



"DON'T miss visiting the new Philadelphia station" was the postscript of a letter which I had last week from a reader who knew that I was travelling in the States on business and taking the opportunity of visiting radio stations en route.

So I made arrangements when in Philadelphia to visit the WCAU station.

I made the acquaintance of two interesting personalities. John G. Leitch, the Technical Supervisor of the station, and Charles Miller, the Chief Engineer.

This being one of the latest of American stations and totally different from any European broadcasting plant, a description of it is interesting.

## TRANSMITTER TOWER

Outside the station is striking. It is a modern shaped building with wide steps leading up to the entrance hall. And above the portico are the large metal name letters giving the station call-sign. A sort of control-tower overlooks the main entrance, and this is actually the transmitter-room.

But before we go inside, just a word about the aerial. WCAU uses one of the new vertical aerial masts in which the actual aerial cable is contained within the hollow lattice mast itself. There is a 500-ft. contraption braced at the middle and pivoted at the lower end.

## TAPERED TOP AND BOTTOM

It is really made like two Eiffel Tower type aerial masts placed end to end, so that it tapers off top and bottom and is widest at the centre. There is an H.F. transformer hut a few yards away from the base of the mast, and there is the usual twin set of cables running

from this to the top of WCAU building.

This 500-footer dominates Newton Square, where WCAU has been built.

Well, we go into the power-room of WCAU first of all. Here are not only the motor generators for the

A reader now travelling in America tells you about the giant new American station WCAU, which can be heard at excellent strength in this country.

filament and grid-bias voltages of the huge valves which handle the 50-kw. output, but also the power transformers working off the mains and giving the high-tension supply, and the water-cooling system.

The high power of WCAU is in a shielded-off section of the power-



A vertical aerial is used at the Newton Square station, and it is supported inside this peculiarly-shaped wooden mast. It is 500 feet high.

room over in the right-hand corner by the water-cooling machinery.

The power mains at Newton Square carry 2,300 volts. And behind a safety-cage is a large power transformer nearly twice the height of a man, which is used to step up to 2,300 volts to 18,000 volts for the rectifiers. Then it goes on to the anodes of the water-cooled valves. The rest of the heavy components of the rectifier circuit are also behind this safety-cage, and the wiring (of heavy copper tubing) is carried on struts high above head level.

## BUILT-UP PANELS

Then we go upstairs to the transmitter-room by a steep metal staircase leading up from the power section.

The WCAU transmitter itself is built up on panels placed around the walls of the transmitter-room, and the operator's desk in the centre is on a raised dais.

The control-desk has not the usual array of remote-control knobs on it that one sees so frequently in European stations. There is no need, for all the actual switch-gear is on

the panels themselves only two paces in front.

WCAU's output now is 50 kw., and there is the usual drive circuit to keep the transmitter exactly on its allotted point of 1,170 kcs. Incidentally I believe that this means that WCAU comes in very close on the dial to Radio Toulouse.

Leitch, the Technical Supervisor, tells me that the outside staff has been busy plotting polar diagrams to show how the vertical aerial is working. It's an idea which is being sponsored by the R.A.C. Victor engineers, and which definitely does seem to increase the range of the station without affecting the local field strength.

## AT BUMPER STRENGTH

The Newton Square station is certainly one of the most interesting of the R.A.C. Victor group, and judging by the letter from my listener friend, it is obviously a station coming in at bumper strength. Probably the vertical aerial has something to do with that.

Anyway, now when you search round about Toulouse's wavelength and find WCAU "on the air," you will know what it looks like.



This month we come a little nearer home, and deal with the newest of the broadcasting countries—the Irish Free State. Listeners who have been tuning to Athlone recently may now read all about that station's policy and its hopes for the future.



## OTHER PEOPLE'S PROGRAMMES

### No. 6—IRISH FREE STATE

UNTIL a few months ago not even the staunchest of the Michael O'Donovans would have claimed that broadcasting in the Irish Free State merited comparison with the long-established and elaborate services of other European countries.

But the advent of Athlone has very definitely placed the I.F.S. on the broadcasting map, and it is a matter of no little interest to see how the radio problem has been tackled in this the youngest broadcasting state.

#### THOSE SPONSORED ITEMS

The fact that the Athlone station devotes part of its programme time to the broadcasting of concerts sponsored by various manufacturers has given many people the impression that Free State programmes are not to be taken as seriously representative of the artistic thought of the country. Nothing could be farther from the truth.

Meet Mr. Shamus Clandillon, the station director at Athlone. He holds very strong views on the importance of broadcasting in the Free State, and what he has to tell may be taken as the authoritative Irish point of view.

#### REALLY REPRESENTATIVE

"The Irish Free State," said Mr. Clandillon, "in building a high-power station at Athlone had in mind not only the building up of the radio industry of the country, but also the development of artistic talent so that the people of Ireland might have programmes really representative of their national thought and outlook. But remember, please, that at the present time there are

only 30,000 licensed listeners in the country.

"Moreover, even if the licences of the Free State were on the same percentage basis as in England, this would only provide about 200,000 listeners as compared with your five and a half million.

#### ONE HOUR A DAY

"Programmes cost money, stations cost money, and good artistes have

And where better than from sponsored programmes?"

There is no question of the Free State programmes being run on American lines. At the moment sponsored programmes are confined to an hour every weekday, and whatever the future developments may be, listeners can depend upon Mr. Clandillon to see that the main part of the programme is devoted to Irish interests.

#### A QUESTION OF REVENUE

Sponsored programmes, quite frankly, provide additional revenue for the furtherance of all that is best in the music, drama and intellectual pursuits of the Free State, and that is how listeners are being taught to look at it.

In the short time that this policy has been in force it has proved that it is being conducted along the right lines. Irish listeners are getting just what they want in their own programmes, and a national pride, which has hitherto been sorely troubled when foreign broadcasters had of necessity to provide entertainment for Ireland, is now coming into its own again.

Probably the fact that there are already these 30,000 listeners ready to pay a licence fee of 10s. a year is proof that Free State broadcasting has "come to stay."

#### MUSIC AND DRAMA

What of the programmes themselves? If you listen to Athlone you are not going to find much difference in the main outlines from the programmes of all the other European countries.

Light music there is in profusion, either by the Station Orchestra or



CARROLL GIBBONS AND HIS BOYS

—or some of them! A very popular item in the Athlone programmes.

to be paid. That is why we came to the conclusion that additional revenue must come from somewhere.

## BANDMASTER OF THE PRUSSIAN GUARDS

on gramophone records. Perhaps a little more time is given to radio drama, for the Irish like their plays, and it seems evident that the Free State contribution to this form of dramatic art is going to be no small one.

But what else could one expect when Dublin is the home of the world-famous Abbey Theatre which, since its foundation by Miss Horniman

ing up of the Free State Army Band has made it one of the foremost combinations in the world.

And in the musical line we must not forget Dr. Vincent O'Brien. Well known in Dublin for many years, Dr. O'Brien has now put his whole heart and soul into the building up of a fine studio orchestra, and although this is small in numbers at the moment, it has no lack of talent.

worries the Athlone officials. Mr. Clandillon asked me to make it quite clear to the people in England that the Athlone station is in no way a rival to the B.B.C. stations.

"Our wavelength of 413 metres," said the station director, "does not interfere with any of the British regional transmitters, and we have never thought of Athlone as a competitor of the B.B.C. But if English listeners find our programmes a pleasant alternative occasionally to their own local entertainment, then we shall feel glad of the opportunity to give them some small insight into the artistic adventures of the Irish Free State."

### A GOOD BEGINNING

Irish people as a whole have never been really radio-minded and the Free State radio industry is only now in its infancy. But the fact that Irish listeners can now listen to Irish programmes and buy Irish sets is fast bringing a new light to the subject, and the Free State now finds itself in the position experienced by other countries many years ago—that is, at the bottom of the ladder. With wide opportunities for studying the methods of other people and avoiding their mistakes, there is little doubt that that ladder will very soon be climbed.



BRITISH

BUILT

The control desk at the Athlone transmitter is part of the new equipment made by the Marconi Company for the Irish Free State.

nearly thirty years ago, has set a standard in radio production and play writing. And so in the studio at Athlone we are not surprised to find members of the company which has made its name by the production of the plays of Synge and O'Neill.

### THE STUDIO ORCHESTRA

With the Abbey Theatre's co-operation, with plays by known and unknown playwrights being performed several times a week, with enthusiastic producers studying the question of radio presentation from every angle and with the fresh ideas of youth, it will probably not be long before Athlone joins the B.B.C. and Germany in the originality of its art.

In music, too, there is no lack of talent. Perhaps the most interesting personality in the musical line is Colonel Fritz Brase, whose concerts with the Irish Free State No. 1 Army Band are fast becoming quite an event.

Colonel Brase was at one time bandmaster to the famous Prussian Guards, and his interest in the build-

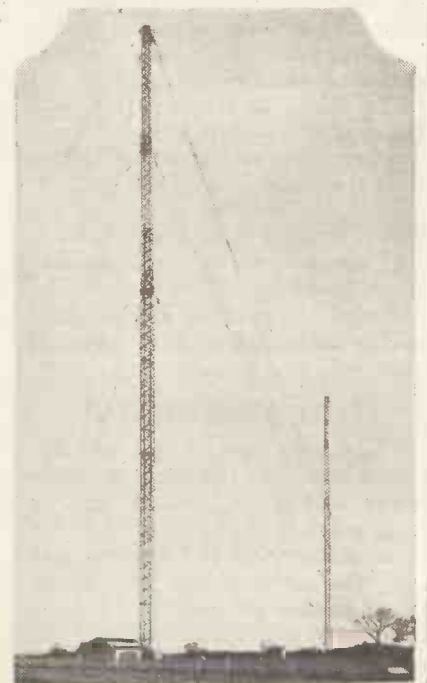
Even the station director himself is well known in the Irish musical world, for Shamus Clandillon is a fine singer of Irish songs, as well as being experienced in all matters of broadcasting. Once you have met him you can have no doubt that if Athlone's success depends upon his efforts, then that station will soon take its place among the leading entertainment providers of the world.

### "RADIO ROMA'S" RIVAL

Finally, there is the charming Miss O'Grady—and what could be more Irish than that?—who carries the duties of chief announcer on her shoulders. Many listeners to Athlone in England have been puzzled by these announcements in a tuneful feminine voice. They have been attributed to most of the foreign stations in Europe. Actually, it is just Miss O'Grady announcing in her native tongue.

It will not be long, I think before Señora Boncompagni, of "Radio Roma" has a serious rival in the affections of British listeners!

There is just one little point which

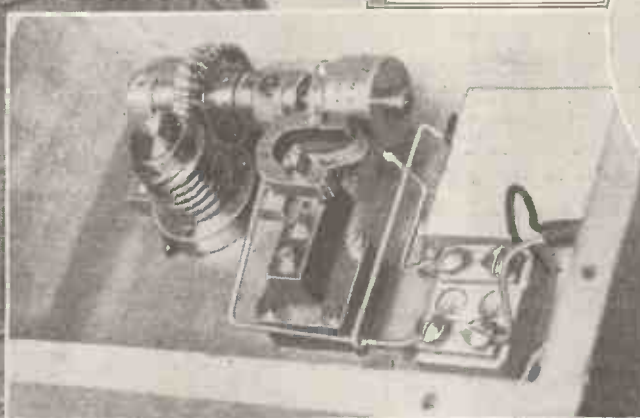


ATHLONE'S AERIAL

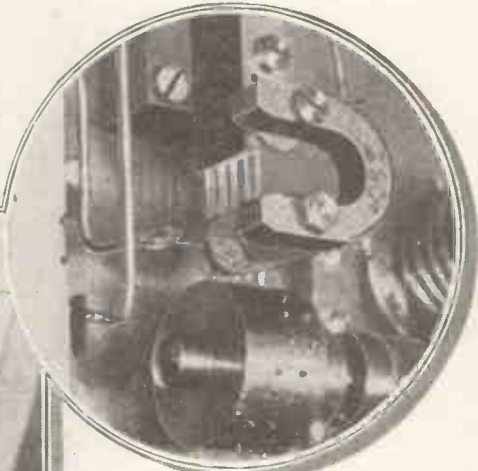


# THE NEW GERMAN INTERVAL SIGNAL

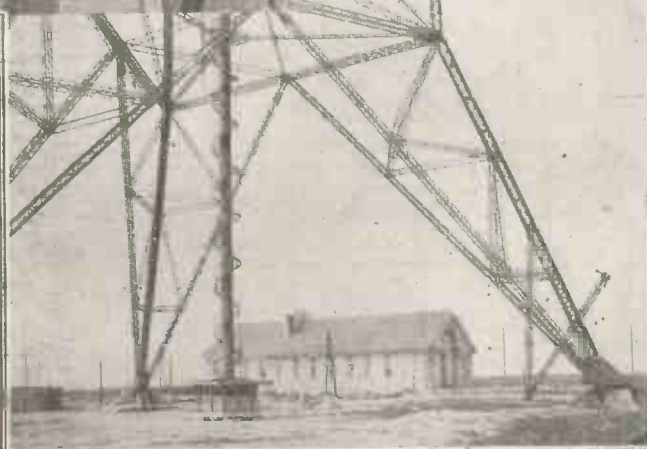
March 21st, 1933, marked the beginning of a new regime in Germany and the opening of the National German Reichstag in the Garrison Church in Potsdam. The national broadcasting station at Königs Wusterhausen, to commemorate the occasion adopted for the Deutschlandsender a new interval signal, the chimes of the Garrison church being chosen as most fitting to the event. The actual signal is not an exact replica of the chimes, but the tune—an old German folk song—is the same.



Built in three days, this apparatus uses an electro-magnetic pick-up for the reproduction of the Potsdam chimes.



A close-up of the apparatus which, using no microphone, is more stable than an acoustic system.



The base of the giant mast at Königs Wusterhausen, which has now been appointed as the official Government transmitter for Germany. It is from this station that official Hitlerite announcements are made.



# BRATISLAVA'S RELAY WORK

Since the big new Prague transmitter opened with its 120 kw., Bratislava has had to take a back seat, so far as original work is concerned. It now acts as a 14-kw. relay for Prague. Though sometimes the Bratislava studios are hard at work providing a programme for relay to the main Czechoslovakian station.

SINCE the huge Prague station opened in December, 1931, Bratislava has lost its claim to the title of the biggest broadcaster in Czechoslovakia. It is now, for most of the time, an enormous relay of the Prague programmes; although, as I was shown on my visit, Bratislava has its own studio.

The Bratislava station, actually at Pressburg, is in a rather exceptional transmitting district. For one thing it is close to Vienna and the Linz, Salzburg and Graz relays, and to Budapest.

### Plenty of Talent

All these places are as close together as Manchester is to London. In addition, the district is one of considerable artistic resources. Mozart was born at Salzburg, and Vienna is, of course, acknowledged as one of the musical "high spots" of the Continent.

The result is that although the stations are relatively crowded together, the programmes are of a high order. Not only is there plenty

of talent available, but listeners, musically speaking, have a high standard of appreciation.

of talent available, but listeners, musically speaking, have a high standard of appreciation.

### Two Masts

For a 14-kilowatt, Bratislava is a large station. The aerial masts, replicas of the Eiffel Tower, could be seen nearly three miles away as we drove up to the private grounds in which the transmitter is situated.

There are only two masts and the aerial is hung between them. The aerial itself is quite short. Double steel cables constitute a "dead" part of the wire. It is the long down-lead which gives most radiation.

It was explained to me that the station building contains more than just the broadcasting transmitter; in fact, only a small section is devoted to broadcasting.

out from the front. In two of the panels there are little doors with perforated openings through which coil tappings can be adjusted and new valves inserted.

### No Control Desk

Nothing much of a radio description is to be seen from the outside. The tops of the valves can be seen through gaps above some of the valve panels, and the twenty-seven indicator meters on the various panels strike a familiar aspect. Otherwise the station might just as well be the control board of an electric light generating plant!

There are one or two novelties. There is no control desk, the H.T. circuits being regulated from one of the vertical panels. Pull-out porcelain fuses at the base can be worked in emergencies.

The tuning of the final power amplifier (Bratislava is master-oscillator driven) is adjusted from the back of the left-hand panel. Only one tuning control comes through to the front. This is a coupler.

### Avoiding Echo

A switchboard at the side carries keys which bring into circuit the telephone line going out to the local exchange, where the station lines from Prague, Brno and Moravska-Ostrava join up.

Bratislava's own studio is a lofty room, the chief feature of which is a deep curtain hung at one end and which can be pulled up to reveal a sound-reflecting wall, so that when they want more echo they can easily get it. The studio is not sound-proof; windows at the top lead out to the station grounds.

When they first tried this studio there was too much echo, so the curtain was put up. Then one of the engineers suggested an idea for cutting down the echo between the ceiling and the walls.

He suggested fixing vertical strips of sound-damping material at right angles to the walls and the

in the Bratislava studio the tip when to start.

Bratislava often returns the compliment of programme exchange. "D.X."

### SOUTH AFRICAN WAVELENGTHS

A reader sends the very late information from the Union.

To the Editor, MODERN WIRELESS.

Sir,—Being an enthusiastic reader of your magazine, I thought that you might be interested to receive information which would enable you to keep your notes up to date.

In December last it was officially announced that, from that date, all South African broadcasting stations would be operating on the following wavelengths:

	Kc.	Power.
	Kw.	
Johannesburg	670.4	10
Durban	723.25	2
Cape Town	808.6	2
*Bloemfontein	558.9	2
*Pretoria	952.38	1½

\* Johannesburg relay stations. The Johannesburg short-wave station has once more altered its wavelength and is now operating on 49 metres, the times of transmission being as follows: 09.00-12.00, 14.00-16.30, 17.00-20.00 G.M.T. every day and Sundays.

A site complete with eight aerial masts has been purchased, and an order placed for the necessary installation and plant for the erection of a new broadcasting station at Milnerton, five and a half miles from Cape Town. The new station will be in operation early next year, and its power will be 20 kw. The installation of the present broadcasting station will be renovated, improved, and transferred to some other town in South Africa.

We have good reception of the Empire short-wave station at Daventry. At this time of the year all reception is spoiled by heavy atmospheres, and for that reason the transmission on the 49 and 31 metre bands is not successful; 19 or 25 metres would cut out this interference most effectively, as Pontoise comes over marvelously at this time of the year (mid-summer) on that wavelength.

Yours faithfully,  
J. J. VAN RAVESTRYN.

### THOSE "SIGNATURES"

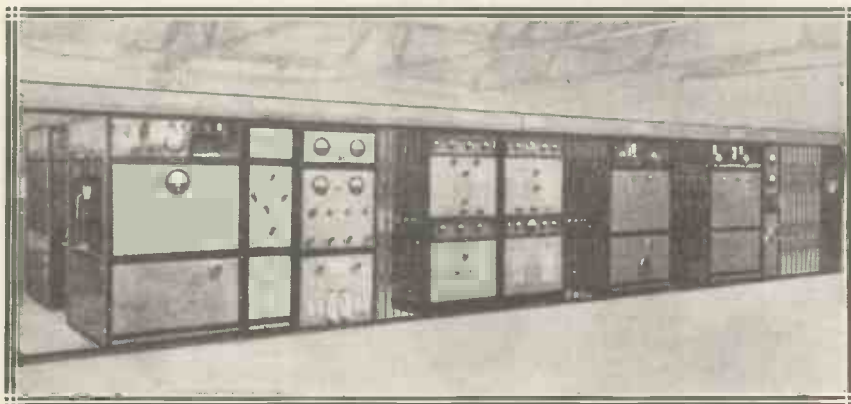
How to know them when you hear them.

### OPENING SIGNALS

- BERLIN (Witzleben). Achtung! Berlin! Die Funkstunde sendet.
- BRESLAU. Achtung! Achtung! Hier sind die schlesischen Sender! Breslau und Gletwitz!
- COLOGNE. Sie hören Westdeutscher Rundfunk—
- MÜNCHEN. Hier Bayerischer Rundfunk, München, Nürnberg, Augsburg und Kaiserslautern.
- BEROMÜNSTER. Hallo! Hier Schweizerischer Landessender. Beromünster! Programm von Zürich (or Berne or Basle).
- STUTTGART. Südfunk! Meine Damen und Herren, Stuttgart beginnt jetzt.
- WIENNA. Hallo! Hallo! Radio Wien!

### CLOSING-DOWN SIGNALS

- KONIGSBERG. Hiermit ist unser heutiges Programm beendet. Wir wünschen Ihnen eine gute Nacht. Vergessen Sie bitte nicht, die Antenne zu erten. (Please don't forget to earth your aerials.)
- KIEL. Wir schliessen unser heutiges Programm.
- MÜNCHEN. Wir wünschen Ihnen gute Nacht und angenehme Ruhe. (We wish you a good night and pleasant repose.)
- WIENNA. Gute Nacht, meine Damen; Gute Nacht, meine Herren; Gute Nacht!



### THE SWITCHBOARD WHICH OPERATES A 14-KW. STATION

The complete control of Bratislava, on 279 metres, is managed from these panels which occupy one corner of the lofty transmitting hall. Note the iron "safety gates" which cut off the power when the engineer in charge has to go through them to attend to the apparatus.

of talent available, but listeners, musically speaking, have a high standard of appreciation.

### Interference

Since Prague has opened, Bratislava has taken a back seat in the programmes. Prague's 200 kilowatts has naturally overshadowed it. Czechoslovakia is rapidly developing its telephone system, and it is now possible for nearly all the stations to be linked up with the Prague studios.

Fortunately there is no interference between Bratislava and Prague, as the wavelengths are so far apart. The nearest other neighbour to Bratislava's 279 metres is

A lofty room is the transmission hall, in which one corner is taken up by the seven panels of the transmitter. The Bratislava broadcaster was built by a German concern and is rather unconventional.

### Safety Device

Valves and tuning coils are behind panels which carry the meters. Lift-type lattice gates fill up the gaps between the panels, so that if the engineer wants to get at any of the gear he has to open a gate. This operates a relay which cuts off the power.

There are four of these gates. Most of the adjustments are carried

room. This has been done, and so the walls are made up of a series of little niches.

These are cut away for the door, and for the usual little windows through which the control engineers watch operations. Otherwise they cover the whole of the wall area. The room is some thirty feet high. That is why they had trouble in keeping the echo in hand.

### Programme Exchange

In one of the niches is a loud-speaker connected through to the control amplifier next door. When the programme is coming from Prague or one of the other studios, this is switched on to give the people

There is generally some small extra item that will improve the distance-getting powers of a set, and these details of

## ADDITIONS FOR DISTANCE

probably include something or the other that will enable your set to bring in more foreigners.



Is there anything I can add on to improve results?" That's how many listeners feel about their sets. And, luckily, in quite a lot of cases, there is some inexpensive addition that will enable more foreigners to be received.

Naturally, the sets to which this applies are not of the very latest design, but are mainly those introduced two or three years ago, or simple receivers in which refinements have been intentionally omitted. Some of the additions suggested, however, may be found helpful by users of quite recent designs, because of some peculiar conditions of operation, or difficult locality for reception.

### IMPROVING SELECTIVITY

The following hints are thus worthy of investigation by all who are out for good logs and big distances. But mostly they will be of interest to those who, realising their sets are not the "last word" and being unable to build new ones, yet desire to keep abreast of the times as far as possible.

Since selectivity is the most important attribute of a set for long-distance listening these days, we will first of all consider schemes that will increase it.

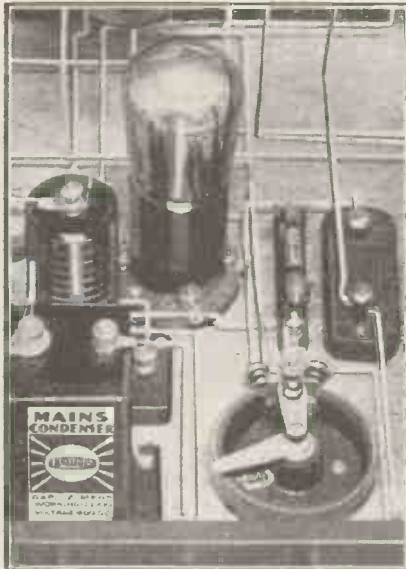
Chiefly due to their simplicity, a



The preset condenser is a small component, but it makes a big difference to selectivity when joined in series with the aerial lead.

number of the additions that give better selectivity, do so at the expense of volume. The extent to which volume is sacrificed depends upon the degree of extra selectivity and the method utilised to provide it.

But volume is of little avail if the



With small sets, smooth control of reaction is vital where distant reception is concerned. And the addition of a potentiometer for adjusting detector bias is a great help in attaining this.

stations heard loudly come in two or three at a time. Better to have less strength and the power to select the individual programme desired.

The simplest of all extras where selectivity is wanted, is the series-aerial condenser. This may be either fixed or variable; the latter is better, giving an instantly adjustable degree of selectivity.

### USING A SERIES CONDENSER

Most sets have a so-called aperiodic aerial circuit, whether the aerial turns being a separate winding or part of the tuned circuit, to which connection is made by a tap. If a fixed condenser is to be used, experiment with values

from '0001 mfd. to '0005 mfd. The bigger value is generally found better on long waves.

The aerial lead is disconnected from the set and joined instead to one side of the fixed condenser, the other side of the condenser going to the aerial terminal of the set. Similar connections are used in the case of a variable condenser.

### FOR LONG WAVES

Although a variable condenser of the type used for tuning can be employed, one of the preset variety is far more convenient and just as effective. A maximum value of '0002 mfd. or '0005 mfd. will do nicely.

A switch for shorting out the condenser when going over to long waves may be found a worth-while addition. Use an ordinary on-off switch and connect it across the terminals of the condenser.

A series-aerial condenser is most useful when a general improvement in selectivity is needed. If the interference is mainly that of a powerful local jamming distant stations, and not so much the foreigners spoiling one another, a wave-trap or rejector is more likely to prove beneficial.

### HETERODYNE TROUBLES

At one time quite a lot was heard of these additions, but they are little heard of these days. The reason is that they only improve the selectivity of a set so far as one station is concerned. And while improving designs so that distant stations can be separated, technicians have also to a large extent overcome this local jamming. Nevertheless, there are still cases in which a wave-trap is worth adding.

We have already dealt with foreign stations that come in together, but there is still another way in which they can interfere with one another. You are all familiar with heterodyne whistles that occur with a

## INCREASING THE RANGE OF YOUR SET

surprising number of distant stations. Increasing selectivity sometimes reduces this trouble, but it is one that really requires to be tackled in a somewhat different manner. Quite a lot can be done with a heterodyne filter connected across the loud-speaker. I gave brief details for making such an addition in my notes in the December number of MODERN WIRELESS under "Interference Intervention."

### ADDING AN H.F. UNIT

Now we come to the best way of increasing selectivity when your set does not incorporate an H.F. stage. It is, perhaps, hardly an inexpensive addition in some people's eyes, but it has the added advantage that at the same time an increase of range is effected.

Many of you will already have guessed what I have in mind this time—an H.F. unit. An extra tuned circuit, of band-pass type if desired, is added with the unit, and this provides a most marked increase of selectivity.

The screened-grid valve that will be used more than makes up for any loss of input due to the extra selectivity. The only "drawback" (seldom considered so by the enthusiast) is that there is an additional dial to tune, but the smaller importance that will be attached to the reaction control more than makes up for this.

The question of H.F. units has brought us to schemes that are intended to increase the volume of distant stations. For those whose sets use a plain reaction condenser (not the differential type), and which have no direct H.F. by-pass from the detector valve's anode, there is a simple addition always worth trying.

### WORTH TRYING!

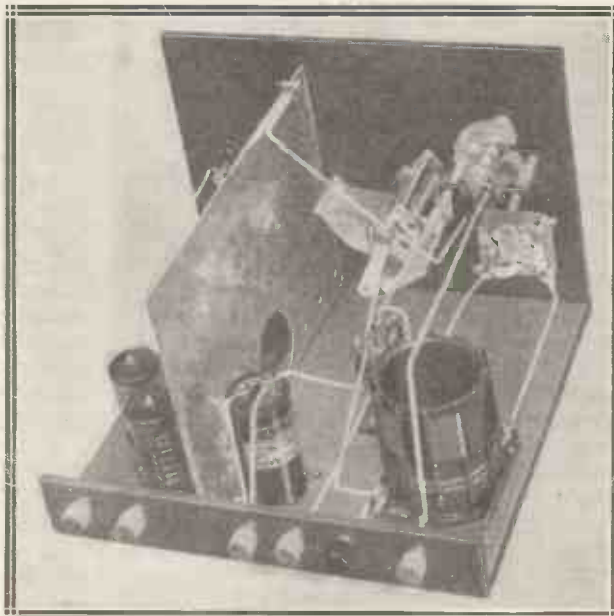
It consists of a .0001-mfd., or in some cases a .0002-mfd., fixed condenser joined between the anode terminal of the detector valve holder and the filament negative terminal of the same holder. The effect of this

is most noticeable on sets with which little reaction is usually employed.

Another tip well worth trying—although I must warn you that it will not prove beneficial in every case—is to join an indoor aerial up with the outdoor aerial. Just connect the two lead-in wires to the aerial terminal.

### REACTION CONTROL

Where simple sets are concerned, one of the necessary items for successful long-distance work is a smooth control of reaction. There are several things which influence this, but many a time there is still a plop when the best setting has been found for every variable factor.



ONE OF THE BEST.—An H.F. unit not only increases the selectivity of the set to which it is added, but also gives good volume from distant transmissions which would otherwise not be heard at all.

What is to be done, then? Without a doubt the answer is to fit a grid-leak potentiometer.

A potentiometer of around 400 ohms is used, and the outer terminals or ends of the winding are joined across the filament terminals of one of the valve holders. The grid leak is then disconnected from L.T. positive and joined to the slider of the potentiometer instead. A little experimentation with various positions will soon show the best setting of the slider for smooth reaction control.

A somewhat similar cause of trouble is threshold howl, well known on short-waves but sometimes experienced on medium and even long waves. It is a grunting sort of squeal just at the most sensitive point of reaction build-up, and thus upsets the reception of weak stations.

A resistance of about  $\frac{1}{4}$  megohm across the secondary of the L.F. transformer following the detector sometimes provides a cure.

### CONNECTING 'PHONES

Mention of weak stations brings me to a suggestion for those who are most keen on a comprehensive log. There are bound to be a number of stations that cannot be heard on your speaker, because they are too weak to operate it, or too weak to be tuned in properly.

In these cases a pair of telephones is a useful extra. The best way to connect them is by a two-pole change-over switch. The centre contacts go to the set's output and the outer ones to phones and loud-speaker respectively, so that a quick change-over is possible. If the noise of the telephones is too much for the ears a variable resistance across them will reduce the volume.

### MAINTAINING QUALITY

Though rather in the nature of an alteration to a set than something that is added on, I cannot omit to call attention to A.T.B. This is an invention of Mr. G. V. Dowding and enables high quality reproduction to be maintained when reaction is applied for the reception of distant stations.

You will find it fully explained in the "A.T.B." Three, which is described elsewhere in this number.

My space is now filled, but I have no doubt that you will find one at least of the additions that I have described for increasing distance applicable to your own receiver. But don't forget to take a look at your aerial and earth now and again. Clean joints are absolutely essential.

A. S. C.



# “The A.T.B.” THREE

Designed and Described by the “M.W.” Research Dept.

**I**N recent years we have heard much about selectivity in radio receivers, of superhets, and of such things as tone control, high-note correction, and so forth. Each has its specific niche in the building of radio history; each has its uses, great or small.

Selectivity, we realise, is one of the most important properties a receiver can possess; it is essential to successful reception in these days of etheric crowding.

### Making Selectivity Cheap

But, as in many branches of life, it is difficult in radio to obtain anything without cost of some sort or other. Thus, if an advance in receiver design does not actually cost money, making the set more expensive, it will usually cost something in the way of another characteristic lost or impaired.

This holds good in the case of high selectivity—for this costs not only money (in components), but it is also liable to cause loss in high-note reproduction if steps are not taken to nullify the effect.

You will immediately say that the band-pass arrangement does not cause this loss of quality, and that in other cases tone correction can be used to compensate. Very true, if one is prepared to spend money.

**AUTOMATIC TONE BALANCE** is one of the biggest contributions ever made to realistic reception of foreign stations. It is incorporated in the “A.T.B.” Three, and makes this receiver ideal for rendering distant programmes as alternative entertainment to the local station.

But what of the small set owner who cannot afford to go in for band-pass tuning, Ferrocart coils, or other super selective schemes, and who is prevented either financially from using tone-control devices, and so forth, or else bars them from his set because of the extra controls they demand? Is this man to be doomed to poor selectivity or inferior quality?

No. There is a way of getting over the trouble without materially

increasing the cost of any receiver, and without providing any extra control. It is known as “automatic tone balance”—or A.T.B.

There are ways of obtaining high selectivity in a set without going in for a number of tuned circuits and the attendant cost, and that is by the judicious use of reaction.

### Reaction's Two Functions

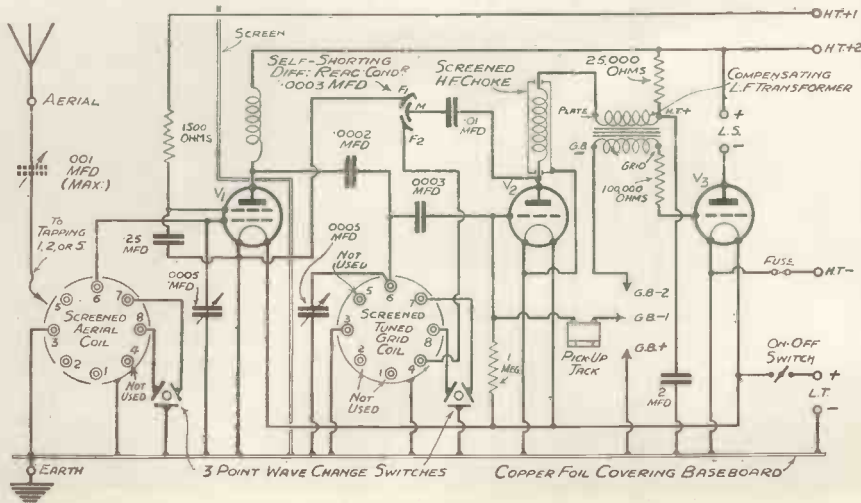
Many set owners are inclined to look upon the reaction control as one to be used only for the increase of reception strength when distant stations are being tuned in.

This is a cramped outlook. Reaction is, obviously, of the greatest value where the *sensitivity* of a set needs increasing so that a distant programme may be better heard, but if one considers *how* this increase of sensitivity is obtained (the decrease of circuit damping), a second, important use of regeneration becomes apparent.

Decrease in circuit damping means increase in *selectivity*. There, at once, we have the secret. Why not use

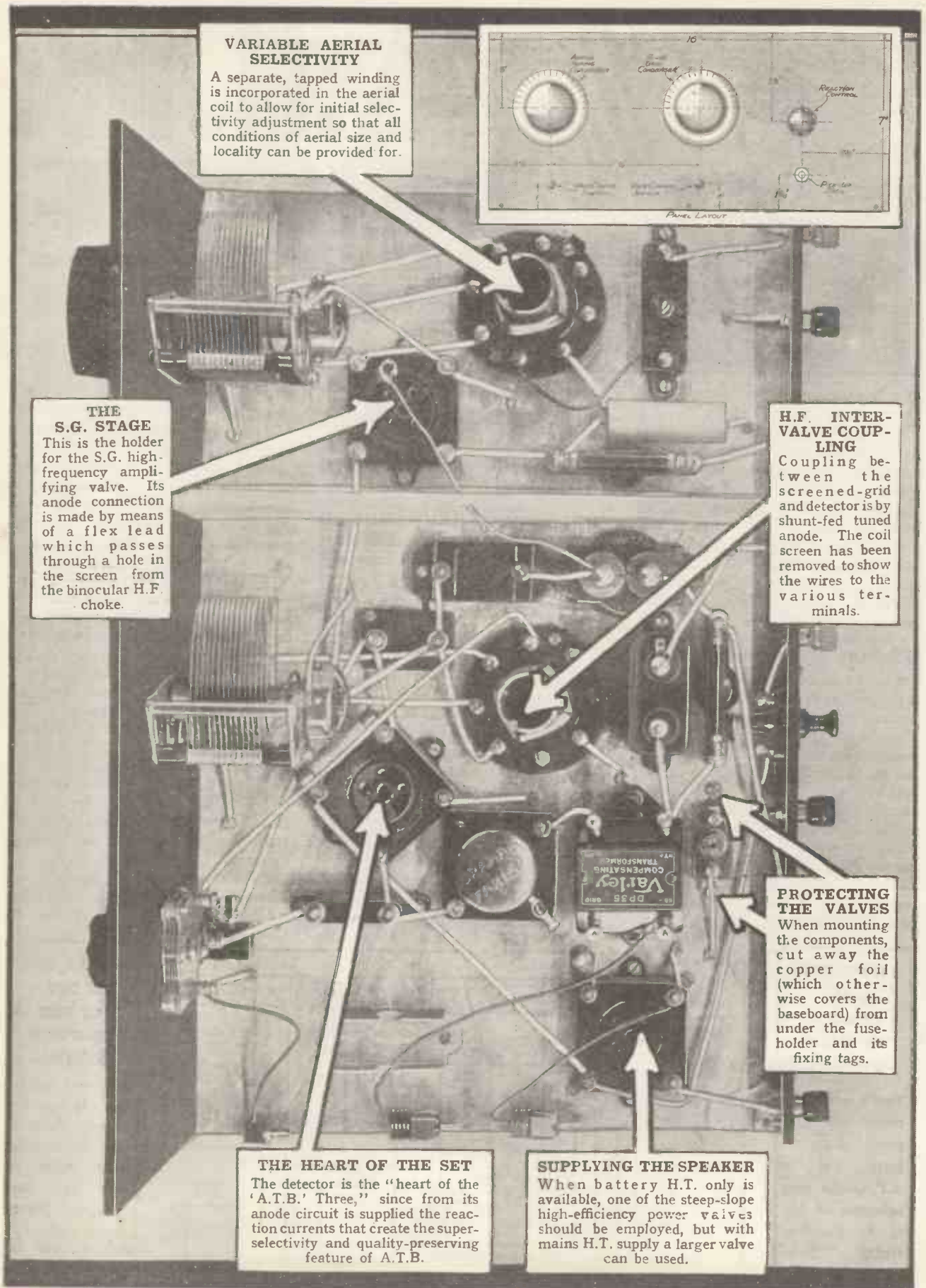
**SELECTIVITY  
AND  
QUALITY  
WITHOUT  
EXPENSE**

That's what this circuit will give you! And its secret lies in A.T.B.—the new invention of Mr. G. V. Dowding, “M.W.’s” Technical Editor.

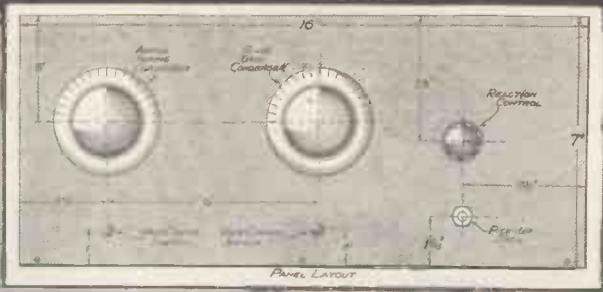


**MAKES THE  
MOST  
OF THE  
REACTION  
CONTROL**

You need not be afraid to boost up distant stations with reaction to their utmost if you use the “A.T.B.” Three. Quality will not suffer as in ordinary sets.



**VARIABLE AERIAL SELECTIVITY**  
 A separate, tapped winding is incorporated in the aerial coil to allow for initial selectivity adjustment so that all conditions of aerial size and locality can be provided for.



**THE S.G. STAGE**  
 This is the holder for the S.G. high-frequency amplifying valve. Its anode connection is made by means of a flex lead which passes through a hole in the screen from the binocular H.F. choke.

**H.F. INTER-VALVE COUPLING**  
 Coupling between the screened-grid and detector is by shunt-fed tuned anode. The coil screen has been removed to show the wires to the various terminals.

**PROTECTING THE VALVES**  
 When mounting the components, cut away the copper foil (which otherwise covers the baseboard) from under the fuseholder and its fixing tags.

**THE HEART OF THE SET**  
 The detector is the "heart of the 'A.T.B.' Three," since from its anode circuit is supplied the reaction currents that create the super-selectivity and quality-preserving feature of A.T.B.

**SUPPLYING THE SPEAKER**  
 When battery H.T. only is available, one of the steep-slope high-efficiency power valves should be employed, but with mains H.T. supply a larger valve can be used.

## Gives Distant Listening a New Fascination

reaction as an aid to *selectivity* besides a help towards increased *sensitivity*? It is cheap and is quite as effective

monotonous droning devoid of that brilliance which gives it its life.

Automatic tone balance changes all

that. Speech remains crisp and music retains its life. The cost? A matter of a shilling or two—just the price of one small fixed condenser. Let us consider the set design shown

valve followed in the usual way by a detector and L.F. stage.

Canned coils are employed in conjunction with a vertical screen to provide complete immunity from feedback on the H.F. side. This screen is valuable in preventing interaction between the two sets of wavechange switch wires, and between the variable condensers and their connections. It is not always sufficient precaution against instability to screen only the coils.

### THE VALVES FOR YOUR "A.T.B." THREE

Make	S.G.	Det.	Output	Output for Mains Unit
Mazda	S.G.215	H.L.2	P.220	P.220A.
Mullard	P.M.12	P.M.1H.L.	P.M.2A.	P.M.202
Marconi	S.22	H.L.2	L.P.2	P.2
Cossor	220S.G.	210H.L.	220P.A.	230X.P.
Osram	S.22	H.L.2	L.P.2	P.2
Eta	B.Y.6	B.Y.1815	B.W.604	B.W.602
Hivac	S.G.210	H.210	P.220	P.220
"362"	S.G.	H.F.	Power	Super Power

on near-by stations as on the more distant ones, and is simply carried out by reducing the input from the aerial and getting back the overall strength by means of reaction. The result is good sharp tuning and reception remarkably free from interference.

"Ah," you say, "that is all very fine, but what about quality? The high notes will vanish, and we shall be left with boomy, muddy reproduction."

### Automatic Compensation

True—if you leave it at that point. But here we make use of a single perfectly automatic way over the trouble—"A.T.B." By an ingenious use of the differential reaction condenser the tonal balance of a reactive set can be adjusted to compensate for loss of high notes due to the application of reaction so that even with the set "sharpened up" to its limit for local reception, or with reaction applied (for the reception of distant stations) to such an extent as to be on the threshold of oscillation, the brilliance of the reproduction is still retained.

High notes are retained and distant speech and music come over with a crispness that is astonishing. There are no knobs to wangle. Everything is done automatically when reaction is applied, and without the need for complicated circuit arrangements.

### Straightforward Design

A.T.B. gives distant listening a new fascination, for it enables real programme value to be retained even though the station is right across the other side of Europe.

In the majority of sets reaction means such a snipping off of the high notes as to render distant speech quite unintelligible, while music becomes a

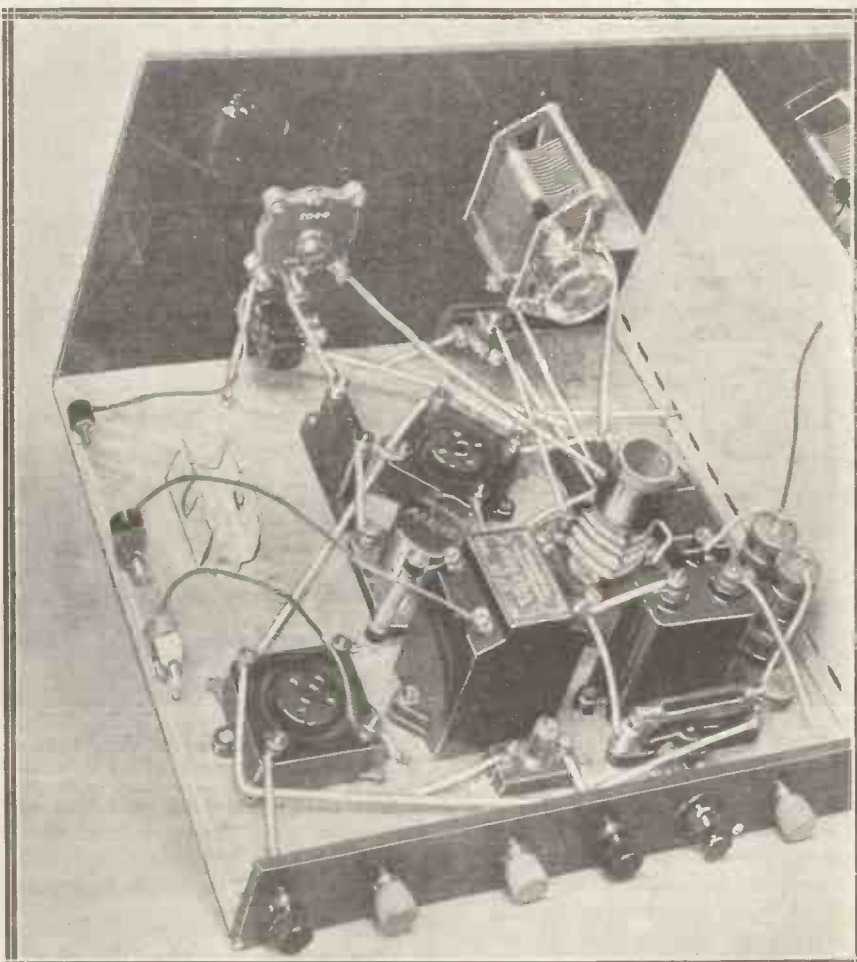
in these pages, and see how this new advance in radio reception—for it is undoubtedly that—is achieved.

In its essentials the receiver is a straightforward three-valver of inexpensive design, with a screened-grid

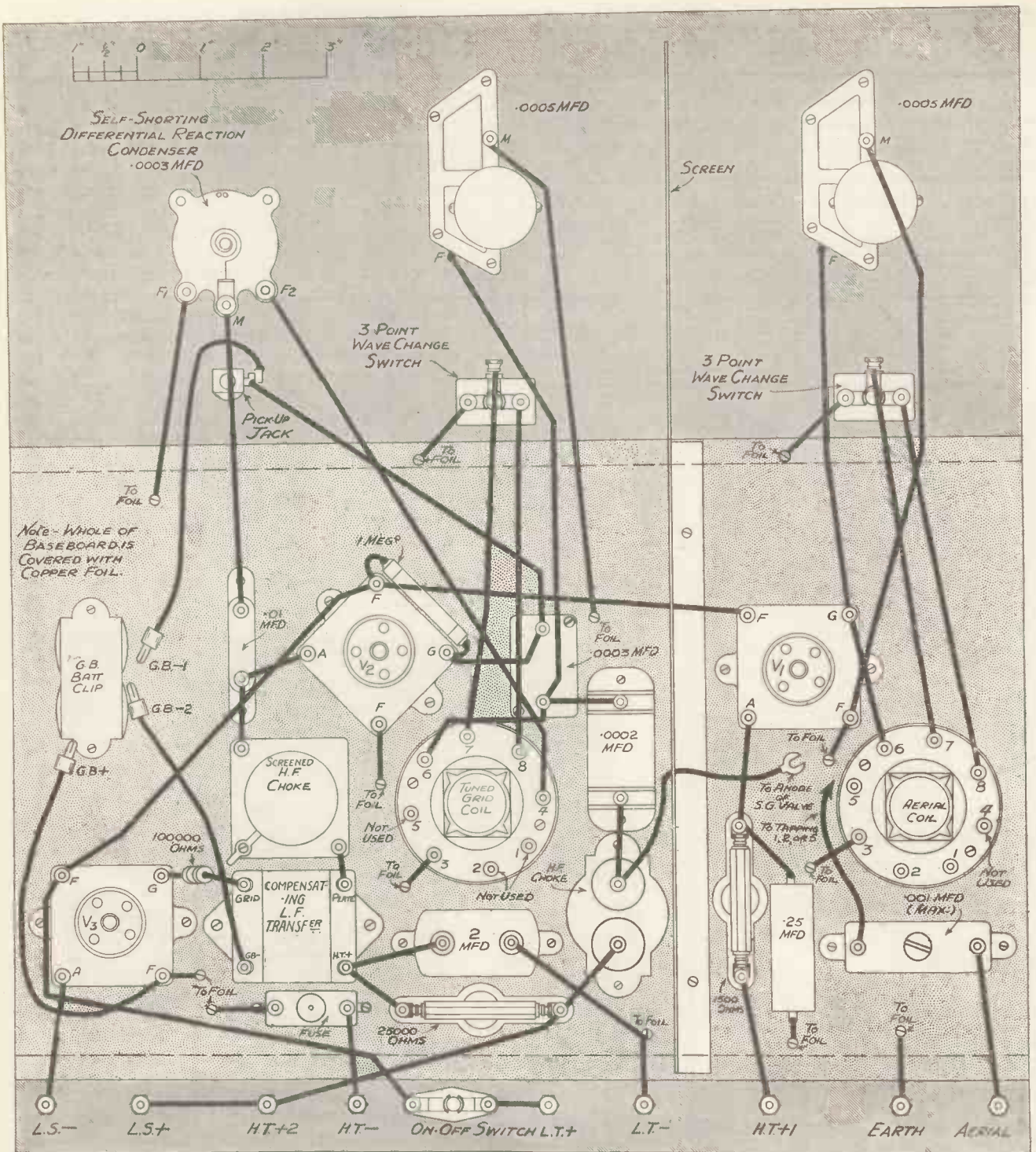
### Circuit Details

A separate and tapped aerial winding on the first coil provides a valuable control of selectivity and sensitivity, while the adjustable series aerial condenser adds to this control, enabling very fine variation to be achieved.

### EFFECTED WITH THREE SIMPLE COMPONENTS



The duty of automatically adjusting the tone of distant stations so that their quality equals that from near-by ones is carried out by three simple components—the self-shorting reaction condenser on the panel, the fixed condenser near to it and connected to it, and the compensating transformer in the foreground.



From the constructional point of view, simplification of assembly is a most outstanding feature. Note the small amount of wiring to be done, and the shortness of many of the leads. In a large number of cases direct connection to the foil covering the baseboard plays a big part in the attainment of the set's simplicity.

Shunt-fed tuned anode—or tuned detector grid—coupling is employed between the screened-grid valve and the rectifier, with differential reaction applied to the detector grid circuit.

Herein lies the basis of the automatic tone balance, and we must perforce discuss this reaction control together with the L.F. stage coupling before we go away further.

It has been stated that A.T.B.

prevents that annoying reduction of high notes when the set is used with reaction, even if the reaction is pushed to its limit. Now let us see how it is done.

### Strengthening the Weak

The application of reaction to the circuit results in attenuation of the high notes, due to a sideband cutting effect. The high notes are not lost;

they are *weakened*. Therefore, if we apply corrective methods to allow added amplification of those high notes above that provided for those frequencies not affected by the reaction, we shall get back our tonal balance.

This is what is done in A.T.B. Apart from the automatic control, what happens is that the high-note-attenuated L.F. impulses are fed from



## "A.T.B." Costs Very Little in £ s. d.

the detector to the L.F. valve through a compensating transformer whose amplification curve is adjusted to provide a rising characteristic. In other words, the transformer gives the high notes a greater step-up in voltage than the lower notes. The result is good balance supplied to the L.F. valve.

### An Ingenious Scheme

So much for the corrective scheme. But what happens when the set is used for a local station where reaction is not necessary, and the high-note attenuation is not present? To apply corrective measures here would be to gild the lily and overbalance the reproduction at the top end of the musical scale.

With no reaction, arrangements are made to correct for the rising characteristic of the transformer by placing a condenser virtually across the primary. This flattens the curve, restoring the balance again.

Automatic connection of the condenser is achieved in a very ingenious manner, as will be seen from a study of the theoretical diagram. The differential reaction control will be observed to be perfectly normal in its application except that between the anode of the valve and one set of fixed vanes of the reaction condenser is a .01-mfd. fixed capacity.

### Special Condenser Contact

A condenser of this size can obviously have no effect upon the reaction control, so that this is obtained as usual when the reaction condenser knob is turned to the right, and the moving vanes mesh with those marked  $F_2$  in the diagram.

On reducing reaction the moving vanes commence to mesh with  $F_1$ —a perfectly normal scheme. On completing the reaction-reduction movement, however, the moving vanes and  $F_1$  vanes are made to come into electrical contact with one another, by virtue of a special contact on the condenser.

### How It Works

Now what happens? During reaction and during the gradual decrease of reaction the .01 mfd. is in series with the capacity of the reaction condenser (.0003 max.), the two capacities being in series across the output of the detector—i.e. across the primary of the transformer.

But .0003 mfd. in series with

.01 mfd. results in something a little less than .0003 mfd., and has practically no effect on the response curve of the L.F. transformer. In these conditions, then, the transformer will retain its rising characteristic, and will compensate for high-note reduction—exactly what we want it to do.

in accordance with the requirements of the non-attenuated L.F. received from the local station.

The extreme simplicity and efficiency of the A.T.B. system is now apparent, and it will be seen how this valuable property can be used in any set with reaction, without in any way complicating the circuit.

The rest of the "A.T.B." Three is as straightforward as could be. The compensating transformer feeds into the grid of the output valve, which in turn is connected to the loud-speaker in the usual way—and that is all there is in it.

The actual construction of the design is also quite simple, the wiring being made remarkably easy by the use of the copper foil covering the base-board.

### Safety Precautions

The usual precautions about "short circuits" to foil should be taken, by placing pieces of thin card under the valve holders and the resistance holders, and the foil should be cut away round the fuseholder, for the two metal fixing tags are in electrical contact with the poles of the holder.

Make sure, too, that the reaction condenser is correctly connected, otherwise the results obtained from the set may not be what are expected.

**ACCESSORIES**

**CHOOSE YOURS FROM THESE**

**LOUDSPEAKER.**—B.T.H., Celestion, R. & A., Marconiphone, H.M.V., Ormond, Blue Spot, Epoch, Magnavox, Amplion, Atlas, Ferranti.

**BATTERIES.**—H.T. 120 volts: Ediswan, Drydex, Pertrix, Lissen, Magnet, Marconiphone, "Silver Knight," Siemens, Ever Ready.

**G.B.** to suit output valve: Lissen, Siemens, Ediswan, Pertrix, Drydex, Ever Ready.

**L.T.** 2 volts: Exide, Ediswan, Block, Oldham, Pertrix, G.E.C., Lissen.

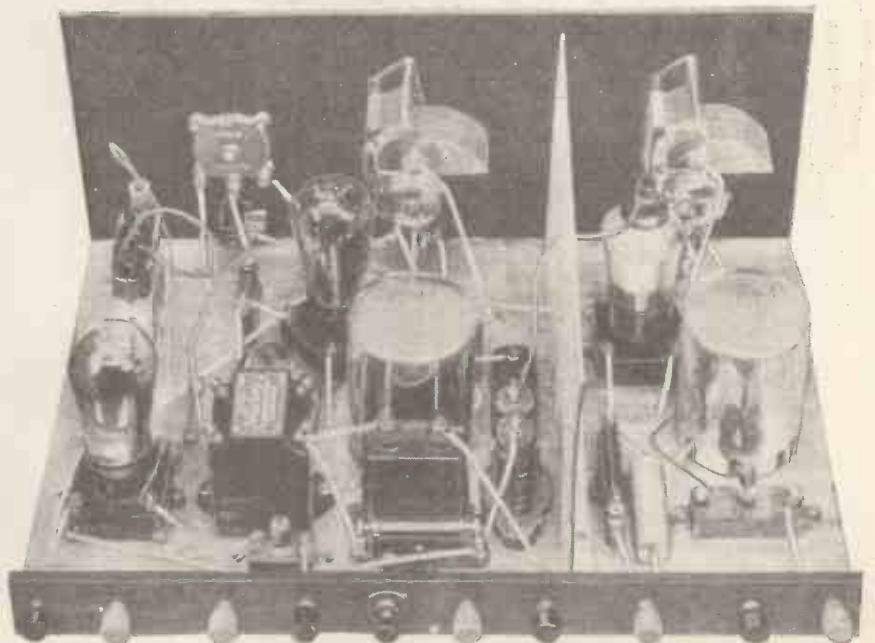
**MAINS UNIT.**—Two H.T. taps, 120 to 150 volts: Atlas, Ekco, Regentone, Ferranti, Lissen, R.L. Heayberd, Tunewell.

**AERIAL AND EARTH EQUIPMENT.**—Goltone "Akrite," Electron "Superial," Graham Farish "Filt" earthing device.

With reaction at minimum (or zero) the reaction condenser vanes come into contact as stated, and the .0003-mfd. capacity in series with the .01 mfd. is removed. The result is that .01 mfd. is now applied across the transformer.

This has a big effect on the response curve, and the high-note "lift" is removed, the curve being flattened

**NO COMPLICATIONS—NO EXTRA CONTROLS**



To look at the set from the back you might think it was an ordinary three—although considerably simpler than most—instead of a very special receiver that will open up a new era in long-distance listening for many constructors.

# Long-Distance Woolliness Banished for Ever

## WHAT YOU SEE IN THE "A.T.B."

Component	Make used by designer	Alternative makes of suitable specification recommended by the designer
1 Panel, 16 in. x 7 in.	Goltone	Peto-Scott, Becol, Lissen
1 Baseboard, 16 in. x 10 in.	—	—
1 Sheet of foil to cover above	—	—
1 Cabinet to fit panel and baseboard	Camco	Peto-Scott, Osborn, Pickett
2 -0005-mfd. variable condensers	J.B. "Popular Log"	Polar, Ormond, Telsen
1 -0003-mfd. differential reaction condenser	Ready Radio	—
1 2-mfd. fixed condenser	"A.T.B." type	—
1 25-mfd. fixed condenser	Dubilier BB	T.C.C., Telsen, Igranic
1 01-mfd. fixed condenser	T.C.C. type OF	—
1 -0003-mfd. fixed condenser	T.C.C. type 34	—
1 -0002-mfd. fixed condenser	T.C.C. type S	Dubilier
2 Screened dual-range coils	Dubilier 610	Dubilier, Ferranti, Telsen, Lissen
1 H.F. choke	Sovereign	Ferranti, T.C.C., Telsen, Lissen
1 H.F. choke	Igranic Binocular	Telsen Binocular, Bulgin S.G., R.I., Lewcos, Varley
3 4-pin valve holders	Graham Farish	Lewcos M.C., R.I., Telsen, Lissen
1 Preset condenser .001-mfd. max.	H.M.S.	—
1 1,500-ohm resistance with horizontal holder	Benjamin	W.B., Telsen, Lissen
1 25,000-ohm resistance with horizontal holder	Sovereign type G	Telsen, Lewcos
1 100,000-ohm resistance with wire ends or terminals	Graham Farish	—
1 1-meg. grid leak with wire ends or terminals	"Ohmite"	—
1 L.F. Transformer (compensating type)	Graham Farish	—
2 3-point on-off switches	"Ohmite"	Graham Farish "Ohmite"
1 Push-pull on-off switch	Dubilier 1 watt	—
1 Single circuit jack and plug	Varley DP35	Graham Farish "Ohmite," Tunewell, Goltone, Igranic
1 Terminal strip, 16 in. x 1 1/2 in.	Ready Radio	R.I. "Varitone," Telsen "Audio-former"
9 Indicating terminals	W.B.	Bulgin, Telsen
6 Battery plugs	Igranic "Midget"	Telsen, Lissen, Ready Radio
2 Accumulator spade terminals	—	—
4 Yards insulating sleeving	Bulgin	Belling-Lec, Goltone, Igranic, Clix
5 Yards 18-gauge tinned copper wire	Igranic	Clix, Bulgin, Goltone, Belling-Lec
1 Bias-battery clip	Goltone	Wearite
1 S.G. anode connector	Goltone	Wearite
1 Fuse holder	Bulgin No. 2	—
1 Fuse for above	Belling-Lec	Telsen, Bulgin, Belling-Lec
1 Screen, 10 in. x 6 in.	Goltone	Goltone, Telsen, Bulgin
Flex, screws, etc.	Belling-Lec	—
	"Scrutuse"	—
	Magnum	—

After this fine adjustment of the aerial input can be made by means of the preset condenser.

As regards H.T. and G.B. voltages, the H.T. + 1 terminal should have 75-80 volts applied to it, and H.T. + 2 the full voltage of the 120 or 150-volt battery or mains unit. An S.G. valve in  $V_1$ , H.L. or detector type in  $V_2$ , and a power valve in  $V_3$  are required, but it should be noticed that either a "small" or "large" power valve can be used according as H.T. is supplied by battery or mains unit.

### Record Tone Control

The grid-bias voltage for G.B.—1 should be 1.5 volts, but that for G.B.—2 will depend upon the output valve chosen. It should be decided in accordance with the data supplied by the makers of the particular output valve.

It is of interest to pick-up users to note that the reaction control can be either at zero or slightly "advanced."

In the former case tone balance is applied to the gramophone reproduction, and scratch and high-note pick-up harshness can be greatly reduced. With reaction "advanced" the fullest brilliance of which the pick-up is capable is obtained.

The aerial tap connection is not shown fixed in the wiring diagram, for the aerial feed into the first coil should be varied under test until the most satisfactory connection is found.

Flex lead for the connection can conveniently be used during the testing period, stiff wiring and sleeving being substituted later, for after the best position for the tap has been found it will not have to be altered. Thereafter any selectivity adjustment can be made by means of the preset series aerial condenser.

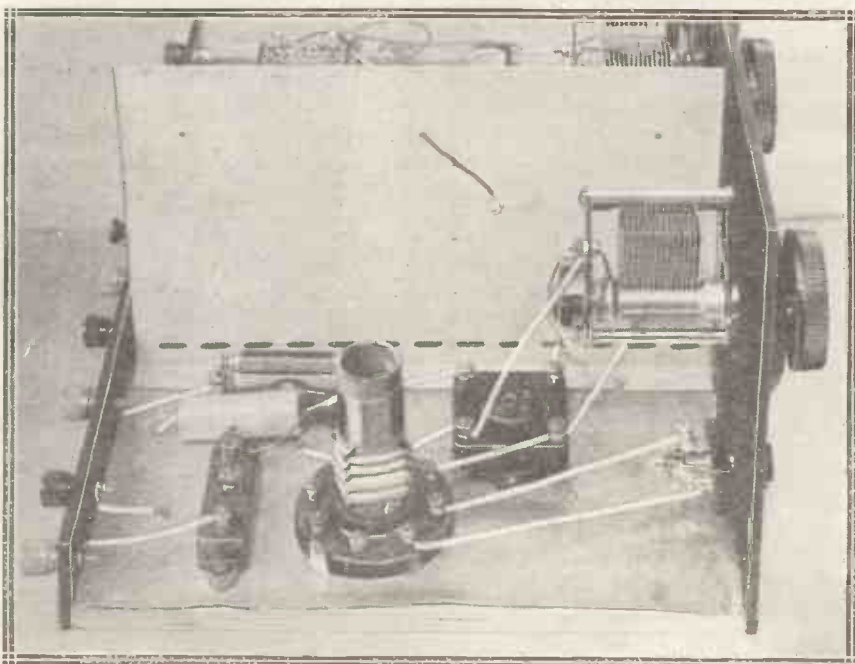
### No Ganging Adjustments

The actual operation of the "A.T.B." Three is such that the most inexperienced constructor will be able to get the last ounce out of the set. There is no ganging to do, so that the adjustment of trimming condensers, which is sometimes a stumbling block to the uninitiated, is not a requirement of efficient operation.

The only adjustment that is left to the constructor is that of the aerial input tap, which should be tried on terminals 1, 2, and 5, with the preset condenser half "in," until the best

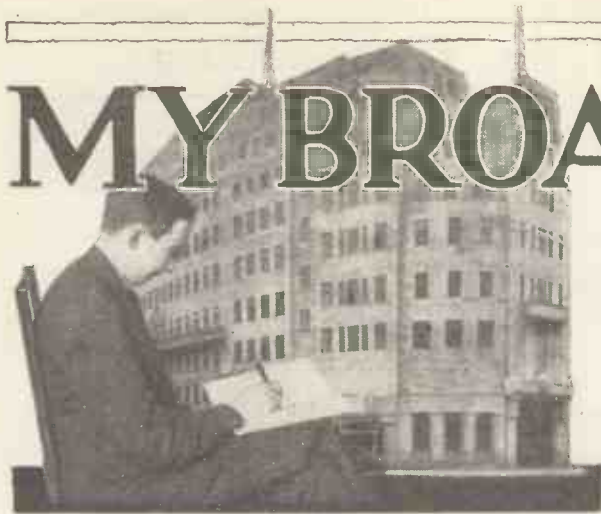
compromise between selectivity and sensitivity is found.

### THE H.F. STAGE—UNHAMPERED BY RESTRICTIONS



Because of the compensating effect of the L.F. arrangement, which ensures proper high-note reproduction, the H.F. stage can provide its full degree of selectivity without the usual limitations imposed in avoiding high-note cut-off.

# MY BROADCASTING DIARY



*Keeping a critical eye on the affairs of the B.B.C., our Special Correspondent comments frankly and impartially for the benefit of listeners on the policies and personalities controlling British broadcasting.*

It seems that Mr. Whitley, the Chairman of the B.B.C. Board of Governors, has really taken hold at Broadcasting House. This does not mean that there is any conflict or rivalry with Sir John Reith, but it does mean the introduction of a new and excellent influence into the day-to-day affairs of broadcasting.

In his little office the ex-Speaker of the House of Commons does worlds to smooth out the numerous creases and worries of broadcasting. Good luck to him!

## *More Argument Wanted*

I suppose it would be hardly less than human for the B.B.C. to obey the general tendency to play for safety in the expression of political views, but I am bound to say that I think there is too much reserve recently. We are not getting the biting antagonism, the sincerity of advocacy and denunciation that make argument vital and entertaining.

Something should be done about this, else we had better have music. As a basic formula for broadcasters of all countries and at all times, "when in doubt give us Gilbert and Sullivan or Sandler" wants some beating.

## *7-Metre Worries*

The tower of the Langham Hotel is causing Mr. Ashbridge, chief engineer, and his staff a good deal of worry. The 7-metre transmitter does not get out as well as it should in a south-westerly direction, and this is explained by the fact that the tower intervenes between this point of the compass and the 7-metre aerials on the roof of Broadcasting House.

Well, the Langham Hotel was there long before the B.B.C. ever thought of building their headquarters just behind it. The only thing to do is to move the ultra-short-wave transmitter to a more open locality. I am sure this would find favour with a great many people at Broadcasting House, for once the aerials and network of "feeders," etc., were removed, it would be possible to provide that long-talked-of roof garden.

## *The Fire Alarm*

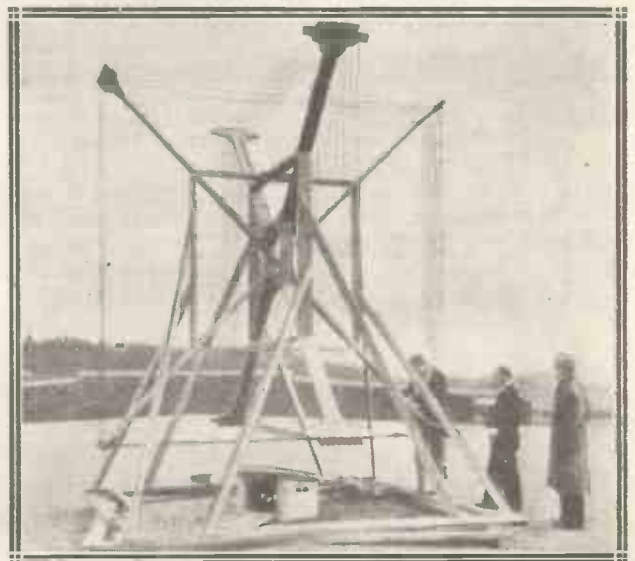
A very bright broadcast is in store for North Regional listeners on Saturday, June 3rd, in a programme entitled "Fire," which is to be relayed from a new fire brigade station recently built at Rochdale.

Without going too deeply into the details of the broadcast, because to do so would only spoil the effect and give away what are intended to be some surprises, it is well worth giving a brief description of some of the devices in this most modern of fire-fighting stations, as they will, of course, form the basis of the programme. Practically everything is done by electrical gadgets, which not only call any number of men required from their houses ranged conveniently round the station yard, but does all that is wanted up to the actual moment when the various appliances leave the station.

The pressure of one single knob not only calls out the men and switches on the lights in the building, on the stairs of the firemen's houses and in the yard outside, but opens the doors in front and behind the fire-engines, starts up their motors (previously kept warm electrically), and records the time, first of the actual call, then when the engines leave the station, and finally when they come to a standstill at the scene of the fire.

All these operations (with the exception of recording the time of arrival at the fire) are directed from the control-room of the station, which is also fitted with a

## RADIO AIDS AIR NAVIGATORS



This contraption is a directional transmitting aerial which sends out a radio beam along which air pilots can fly through fog, etc., without fear of losing the way. Its tests have been extremely successful, enabling the plane to find the landing field without difficulty.

## Shielding Tatsfield from the New Daventry

microphone so that the drivers of the engines receive confirmation of the address to which they are going. Fire fighting (or, at any rate, the turn-out of its fire brigade) has been brought to a fine art at Rochdale, and this relay on June 3rd promises to be one of the most interesting heard for a long time.

### News of the New Long-Waver

Now that the opening and full-dress visits to the West Regional are over, the next big constructional work to be taken in hand by the B.B.C. is Droitwich, the new station which is to supplant the Midland Regional and the long-wave National.

Work has, indeed, begun, but the powers that be are very reticent about the design and possibilities of Droitwich, apparently for a combination of very good reasons. To begin with, the cost will be high, and in these days of economy the less said about expenditure the better.

The suggestion that salt undermines the site where the

how a little forest of aerials has grown up there of late. Two big masts tower above all the others, and it is these that concern Droitwich. The engineers have been experimenting with suitable types of aerials to discover a system that will provide a minimum of interference. I gather that the B.B.C. are anxious not to let Droitwich do to Tatsfield what Mühlacker did to London a year ago.

### Photographic Publicity

The photographic policy of the B.B.C. came in for a good deal of adverse criticism when I discussed the matter with several radio artiste friends the other evening.

One well-known artiste told me that at the request of the B.B.C. she had sent them a photograph for Press purposes, and had been astonished to hear from a Fleet Street friend that newspapers using the picture had to pay for it. She had naturally assumed that the B.B.C. would circulate the photograph with the programmes so that all and sundry might make use of it free of charge.

### Scottish Items

Here are two items for Scottish listeners to look forward to:

Monday, June 5th. A light, braid Scots comedy called "Wood an' Mairrit an' A'." This will be put on by Glasgow.

Friday, June 9th. A new revue by The Radioptimists entitled "College Crimes."

### Quite a Ritual!

Quite a ritual is observed these days when Sir John Reith enters Broadcasting House. Commissionaires spring to attention in the entrance hall as soon as the Director-General (or "D.G." as he is usually called) arrives. One man escorts him to the lift, where another takes over, and in turn hands over to a third when the lift reaches its destination.

I have never yet discovered how it is that those in the entrance hall know exactly when Sir John is about

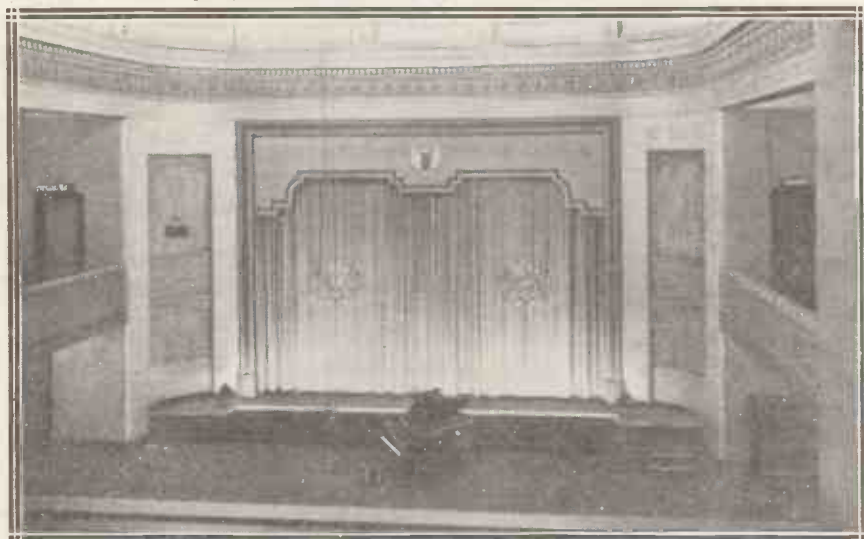
to depart, but there must be some means of communication—whether it be wireless or telepathy—for about two minutes before the "D.G." comes down in the lift there is an air of expectancy among the uniformed attendants, and they place themselves at suitable points of vantage across the mosaic floor in readiness to salute and say good-evening to their chief.

### Organ Relays from Coventry

Dr. Harold Rhodes, the organist of Coventry Cathedral, is leaving this month to become the organist of Winchester Cathedral in succession to the late Dr. Prendergast.

It is hoped that not only will arrangements be made to continue the popular relays from Coventry Cathedral, but also that permission will be obtained to follow Dr. Rhodes to Winchester. Whatever happens, the relays from Coventry must continue, for it is agreed that the organ there broadcasts almost perfectly.

### THE FINEST STUDIO IN BRITAIN



Edinburgh claims that their main studio—a converted concert hall—is the finest broadcasting studio in the country. This picture of "the stage" was taken from the balcony, and shows the microphone suspended to the left of the piano.

station is to be built on a little hill at Wychbold is not taken very seriously. But it is a point which must be considered.

Finally, there is the international situation to think of. How can the B.B.C. go to Lucerne with complaints of jamming and interference, and with suggestions for weeding out unnecessary transmitters, when they are themselves talking of their wonderful new station at Droitwich which will be four times as powerful as the old one at Daventry?

Wait till the Lucerne plan is settled, then we shall hear all about Droitwich.

### Droitwich and Tatsfield

There is, however, just one secret which I can reveal about Droitwich. It concerns Tatsfield, the B.B.C. listening-post in Surrey.

The thousands of motorists and hikers who pass over Titsey Hill, near the listening-post, must have noticed



# On the TEST BENCH

*Our comments regarding some interesting new components.*

## Telsen Ganged Condensers

**A**N interesting few minutes can be spent examining closely and critically the details of design and construction of a modern radio component.

Particularly if the component is a ganged condenser, which is a combination of the electrical and mechanical in almost equal proportions.

The Telsen Twin-Gang Condenser constitutes an excellently representative example of such a device, because of its soundness and ingenuity of design.

Let us briefly indicate the points worth special notice. It will be observed that the frame is built up from stout plates cunningly locked, screws being avoided as far as possible owing to the necessity of achieving great rigidity.

The spindle is very heavy, the object of this being to prevent whip, which would be disastrous in a gang condenser.

Then the vanes are locked in solid

masses of metal, not merely pinched in thin supports.

Easy-to-handle star wheels are supplied for the trimmers, and a nicely moulded dust shield drops over the vanes.

The dial achieves its smooth, slipless action through the employment of precision-made friction grips and a well-gauged spring pressure.

Yes, the Telsen Twin-Gang Condenser is a first-class example of the fine work that can be accomplished by modern machines—and men.

## A Lissen Power Pack

We have naturally a keen interest in power packs, because it was "M.W." which popularised these devices. This was not, we may add, a difficult task, for constructors at once realised their advantages.

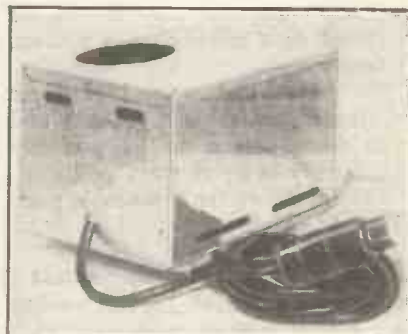
If a power pack is used, not only are all the mains components grouped and screened separately, but if and when the set is changed the power pack can be transferred en bloc to the new outfit.

There are also many constructors who would not tackle mains sets at all were it not that the existence of power packs provides a safe and easy method of adding the mains power section.

Lissen's have an exceptionally useful power pack for the more modest

type of set. It provides 30 ma. at 180 volts from its power tap and has an S.G. and a detector tap.

## WELL SCREENED



This useful Lissen power pack provides a terminal for mains aerial connection.

There is an output of 4 volts raw A.C. for valve heaters.

A really novel note is struck by the provision of a terminal for a mains aerial connection. It is such a simple thing to arrange, and so convenient, that we are surprised that it hasn't been done before.

However, everything must be done first by someone, and here again Lissen's demonstrate their traditional enterprise.

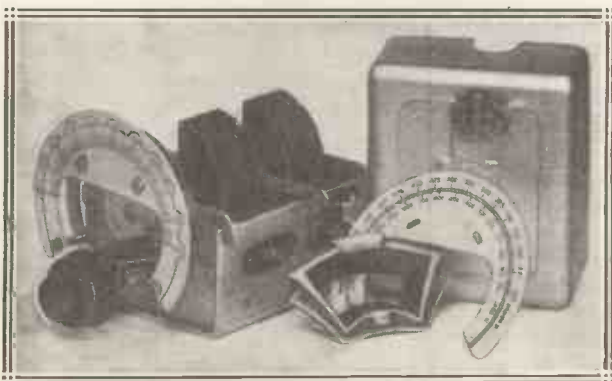
## A Mains H.F. Choke

It is frequently advantageous to insert H.F. chokes in mains input leads for, especially with D.C., interference often arrives through them in the form of high-frequency ripples.

But ordinary H.F. chokes will not withstand the comparatively high current flow.

Suitable chokes are, however, obtainable. For instance, Messrs. Ward and Goldstone make them. Their mains H.F. choke can take up to

## RIGID CONSTRUCTION

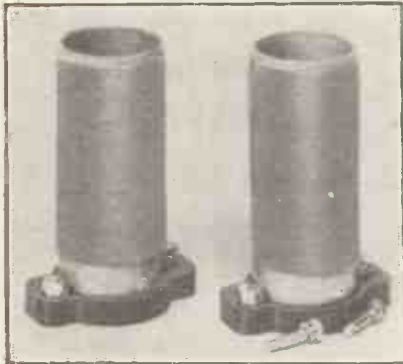


The Telsen Twin-Gang Condenser is an excellent example of modern component design and construction.

## Some Interesting New Radio Productions

6 amp., while its resistance is sufficiently low to make its effect on the mains feed voltages negligible.

### MAINS CHOKES



Low resistance and ability to withstand comparatively high current flow are features of the Goltone D.C. mains choke.

It is strongly made and is provided with sub-base terminals as well as ordinary ones, so that it can be mounted on a metal chassis without difficulty.

We have used several of these "Goltone" mains H.F. chokes and have found them to be perfectly satisfactory in every way.

They retail at the reasonable price of 3s. 6d. each.

### New Ferranti Components

There is a popular belief that quality goes with lack of enterprise, and that the firms which make high-class goods slowly and painfully plod behind.

Fortunately, this is not the case; at least, in radio. For example, Ferranti, whose reputation for L.F. transformers is second to none, were in production with "Class B" components as early as anyone.

Among the many types of these new Ferranti products, we have tested the following:

The type O.P.M.15c Output Transformer has three ratios—1/1, 1.6/1 and 2.7/1—for high-resistance speakers and low-resistance moving-coil types

### FOR "CLASS B"



The new Ferranti "Class B" transformers.

with built-in transformers. The primary D.C. resistance is 110 ohms each half, and the total primary inductance 35/10 henries.

The type O.P.M.16c Output Transformer is for low-resistance moving-coil speakers of 5 to 20 ohms. It has three ratios: 15/1, 22.5/1 and 45/1. The total primary inductance is 35/10 henries, and the primary D.C. resistance 110 ohms each half.

The type A.F.15c is a drive transformer having a 1/1 ratio and a primary inductance of 62/17 henries. Its secondary resistance is 80 ohms for each half.

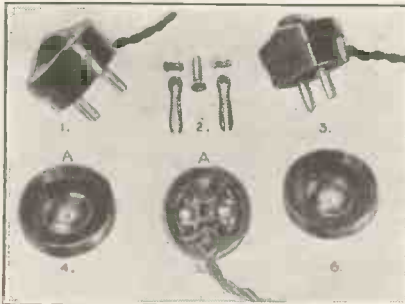
All the above can handle up to 20 ma. They are high-class components in the fullest sense of the term, and the constructor who uses them can rest assured that he is in a position to get the best results possible with the new principle.

They cost more than most others, but they definitely are worth the money.

### An Efficient Wall Plug

The new wall plug which has recently been introduced by Lectro Linx has been hailed by the electrical

### IMPROVED DESIGN



The Clix wall plugs. 1, 2 and 3 show two types of plugs and the pin details. 4, 5 and 6 depict the interior and two types of covers.

world as a revolutionary improvement in existing designs.

It is certainly a very ingenious and effective article, and is totally free from the many snags encountered in such devices.

There is an absence of those usually tricky and inefficient screw connections. Connection is made to the leads by a novel method



Micrometer adjustment can be obtained with this new Igranic Indigraph dial.

which ensures a firm grip and good contact with any kind of wire.

By means of a "tortuous path" all strain is removed from these actual points of connection and equally distributed over a comparatively great length of lead.

And the pins are highly adaptable. Possessing unusual inherent springiness, they are tolerant over a wide range of error in socket size and separation.

Lectro Linx have undoubtedly achieved a considerable success in their new Clix wall plug, and have clearly proved that we need not look only to the Continent, especially Germany, for important advances in the design of electrical fittings.

### The Indigraph Dial

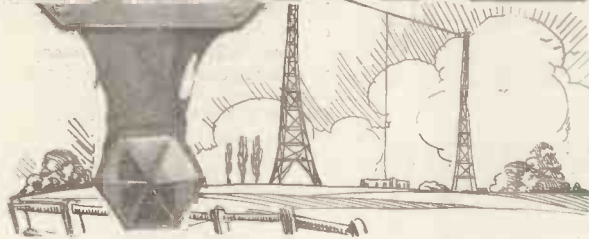
Igranic have now produced a new  
(Continued on page 558.)

### A FINE INSTRUMENT



The handsome 22P.M. Blue Spot loudspeaker.

# HOW TO OBTAIN BETTER RADIO



Whether you build your sets or buy them ready-made, you'll always find some query cropping up regarding maintenance, installation or modification. This special feature solves such problems for you in an attractive and entertaining manner.

## A CHAT ABOUT PORTABLES

THE past very great popularity of portables was undoubtedly largely due to their novelty appeal. When this wore off the inevitable happened.

And now the portable is judged from a purely utilitarian point of view. Until quite recently it rather failed in this aspect by comparison with portable gramophones, for it was heavier and its voice had less carrying power in the open.

Also its running costs, especially in regard to H.T., made it a somewhat expensive instrument.

### New Developments

But of late there have been developments which make it probable that portables will once again come into prominence.

First and foremost there is "Class B" amplification, with which great output power can be obtained at reasonable H.T. currents. This is, of course, exactly what is wanted.

Then, secondly, improvements in the technique of loudspeaker

design and construction have rendered it possible to produce comparatively small and light moving-coil loudspeakers, so no longer need the portable set be restricted to the moving-iron class of instrument.

### Compact Coils

A further innovation of importance to portable set designers is the compact and very efficient Ferrocort coil.

However, it must be borne in mind that all these items are moderately expensive ones, so that the initial cost of a portable embodying them all will be fairly high.

It remains to be seen whether

outdoors. On this page you will see a sketch which gives some hints on the subject.

The three forms of aerial are all capable of giving results superior to those provided by the tiny frame of an "all-in" set.

### Three Suggestions

The first comprises merely throwing a length of insulated wire over the branch of a tree.

In the second case the wire is twisted loosely round a wire fence—not electrically connected to it.

In the third instance a wire is joined to a convenient point on

## AUTOMATIC WIRELESS CONTROLS

REMOTE control of wireless receivers has been very elaborately developed in America and, in due course, we may expect to see something of the same kind happen in this country.

The de-luxe controls are extremely ingenious. With one we have seen, not only can the set be tuned to any station, but it can be switched on or off and the volume and tone adjusted.

All this, bear in mind, with nothing more than a small device connected to the set by means of a thin cable.

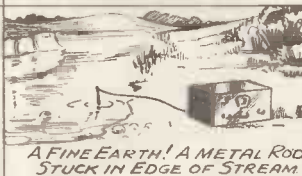
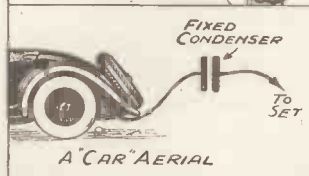
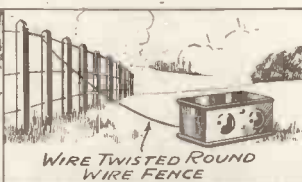
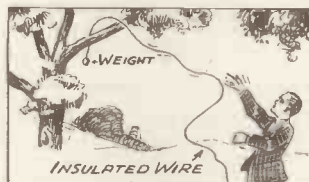
### Time Clocks

The control can, in cases, be extended to rooms far removed from the one in which the set is installed.

Of course, simple on-off remote controls have been marketed for years in this country, but they have never attained any very great popularity. We ourselves have always felt that it would be much more convenient to be able to change the programme at a distance rather than merely to stop and start the set.

If it is required to do this we prefer a clock switch that would switch on or off at a pre-determined time.

## IMPROVISED AERIALS AND EARTHS



Four hints for radio "hikers."

or not the public will respond in large numbers to its appeal.

In the meantime, it is worth noting that there is a growing tendency to exploit what we may term "quasi-portable" sets.

By this we mean a kind of compromise between the "all-in" suitcase type and the ordinary domestic model.

Indeed, the only real difference from the latter is that the receiver is packed up or, perhaps, built for use in the open with an improvised aerial and earth.

### Dual Purpose

Many constructors are, in fact, making their sets so that they can be used either at home or

the chassis of a car (its tyres insulate the car from earth). The fixed condenser should have a capacity of .0003 mfd.

### A Good "Ground"

The provision of a good earth connection is simplicity itself if there is a stream near by. Alternatively, a length of flex laid on the ground often proves effective.

This wire should be run under the improvised aerial as far as practicable. In certain cases of improvised aeriels an earth connection may not make an appreciable difference to reception. However, it is always worth while experimenting with a ground connection when facilities are available.

## A ROBOT SWITCH



This clock switches the set on and off at pre-determined times.

## MODERN METHODS



A portable set embodying a moving-coil speaker, "Class B" amplification and Ferrocort coils.

## Simple Methods of Testing Your Set

Such clock switches are also not new things, but we believe their comparative failure has largely been due to their generally poor reliability.

However, there are now available makes which are trustworthy timekeepers as well as being good switches.

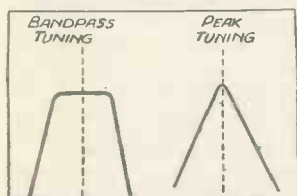
### BAND-PASS BENEFITS

WE have been asked why it is that band-passing has not achieved the overwhelming success that was once predicted for it.

It is widely used, but we presume that its greater popularity is prevented by its cost and complication. The simplest band-passing demands two tuned circuits.

And that means that, in addition to two coil units, and

### THE "FLAT-TOP"



Showing how band-passing tends to maintain the amplitude of sidebands.

comparatively complicated ones embodying all the various inductances required for the two circuits, two tuning condensers are needed. Generally, of course, the condensers will be ganged in order to simplify the control.

#### Peak Effect

But band-passing properly carried out has much to be said in its favour.

With ordinary single-circuit tuning, and particularly when reaction is applied, a peak effect results and there is a definite falling off in the "sidebands."

This results in a depreciation of the high notes, and it is in such circumstances that a compensating transformer can be used to very great advantage.

### SIMPLE TESTING

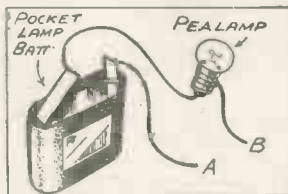
PROBABLY the simplest of all testing instruments is a flashlamp and battery. With it anyone can conduct numerous tests.

For easy handling it is advisable to fix the two articles either on a small flat piece of wood or in a small box.

They should be fixed so that the light from the bulb can easily be seen, and so that the ends of the two wires marked "A" and "B" in the diagram are free for applying to the objects to be tested.

They will be easier to handle if what are known as "test prods" are fitted to them. These are merely pointed metal

### CONTACTS AND CONTINUITY



An easily rigged-up tester.

devices which allow good contact to be made.

#### Lamp Lights Up

Now if the free ends of the wire or the prods fitted to them are touched together the bulb will light up.

When the two wires at the same time touch a piece of metal, such as a coin, the same thing happens because the circuit is being completed.

So long as the metallic bridge or path between the two ends of the two wires is an easy one for the electricity to pass through, an indication of the circuit completion is at once evident.

Obviously, then, we have an excellent tester of contacts and



A voltmeter can be used for numerous interesting tests.

terminal connections, and of low-resistance metallic paths such as are provided by loud-speaker connecting cords, battery leads, and so on.

#### Touching Vanes

Also it will show if "easy paths" exist when they should not exist, such as between the fixed and moving vanes of a variable condenser, although you must disconnect its connecting leads first.

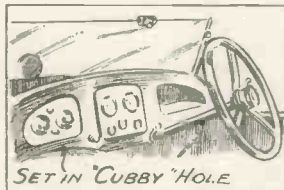
There are indeed many tests that can be carried out, and more and more will occur to the user as he becomes accustomed to this method of testing.

### YOUR OUTPUT POWER

IT is as well to remember that a valve does not generate power like a dynamo. The energy which operates the loud-speaker is derived from the H.T. battery, or mains if a mains set or unit is used.

Obviously, then, it is absurd to try and develop a big output with an inadequate H.T. supply. If you want power and quality it is essential that the output valve is supplied with all the H.T. voltage that the makers recommend. And, of course, the valve itself must initially be capable of that degree of power that is required.

### HANDILY PLACED



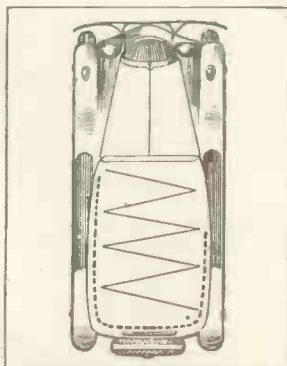
If the set is built into a dashboard cubby hole, the controls are easily accessible to the driver.

### RADIO IN CARS

THOSE who have to use their motor-cars constantly for long journeys would find a radio equipment very useful.

It would keep them supplied with the news and weather reports, and help to while away the tedium of the journey.

### THE AERIAL



Two methods of arranging the aerial for car radio.

It is debatable whether it would be worth the while of the ordinary week-end motorist to

fit his car with wireless, though even in such cases it must be admitted that it would be an attractive fitment.

An ordinary portable set laid on one of the seats, or stood on the floor, can be used, but only if the accommodation for it can be spared.

Even so, it is likely that many would experience trouble from interference due to the ignition system. Good screening is needed to eliminate that.

#### From Car L.T.

There are special sets now made for neatly fitting into cars, and these employ the car accumulator for L.T., and are generally equipped with automatic volume control so that programme strength is maintained at a constant level despite changes of locality and conditions.

### GOING OVER TO "CLASS B"

A GREAT deal has been said about the H.T. current-saving qualities of "Class B" amplification. Quite rightly, too, because you can get more out of a "Class B" amplifier in the way of undistorted power than you can from a "straight" outfit for a given H.T. current consumption.

### FOR ANY SET



An adaptor for converting an ordinary receiver into a "Class B" outfit.

But it should be borne in mind that "Class B" isn't purely and simply an H.T. saver.

Take an ordinary S.G., det. L.F. set, with an H.T. consumption of 10 milliamps. Neither "Class B" nor anything else will allow you to get the same results at less H.T.

#### Simple Conversion

What can be done is to add "Class B" and get a very fine output at comparatively little additional H.T. cost.

It is easy to add "Class B" to



# How to Deal with Electrical Interference

such a set, and it can conveniently be done with an adaptor, for the output valve of the set, if a small power valve, will serve excellently as the "Class B" drive.

In most cases the addition of the adaptor will entail no alterations to the set.

## ELECTRICAL INTERFERENCE

So far as his actual radio set is concerned, the listener cannot do much to reduce many forms of electrical interference.

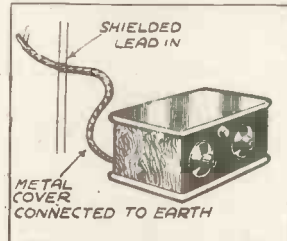
The remedies for it largely lie beyond his direct control. In our opinion, the authorities, local and national, are not helping as much as they might.

Broadcasting is surely one of our vital social services and, therefore, anything that tends

the whole matter is taken firmly in hand by the authorities.

But there is at least one thing it is worth the listener's while to

## SHIELDED LEAD-IN



An idea that is often worth trying.

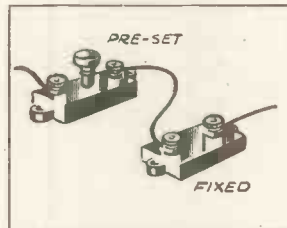
try, and that is a shielded lead-in for the aerial. The type of metal-covered wire so often used for screened leads in mains receivers and for anode leads to S.G. valves is quite suitable.

## CONDENSER CAPACITIES

With two or three fixed condensers of different values and a preset condenser, it is possible, with a little juggling, to cover a very wide range of capacities.

When condensers are in parallel, the total capacity will be the sum of the individual capacities.

## VALUE JUGGLING



"Compression" condensers are extremely useful when odd values of capacity are needed.

When in series the rather tricky "reciprocal" rule comes into action.

This is that the sum of the reciprocals of the individual capacities is the reciprocal of the total—i.e.:

$$\frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} \text{ etc.} = \frac{1}{C}$$

It should be noted that in every instance where condensers are in series the total capacity must be less than the capacity of the smallest condenser. This is especially worth noting when you are checking your calculations or when you have a preset in series with one or more fixed condensers.

## MIXING ACCUMULATOR ACID

Should you ever have occasion to mix an acid solution for an accumulator, this important rule should be remembered. The acid must always be added to the water, and water must never be poured into the neat sulphuric.

This is because great heat is developed when the two fluids mix, and the bigger the proportion of acid the more spluttering and heat there will be.

## A CAUSE OF HOWLING

Sets using dual and triple screened-coil units are often likely to lead constructors into trouble by the

very nature of their ostensible simplicity.

When components are individually screened the ordinary screening becomes largely unnecessary, and its absence makes a set look extremely simple. But where one, two or three S.G. valves are used there will be considerable amplification. The consequence is that "feed-back" becomes dangerous, even through what might at first seem very weak couplings indeed.

An aperture in the "can" of a coil, for instance, might provide quite enough leakage for unwanted coupling to occur.

## Tiny Aerials

The anode leads from S.G. valves can be veritable radiating aerials, tiny but potent.

And, of course, all grid leads are potential "couplers."

But coupling can even occur through filament wires. Filament wires which go straight to earth, too.

Then, again, variable condensers may be the cause of "feed-back" and howling.

No, because you use canned coils, don't imagine that you can take liberties with the rest of the set. We fancy many constructors have already learned that to their cost!

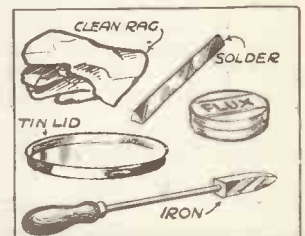
## SOME SOLDERING HINTS

Although we don't advocate soldering for the leads of wireless sets, except when it can't be easily avoided, there are numerous jobs in the dealing of which soldering is invaluable, even indispensable.

And it is quite easy if you bear in mind these points:

1. The iron must be hot; not red-hot, but very, very nearly.
2. The iron should be a fairly

## THE OUTFIT



With these simple articles an enormous amount of useful work can be done.

heavy one so that it can retain its heat well.

3. The iron must be kept clean and well tinned.

4. The surfaces of the metal to be soldered must be well cleaned.

5. A good flux is essential.

## CAN ANYTHING BE DONE?



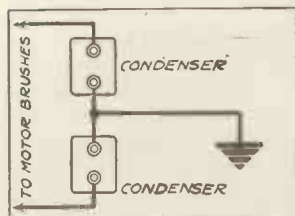
One of the common causes of interference.

to interfere with it should be energetically dealt with by our distended officialdom.

Listeners themselves could help by pressing their local councillors and M.P.'s for action.

Those sparking, flashing tramway trolleys are not inevitable. It is possible to reduce the sparking so that it becomes

## ELIMINATING SPARKING



A simple spark stopper for electrical appliances.

almost negligible, and it is only fair to say that in some towns this is being done.

And there are quite simple cures for sparking lift-mechanism, electric motors and so on. But they will not be applied as vigorously as they should until

## CABINET SIZES

A console or some other such type of cabinet is essential if a home-made set is to attain a really good appearance.

But a well-made piece of cabinet work is a rather expensive affair. And it is not likely easily to be jettisoned in favour of another if a new set is assembled.

Therefore, it is always a good plan to purchase a cabinet with one eye on the future.

### Space to Spare

That means to say, you should see that it is large enough to allow for a little expansion, although, at the same time, it must not be obviously and clumsily over-sized.

But it is nearly always possible to allow a little greater depth and, perhaps, height, than will immediately be needed.

### For Future Use

Also, it should be ascertained that there will be no over-due cramping in the spaces allotted the loudspeaker and batteries or mains unit.

In these respects it would be far better to start with a considerable "waste" of space rather than find it impossible on some future occasion to change the speaker or something, because the new items happen to be too large to fit in. And it is worth remembering that odd valves, etc., can safely be stored in the cabinet.

# THE LATEST "CLASS B" VALVE

Details of a recently introduced "Class B" valve that is designed with extreme economy as its chief factor. It has an undistorted output of about  $1\frac{1}{4}$  watts.

By JEREMY GREY.

WITH all forms of "Class B" amplification, including quiescent push-pull, the idea is to reduce to a negligible quantity all high-tension consumption except that actually required for operating the speaker. In other words, the waste due to the idle or "rest" current of the output stage is eliminated, and current is only drawn from the high-tension supply to provide useful low-frequency power.

## First Principles

The principle is to use two valves, one of which amplifies the positive half-cycles of the low frequency input, and the other the negative half-cycles, each valve being inoperative during alternate half-cycles.

In quiescent push-pull this is achieved by using two ordinary standard output valves (usually small pentodes) and biasing them to the bottom bends of their characteristic curves so that each valve acts as a combined half-wave rectifier and amplifier.

Full "Class B" amplification, on the other hand, uses specially designed valves which need no grid bias, the anode current at zero grid voltage being very small—a milliamp. or so.

## Economical Construction

This is made clearer by Fig. 1, which gives the characteristics of a pair of typical "Class B" valves and shows the relation between the amplified signal "S+", "S-" and the anode currents  $I_1$  and  $I_2$ .

But "Class B" goes a little farther than this, for instead of using a pair of separate valves connected in push-pull, the two triodes forming a "Class B" pair are enclosed in a single bulb. This gives important economies in low-tension consumption, in chassis space, and, what is more to the point, in first cost, for now that the actual prices of these double valves have been announced, it is realised that they are substantially less than that of a single pentode.

Now there are two main schools of thought regarding what is the most advantageous form for "Class B" valves. The one school believes that

big output is the first consideration. Outputs up to 2 or 3 or more watts are suggested—at a very economical H.T. consumption, it is true, but a consumption which is, perhaps, rather beyond the economical output of a dry, high-tension battery.

The other school contend that high-tension economy is of paramount importance, and that the interests of the large majority of listeners will best be served by producing a valve which will give a somewhat more modest output—1 to  $1\frac{1}{2}$  watts undistorted power—for a high-tension consumption comparable with that of an ordinary power valve, namely, an average of something under 5

ing possible both volume and quality far superior to that obtainable with a single small power valve giving only a few hundred milliwatts of output, while the total high-tension consumption is not materially increased.

## Drive Valve Considerations

Another point in favour of what may be called medium power low-consumption "Class B" valves, such as Mullard's P.M.2B. which is now in production, is that in any case it needs only an additional low-frequency stage using a valve of the ordinary general purpose type between the detector and the output stages, thus economising in both H.T. and first cost. For the large output type of "Class B" valve, however, a fairly large drive valve must be provided—usually a valve of the power class, the comparatively high anode consumption of which rather detracts from the efficiency of "Class B" amplification.

## Detailed Description

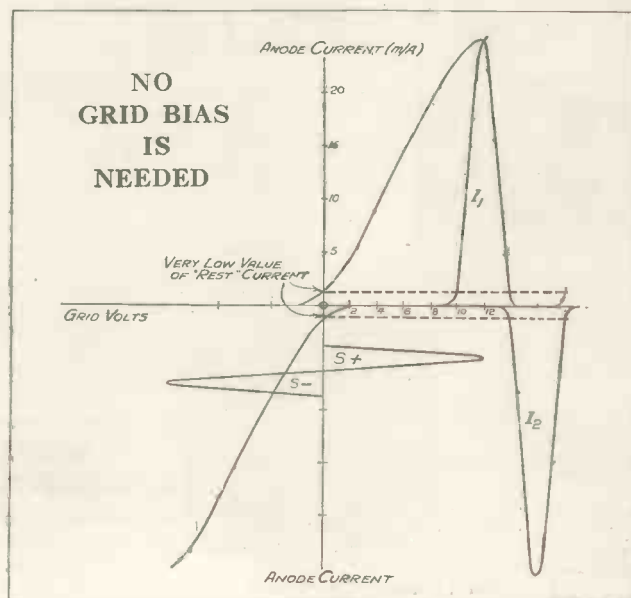
Here are some details regarding the Mullard "Class B" valve type P.M.2B. This is a battery-operated valve, suitable for use with a 2-volt accumulator. The two sets of electrodes are incorporated in a single bulb. The filament consumption of about 0.25 ampere is only just a little more than that of a 2-volt power valve. High-tension voltages up to 150 volts can be employed.

The "rest" current for the pair is only 3 milliamps., so that the standing losses are reduced to a very low figure indeed.

The maximum grid swing to give full output is 12

volts peak value and, when a load of 4,000 ohms per valve—that is to say, 16,000 ohms between the two anodes,—is applied, the valve will give, when fully loaded, an output of the order of  $1\frac{1}{4}$  watts.

A valve of the P.M.2D.X. class taking  $1\frac{1}{2}$  milliamps. is suitable for the drive stage, when the inter-valve transformer should give a step-down ratio of 3:1 for each half of the double valve.



The bend in the characteristic of a "Class B" valve is so arranged that at zero grid volts very little current will flow, thus making a G.B. battery unnecessary.

milliamps. under normal conditions. It is to this latter opinion that the Mullard Wireless Service Company subscribe, at any rate so far as the first "Class B" amplifying valves which they are now producing are concerned.

This view appears perfectly sound, because from 1,000 to 1,500 milliwatts of undistorted audio-frequency power is ample for the average domestic installation, and permits the use of a good moving-coil speaker, thus mak-

# TROUBLE TRACKING



**W**HAT is the most common fault in a radio receiver? Probably background noises such as intermittent or continuous crackles or hisses. Hum may also be included in this category, although there is little or no excuse for this if the receiver is properly designed.

Crackles are not always the fault of the set itself. Often a perfectly new and well-made receiver will exhibit this trouble from the time of installation, much to the annoyance of the unfortunate owner. Upon disconnecting the aerial and earth the noises cease.

## Barbers and Doctors

Frequently, if the set is tried on another aerial in a different locality the trouble disappears, the broadcast programmes coming through quite free from any background crackles.

In these cases the listener should first of all find out from his neighbours whether they, too, suffer from these irritating noises. If so, the next step is to discover what electrical equipment exists in the immediate proximity of the affected aerials. Is there any high-frequency apparatus such as is sometimes used in hair-dressing saloons or for medical treatment?

When the trouble comes from this source it is usually intermittent, only occurring when the apparatus is actually in use and ceasing at night.

The electric flashing sign or neon tube is another offender, and trouble may be experienced from this source by those who reside near shops. Then, again, we have such things as dynamos and motors. Do trams pass the door? If so, does the crackle only start when a tram is approaching? Here, again, the trouble will be intermittent. But with dynamos the noises may be continuous throughout the day and greater part of the night, depending upon the use to which the dynamo is put.

*Every month the Chief of the "M.W." Query Department discusses some of the common difficulties which can often be so troublesome. This time he deals with crackles and how they are caused.*

Suppose the noises do not cease when the aerial and earth are removed. There are several possibilities then. For instance, a fault may exist in the set itself, in which case the crackling may be continuous or alternatively may occur only when the cabinet is subjected to vibration.

On the other hand, intermittent crackles can be due to direct induction from the lighting mains, as, for example, when there is a faulty switch contact. This trouble can generally

be located by trying each switch in turn when the set is working.

Such innocent-looking devices as vacuum cleaners and hair-driers are not above suspicion. Both rely upon motors for their operation, and even a small amount of sparking can produce loud bangs in the speaker.

## Valuable Work

In Germany there is a movement on foot to persuade the makers of electrically operated household equipment to "treat" the apparatus before sale to the public, so that it is immune from causing interference.

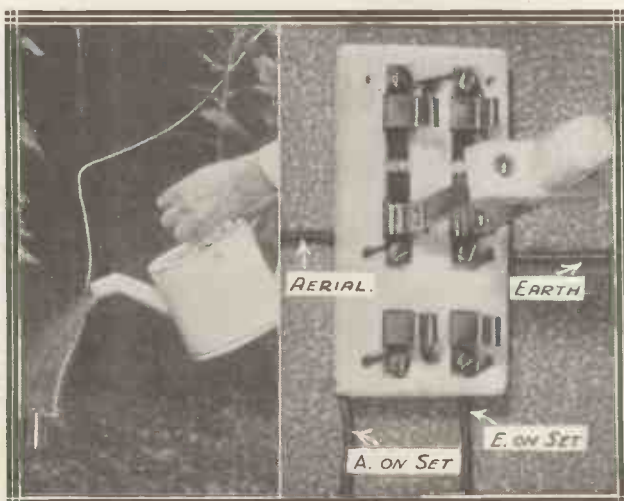
In this country the Post Office Engineering Department has carried out valuable work in this direction, and is able to advise listeners and owners of electrical equipment on the most satisfactory methods of overcoming interference.

The trouble is that there is often considerable difficulty in treating certain technical machinery. Interference from trams, for instance, may be caused in several ways, and each case has to be treated separately.

Moreover, there is the question of expense, which may be heavy with some apparatus. The ordinary case of interference from commutator motors and dynamos is usually curable by joining two large, high-voltage condensers in series across the supply terminals and earthing the centre point.

## Inside the Set

So much for interference from external sources. What about the set itself? Generally speaking, crackles caused by a fault in the receiver may be due (a) to a bad connection; (b) a defect in a component—both important questions which we must leave for discussion next month.



## TWO USEFUL HINTS

At this time of the year the soil around an earth tube tends to get dry, thus reducing the efficiency of the earthing system. So keep the soil damp by watering it at regular intervals.

The use of a lightning switch as a protection against electrical discharges is also advisable. The connections are as shown in the photograph.



# ROUND *the* TURNTABLE

*A Knocking Mystery!—For Portable Gramophones—New Table Amplifier—“Canned” Nightingales.*

*By TONE ARM.*

IF you should receive a letter in rather endearing terms from “Heart’s Desire,” Lovers’ Lane, Matcham, there is no need to get embarrassed, for the correspondence is only part of a clever publicity scheme for the H.M.V. record, “Sweetheart,” by Ray Noble, one of the season’s best-sellers. I’ve already had one of these “billets-doux.”

There is an amusing story going round that is worth repeating. An elderly lady had purchased one of the H.M.V. transportable radiograms, and had only had it a couple of days when she complained to the dealer that there was “somebody inside knocking nails into the cabinet.”

A much mystified and naturally incredulous engineer was sent down to investigate. After some time, during which the hammering refused to evidence itself, his patience was rewarded by the starting of the noise complained of. It was not long before the engineer deduced the source of this phenomenon—the B.B.C.’s interval signal!

## *An Ingenious Pick-Up*

One of the most interesting pick-up units I have seen for some time is the special clip-on gadget placed on the market by Belling-Lee. It consists of the standard Belling-Lee type A pick-up and arm attached to a special mount that enables the unit to be fixed readily on to the side of a portable gramophone, so that the machine can be used with a radiogram receiver.

The existing tone arm on the gramophone need not be disturbed, so that either electric or mechanical reproduction of records can be carried out with the greatest of ease, and with the minimum of trouble or delay.

A volume control is incorporated in

the Belling-Lee unit, which sells for 35s. The control is quite smooth in action, and the reproduction from the pick-up is good. It is not very sensitive, but is sensitive enough for most ordinary purposes, while the adjustable head and arm length are particularly useful features.

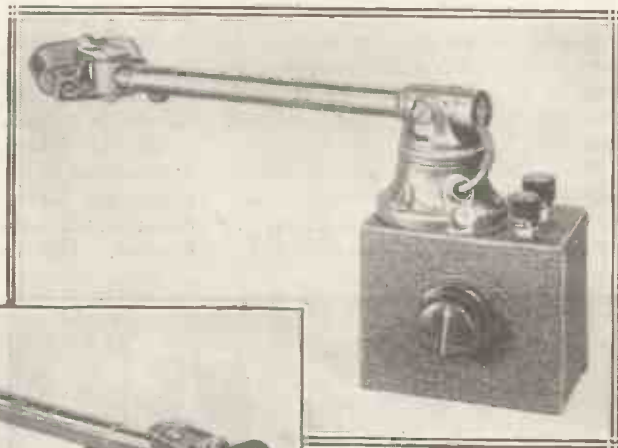
Belling-Lee are to be congratulated on a very useful little idea, and on a pick-up that is inexpensive and carefully designed.

## *The Trix Amplifier*

There seems to be a gradual increase in the number of complete electrical reproducers of the table type. The latest that has come to my notice is

### CLIP-ON OR STANDARD MOUNTING

The two models of the Belling-Lee pick-up that have just been placed on the market. The one on the right is the ingenious unit for attachment to portable gramophones.



**TWO NEW PICK-UPS**

the Trix transportable amplifier, which incorporates in it an electric turntable and a pick-up.

Known as the Type T.P.140, this amplifier is capable of giving an output of some 10 watts A.C., using in the last stage a P.M.24D. pentode. Housed in a wooden cabinet with carrying handles the Trix amplifier

should be very useful for public entertainment purposes, and for demonstration work. The retail price is, I hear, about £24, at which figure it should enjoy a good sale.

## *Bird Records*

The nightingale season has arrived again, and perhaps ere you read this you may have been regaled with Nature’s sweetest song, via the ether, from Pangbourne.

If not, it should be noted that the “canned” version of the nightingale is well worth getting, for H.M.V. have a good record of that wonderful vocalist, assisted by Beatrice Harrison and her ‘cello.

I am not so fond of the rather artificial type of bird records, where an orchestra plays sweet music, such as “Barcarolle,” to the continuous accompaniment of a bunch of roller canaries, or canary-nightingales.

Such records are interesting, but I much prefer my bird “neat,” or more nearly so.

I hear, by the way, that it is quite a business training these canary-nightingales, and that the characteristics of the nightingale’s song are taught to the canaries by close association between the latter and former birds from the very birth of the canary.

Incidentally, though it does not affect the records of the birds, I hear that by some arrangement of diet the

times of moulting of various members of a small troupe of these canary-nightingales can be changed to different seasons, thus ensuring that some of the birds are always in singing trim.

But is it worth it, when once a year one can hear the real thing, perfectly broadcast, or should one live in the right district *au naturel*?

# SPOTLIGHTS

# PROGRAMMES



### Hard to Convince

I HAVE an idea that the O.B. Director mentions "the song of the nightingale" with mixed feelings.

Nine years ago, when the Surrey nightingale was still microphone-conscious, the raucous noise of motor horns and engines of the curious-minded who persistently invaded the spot—presumably for the purpose of telling their friends, "Did you hear the nightingale broadcast? I was there"—at least served one useful purpose. They convinced listeners that the whole affair was genuine.

When, however, the scene was changed in later years to the Berkshire woods, rumour had it that a gramophone record was being used.

The O.B. Director, nothing if not thorough, undertook to wriggle through a very uncomfortable hedge and beg listeners to take his word for it that he was really on the spot.

Mr. Gerald Cock asks me to give you his official assurance that this year's performance is just as genuine—he hasn't got all the thorns out yet!

### What is an Alternative?

There seems to be a little doubt at Broadcasting House as to exactly what constitutes an alternative programme. When those of us who do not feel in the mood for a Cornish Miracle Play are offered a Dramatic Narrative of Work in Cornwall on the other wavelength, it really looks as though someone were under

the influence of the crazy month of May.

And because we didn't all immediately fly to our telephones or fountain pens, the official statement will be that "There appeared to be no substantial objection."

### How It's Done

They do things better abroad. Despite the fact that a bomb was exploded under the floor of his home, Father Coughlin, Pastor of the Shrine of the Little Flower, bravely faced the microphone and gave his regular Sunday radio broadcast against the bankers. I need hardly add that this took place in America.

From that same country comes the news that the U.S. Secretary to the Treasury (who recently composed a dance number which Miss Yvette Darnac sang from the London studio) "is a fine musician and plays

the guitar to his family every morning before breakfast."

Brother, can you spare a dime?

### Parade Dismissed!

Philip Ridgeway is another of those who cannot keep it up. For a long time now his "Ridgeway Parades" have been getting steadily worse, and now they are quite abysmal. "It's just me being silly," said Mr. Ridgeway at the beginning of his last show—and he was right.

The loyalty of the B.B.C. to early artistes is all very well, but it can be overdone. There are several so-called "stars" to whom one of the B.B.C.'s famous letters would not come amiss.

### The Worst Rhyme

Our contemporary, *The Listener*, has been having a lot of fun with "worst couplets," but although such people as Alfred Austin have been dragged in to make a Portland Place holiday, no one has worried much about the really bad rhymes which are perpetrated daily by our modern song writers.

Probably no listener would have difficulty in naming examples.

I guarantee to win every prize going with the following:

"If I could hatecher  
I'd stay away;  
That's not my nacher—  
I'm full of Vitamin A."

Hitler has recently put a ban on jazz; couldn't Sir John Reith appoint a censor for that sort of thing?



THREE'S COMPANY—but Anona Winn, Ernest Longstaffe and Norman Long were only a small part of the large company of radio artistes which gathered recently for a dinner at the Park Lane Hotel in honour of Val Gielgud, Productions Director, and Eric Maschwitz, who is taking over the control of light entertainment on September 1st.

## Thirty-Two Thousand Concerts

### Praise—Warm and Otherwise

Nelly, from Switzerland, and Maryanne, from Austria, are two young girls who have been spending a long period in England and sighing for the time when they could return to their native land. On the eve of their departure for home they wrote to Henry Hall.

"We are two foreigner girls who have been staying here for a few months, and sometimes felt very lonely and homesick because we have no friends here. When we leave this country we shall always remember 5.15 p.m., the only happy hours we had listening to your marvellous band."

Henry Hall has no doubts about the sincerity of that letter, but he is not so sure about the lady who wrote: "I always felt you were meant for a much better career than to conduct a dance band, and we hope in time to see your name attached to something much more musical."

orchestras being actually out of pocket after a broadcast performance.

Much as I admire Jack Hylton, Jack Payne and their colleagues, I cannot imagine that any of them are going to involve themselves in a dead loss merely to entertain listeners, in a spirit of altruism. If broadcasting were not the greatest publicity medium for an entertainer, then we could start to pity the "unfortunate, underpaid artistes."

As it is, we feel very tempted to cry "stuff and nonsense" to the distinguished critic.

### We Noticed Last Month—

—that Miss Effie Atherton, an actress who has not had much publicity, scored the biggest individual success in "The Castle on the Hill."

—that the Productions Director has

### A Fine Record

Those of you who listen to the Bournemouth concerts on Wednesday afternoons will join with me in offering hearty congratulations to Sir Dan Godfrey on having completed forty years as director of the Bournemouth Municipal Orchestra.

Thirty-two thousand concerts in forty years is a record which will be hardly beaten, and those of us who have the good fortune to know Sir Dan will not be surprised at the fact that no dissensions of any kind have marred those years.

Sir Dan's interest in broadcasting since the days when Bournemouth had a studio of its own is probably the reason why his broadcast concerts are enjoyed all over the world.

### Sir John's Influence

The new Western Regional station, although not yet in full service, has already experienced the conse-

### In the Programmes.

#### BARBARA COUPER

Two hundred and fifty plays in less than seven years is the achievement of Barbara Couper, the B.B.C.'s leading actress.

She first broadcast in the autumn of 1926. Went for an audition to Savoy Hill and heard through the microphone the voice of her future husband asking for "a little humour!" She gave it. She is still giving it.

Her favourite radio parts include Hermione in "The Winter's Tale," Effie in Philip Wade's "Oranges and Lemons," and Deidre in "Deidre of the Sorrows."

Barbara Couper was a member of



the B.B.C. Repertory Company which ran for a year.

She loves the country and Queen Anne furniture, of which she possesses a good deal in her Surrey cottage. Does not like modern furniture, and is terrified of television and its possible results!

In private life is the wife of Howard Rose, B.B.C. producer, with whom she has already adapted "Jane Eyre" and "Wuthering Heights" for the microphone. The former has been produced; the latter will probably be heard later this year.

Is at present playing lead in "Wild Justice" at the Vaudeville Theatre, and in her spare time adapts novels for the microphone, draws in black and white, looks after her Blue Chow and collects old glass.

### The Cause of the Trouble

Criticisms of the B.B.C. are all very well in their way, but it is hard to appreciate the point of view of one critic who takes it upon himself to accuse the B.B.C. of "a flagrant abuse of the charter under which it was inaugurated," because a certain number of gramophone records are played every week.

As a justification for stating that the Broadcasting House authorities take a high-handed view of the matter of radio artistes, this critic draws a heart-rending picture of famous dance

only to turn his hand to the production of a light musical show to make it a certain triumph.

—that the worst joke was undoubtedly "I've just seen two men taking a bath in Piccadilly." "No!" "Yes! They were taking it off a lorry."

—that Anona Winn is losing all her individuality as a result of "crooning" for a dance band.

—that Hugh E. Wright is beginning to suffer through a lack of really bright material.

—that Ronald Frankau is one of the radio comedians who can be depended on for consistently good performances.

quences of the Director-General's Sunday programme policy.

Very early the other morning—about fifteen minutes after midnight, to be precise—records of dance music were being played for those listeners taking part in reception tests. The official in charge had broken into the programme for a moment to make an announcement when listeners heard a quiet but distinct voice interrupting:

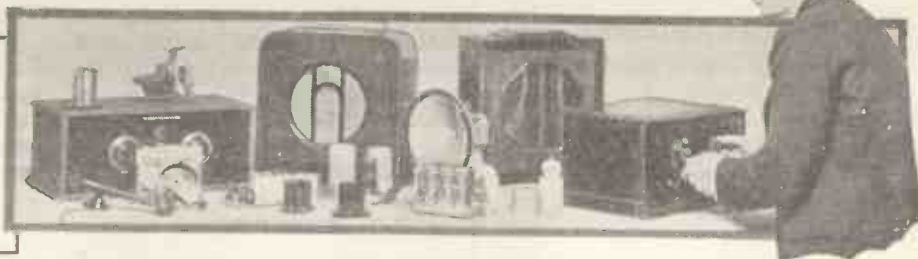
"Sorry to butt in, old man," it said, "but it's Sunday morning, and that dance music will have to stop."

And stop it did!

PATRICK CAMPBELL.

# AT YOUR SERVICE

by  
**OUR TRADE  
COMMISSIONER**



**C**“CLASS B” amplification has certainly caught on, if the reports of the various transformer manufacturers are anything to go by. My post, too, shows that a great number of readers of MODERN WIRELESS are busy converting their ordinary battery sets to the new form of L.F. power amplification.

But in many cases there is no need to convert if you want to try “Class B.” It is easy to use a “B” adaptor, such as that supplied by Sound Sales, or the Ferranti converter.

These can be added to any battery set without altering the wiring of the receiver in any way, while the results are perfectly satisfactory. Full details can be obtained on sending a postcard to the firms concerned.

## “Class B” Speakers

This does not refer to the mediocre after-dinner variety, but to the radio loudspeaker which is suitable for use with a “Class B” set without any output transformer matching scheme. The latest addition to the ever-growing number of speaker manufacturers who have placed special “Class B” speakers on the market is W.B.

This well-known firm have added to their already extensive range “Class B” models of the famous P.M.4 and P.M.5 speaker chassis. An extra charge over that made for the standard P.M.4 and P.M.5 is made, a mere 2s. 6d., bringing the prices to 30s. and 44s. 6d. respectively.

## Long-Life Batteries

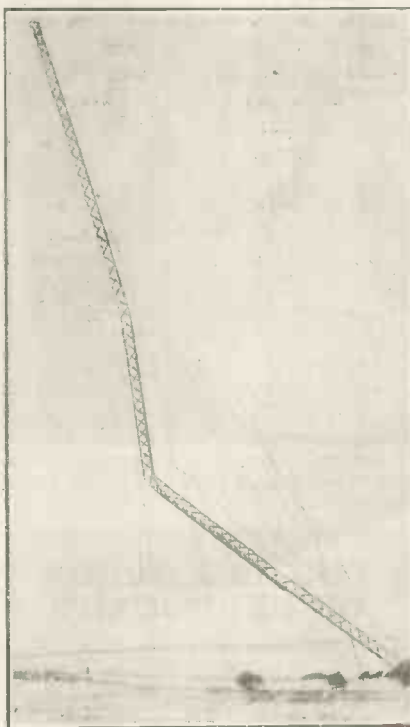
How often do you have to have your L.T. battery recharged? Whatever the length of time the battery lasts you will be interested in the new Ediswan batteries, which have just been announced.

These new types of accumulators enable the charging visits to be halved in frequency, for they incorporate a method of construction that enables the cells to hold their charges for a much longer time than is the case with the normal battery.

*Some trade news and views that will prove of interest to readers, whether or not they are connected with the radio industry. Members of the trade are invited to send items of interest or photographs, to be included under this heading.*

The question of making batteries that will hold charges for long periods has been one that has exercised the attention of battery experts for a considerable time, and the new Ediswan “Extralife” accumulator is a step well in the right direction towards the solution of their problems.

## OUT OF SERVICE!



Installed way back in 1913, this huge mast of the Horsea Island naval station was recently felled to make room for a new installation, “And great was the fall thereof.”

Ediswan “Extralife” batteries incorporate a new principle called “balanced capacity” which has the effect of not only conserving the

charge, but of prolonging the life of the cell. And the new batteries will cost no more than ordinary accumulators.

## New Type of Valves

On another page are given details of a new range of mains valves introduced by Marconi and Osram. Known as “Catkin” valves, these departures from standard practice are practically all-metal in construction, making them almost unbreakable, and of most unusual appearance.

The new valves will probably be released to the public about the time this appears on the bookstalls, so look out for them in the shops, and in set designs.

## More Iron-Cored Coils

As we go to press details are coming in of the new Varley iron-cored coils known as the “Nichore” tuning coils. These are the result of a considerable amount of research, and it is possible that in the near future, perhaps before you see this, it will have been possible to market them as a completely new system of tuning.

I refer to the method known as permeability tuning, which enables the various wavelengths to be covered without any recourse to variable condensers, the tuning being done by variation in the inductance of the coils by means of a variable iron core.

As they are at present, one of the new coils is suitable for aerial input coupling and the other for the tuned grid circuit of a detector, with a reaction winding.

## Lead-in Strip

The great advantage of the new Goltone lead-in strip is that it obviates the need for drilling holes through the window frame to allow the aerial to come through. The strip can be fitted under a window, and, being flat and flexible, will adapt itself to any reasonable shape, thus allowing the window to be shut down on it without damage. The strip is well insulated, and consists of a tinned wire-woven

**AT YOUR SERVICE**

*—continued from previous page*

ribbon, covered with a tough rubber insulation. It is supplied in standard lengths of 6 in., 9 in., and 12 in., though longer lengths can be obtained if desired. The price works out at a penny per inch, the six-inch length costing sixpence.

**More New Valves**

Further new valve types have been brought out, or are being brought out during the end of May and beginning of June. They are the high-frequency mains variable-mu pentode, the short-base variable-mu screened-grid battery valve, and the "Class B" valve—all from the Mullard stable.

The former is due for release on

adequate volume control on all but the most adjacent stations.

Finally, the "Class B" valve, the P.M.2B. This is a no-bias valve which is suitable to be used with the P.M.2.D.X. as driver valve, thus obtaining a very valuable decrease over normal "Class B" practice in the way of drive valve anode current.

**Marconiphone Air Trip**

In connection with the new "Catkin" all-metal valves, a high-speed aeroplane tour was made by Mr. Harris, the Marconiphone Press representative, to inform the provincial papers of the valve details.

Leaving Romford at 8.30 a.m., the plane flew to Birmingham, Liverpool, Manchester, and Leeds, delivering details and samples of the valves to groups of pressmen who collected at the aerodromes of these towns to greet the aeroplane.

**LIGHT ENTERTAINMENT AND VARIETY**



Variety stars and prominent artistes of light entertainment fame gathered at dinner to do honour to Val Gielgud and Eric Maschwitz, of the B.B.C. To the left is Mr. Jetsam with Jeanne de Casalis.

June 1st, while it will be round about that date that the other two will first be seen. The variable-mu pentode is known as the V.P.T., and has wonderful characteristics. It will be especially useful in automatic volume control sets using double diode valves, or other forms of diode rectifiers.

**The Short-Base S.G.**

The short-base S.G. is the P.M.12M., and it is designed to be particularly suitable for variable-mu control in battery "Class B" sets. It has a grid base of some 6 volts, but with only 4½ volts bias available it provides

**THE DISCOVERY OF FERROCART**

*An exclusive interview with the inventor.*

**F**ERROCART, Hans Vogt told me, out in his pretty villa at Dahlem, a suburb of Berlin, was a chance discovery at the time, though since receiving the first impulse strenuous work has had to be put in to develop it.

Readers will probably have heard

about the cores of coarse iron powder mixed with an insulating mass used in the pupin coils for long-distance music-frequency cables. Ferrocart is based on the same principle.

It is just an iron alloy as fine as the finest ladies' face powder. The alloy powder is mixed with an insulating material in special machines. The compound mixture is then spread very thickly on extremely thin paper.

**Supplied in Sheets**

Actually the paper is not necessary, as the insulating mass effectively separates each iron alloy particle from the other; but this compound mixture would be useless for use in any manufacturing process as it would crumble and fall to bits—therefore the paper. Ferrocart in its present form can be cut and sawn and worked.

It is supplied in sheets something like cardboard and in differently shaped rings and cones as required.

I understand that the two leading German radio set manufacturers are already hard at work developing their new season's sets, using the new coils. There is one big difficulty, in some cases the coils are actually too efficient, i.e. for present sets, so that a lot of re-designing has to be done.

Mr. Vogt showed me a tiny coil not much larger than the tip of his little finger, and it is equal in performance to the well-known Philips' local station eliminator coil.

The reader may very well ask why are iron-cored coils better than air-spaced coils, and applied to this special case Ferrocart coils better than our best low-loss air-spaced coils. The reason is not difficult to explain.

**Increases Inductance**

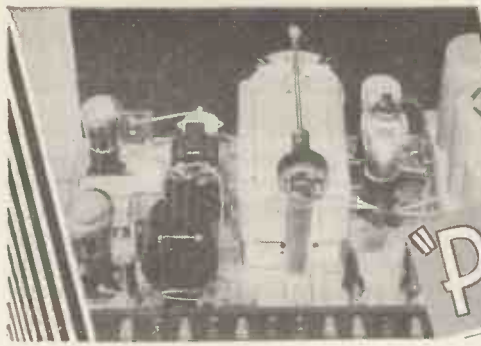
In an air-spaced coil the magnetic field is not concentrated within the coil itself; it passes through air and is liable to interfere or be interfered with. The number of windings to obtain a certain inductance value is large; the length of wire used is thus very long, and unless very carefully made Litz, is used the resistance of the coil to high-frequency is very large.

Pop a Ferrocart core into the centre of the coil and its inductance value rises enormously, while the field is concentrated.

Less wire is used for the same inductance value, the wire can be thinner, thus lighter and less voluminous; the whole coil attains very small dimensions indeed, and is still even more efficient than the equivalent air-spaced coil, as interference and loss have been cut down to a minimum.

A. A. G.





# The Future OF "POSITIVE DRIVE"

BY

P. WOODWARD.

IT is something of a commonplace that new things are often introduced with one particular object in view and yet find their final place in the scheme of things serving quite a different purpose.

The Bunsen burner was devised to provide a means of heating vessels in a laboratory without making a sooty deposit on them; now it forms the basis of all use of gas for heating.

## New Applications

Celluloid was originally developed commercially because of its transparency; then in a few years its opaque forms incorporating colouring matter became its chief application. Here its inflammability soon led to its almost complete displacement by the various synthetic resin products like bakelite, and at almost the same time its transparent form found a new application for photographic films.

The movie industry alone consumes it by the ton, yet here again it seems on the point of being ousted by its second cousin, cellulose acetate, which is almost non-inflammable. By the irony which is seen so often in these matters, "acetate," as it is familiarly called, was itself first exploited commercially for an entirely different purpose!

## Two Tuned Circuits

Coming a bit nearer home, there was a time in the early days of radio when what we called "loose-coupled tuners" were the only wear. The theorists told us that they should always be used because the better L.C. ratio in the secondary circuit enabled us to get a higher voltage to operate our detector. The more practical people, however, know that a far more important benefit was the higher selectivity we got from having two tuned circuits

*What is positive drive, and where will it end? An interesting viewpoint, with which "Modern Wireless" does not necessarily associate itself, is set forth in this article dealing with Q.P.P. and "Class B."*

instead of one. That high selectivity, of course, was the reason for the re-introduction of essentially the same circuit with a great flourish of trumpets under the high-falutin' name of the "band-pass filter." Now, however, we use it for quite different reasons—i.e. to get selectivity without "side-band cutting," whatever that may be in real life.

## A Sceptical Eye

And so it goes on; a new device comes in to meet some particular need, perhaps goes out of favour for a while, and then finds another application

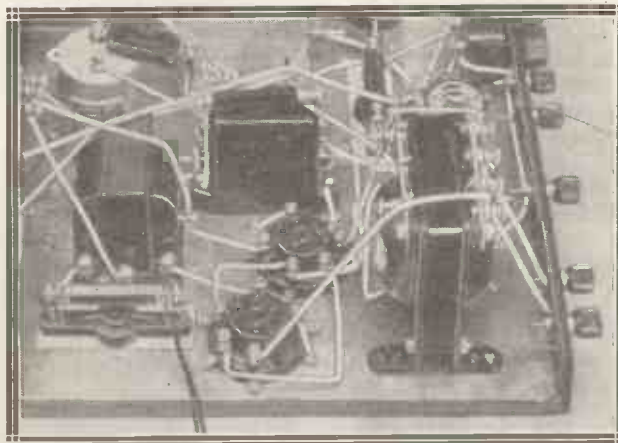
a problem, and to wonder whether their ultimate application won't be found to be something else altogether!

## "Class B" and Q.P.P.

The writer is at this moment turning just such a jaundiced eye in the direction of the various "new" output circuits of the positive drive "Class B" and "Quiescent Push-Pull" types. It seems to him permissible to wonder whether their real virtue will in the end be found to have anything to do with their present application of saving juice in battery sets and making it possible to get large power outputs with small batteries.

Now, the abandonment of a new scheme, so far as its original use is concerned, usually comes about from the discovery that it contains a hidden "catch." Let us therefore first inquire whether there is such a concealed drawback in positive drive. We will investigate "Class B" first. In certain cases "Class B" valves are being introduced which are intended to give outputs up to some two watts of "undistorted" (i.e. only slightly distorted) energy, and which draw momentary currents up to perhaps 50 milliamps.

## IS THERE A CONCEALED DRAWBACK?



The author of this article questions whether Q.P.P. sets, of which one is seen above, have not possibly certain drawbacks which as yet have not revealed themselves.

wherein it is used for quite different reasons.

Those of us who can remember a sufficient number of such occurrences are apt to turn a rather sceptical eye on new inventions which are hailed as the complete solution of such-and-such

begins to age a little and develops a high internal resistance? Will it be able to deliver those 50 milliamp. squirts without a heavy momentary drop in voltage? It's a thousand pounds to a bent tin-tack that it won't!

## Pertinent Questions

It is claimed that such an output stage can be run from a quite small H.T. battery, and there are two very pertinent questions which we should ask ourselves in this connection.

First, what is going to happen when the battery

**“The Future of ‘Class B’ is Probably in Mains Sets!”**

Secondly, suppose a set with an output stage like this happens to be left fully tuned to the local when the tuning note comes on, and there is no one at hand to turn down the wick until that most distressing (and nowadays most unnecessary) shindy is over? The writer recently timed a tuning note to last a full four minutes, and, of course, it is put out with a very heavy percentage of modulation.

**Matching Difficulties**

What would be the condition of our poor little battery after four minutes of continuous discharge at a rate reaching or even approaching 50 milliamps.? And would the “B” valve have its full emission left afterwards? Very dubious points, these!

Now let us take a similarly dispassionate look at quiescent push-pull. Here it seems likely that the catch will be found in the matter of matching the pair of pentodes which are generally employed for this system.

Imagine a commercial Q.P.P. set in the hands of a non-technical owner. In the fullness of time one of the two pentodes will die, either suddenly of a parted filament or lingeringly of lost emission.

The other will be practically certain to outlive it, and so the set will go on working, but will emit a very nasty noise which will quite likely cause the owner to make a service case of it.

Even if this does not happen, he will almost certainly require professional assistance in fitting the new valve, because of the need for primary

grid voltage adjustment to match it up to the survivor of the original pair. Surely the radio dealer is going to regard as a retrograde step anything which compels him to send a service man along just to fit a new valve?

**Q.P.P. OUTPUT STAGE**



A typical layout of the last stage of a receiver employing Q.P.P. amplification. The pentode valves go in the two valve holders seen side by side between the input and output transformers.

These, perhaps, are points which do not concern the home constructor

with his more adequate technical knowledge, but there is another one which *does* affect him, and that is the cost of Q.P.P.

It compels him to use two output valves of an expensive type instead of one which would most probably be of only medium price, and puts up the cost of his intervalve coupling and output circuits.

It makes it

impossible for him to use the simple and still effective direct output circuit, and forces upon him an output transformer or choke of special type (and price!). It is more than doubtful, too, whether it will ever be possible to produce the Q.P.P. type of intervalve transformer as cheaply as the ordinary one of equivalent performance.

**The Real Thrill**

Whether the benefits of Q.P.P. will make the constructor feel adequately recompensed for these things it is perhaps too early as yet to predict. To the writer it seems at least doubtful, remembering that whatever the purists may preach the real thrill of home construction comes chiefly from a superlative long-distance performance. Q.P.P. does not help us in that direction.

Well, we have now seen that there may perhaps be in both “Class B” and Q.P.P. defects which will prevent them from achieving the universal application at first predicted for them. Now suppose we try to foresee their ultimate uses when their possibilities have been fully explored, their defects recognised and their final place allotted to them?

It will probably be something of a shock to the reader as he passes on from this point and discovers that it is the present writer’s opinion that the most important future application of positive drive will ultimately be found in mains sets!

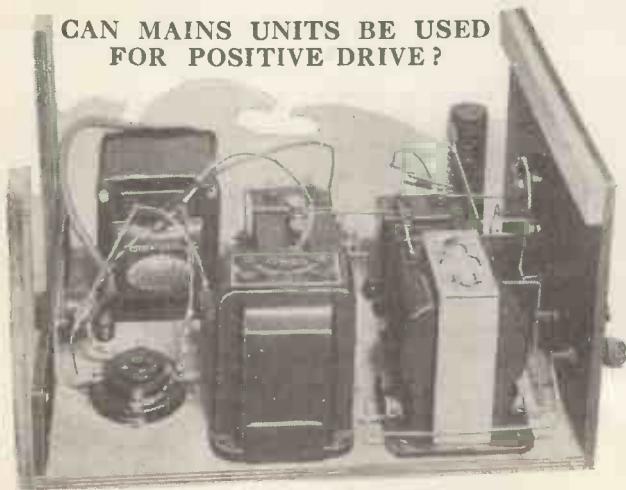
**Reducing Costs**

The strongest tendency in radio to-day is undoubtedly the determined attempts which are being made to reduce its costs. Now, the cost of a mains set of the present almost standardised types is a very difficult matter. The essentials in the way of tuned circuits, decoupling devices, and so on, cannot well be simplified or cheapened much below their present level without a loss in performance which modern requirements do not permit.

What about the H.T. supply arrangements? Their cost depends ultimately on the voltage required and the amount of current they must supply. If the desired results could be got with, say, 150 volts instead of the 250 or more now commonly used, there would be a marked reduction in

*(Continued on page 560)*

**CAN MAINS UNITS BE USED FOR POSITIVE DRIVE?**



A popular question, the answer to which is yes, providing they are specially designed for the purpose. An ordinary unit such as the above would not have sufficiently good voltage regulation for Q.P.P. or “Class B.”



THESE lighter evenings bring with them the pursuit of outdoor pleasures; even the most enthusiastic of "ether searchers" begins to feel the call of the open. Although some will stick to their receivers, however strong the call, and others neglect them entirely, there is always the portable as a happy compromise.

### A Topical Question

But do we want portables? That is a question to which I should like to have the answer of all of you who are sufficiently interested to read this through to the end. It would be most instructive to know the general verdict of to-day on this still very interesting type of receiver. Although not nearly so popular as it used to be, recent developments in radio open up fresh possibilities for the design of a new and attractive type of portable.

Why is the portable as we used to know it so little in evidence nowadays? I imagine that it owed most of its popularity to the novelty of reception without aerial and earth, and the convenience of all-in operation. The old leather-cased portable was not, after all, a very satisfactory affair; too much weight and too little volume for open-air use, with insufficient adaptability and quite unsuitable appearance for permanent use indoors.

### The Trend of Design

The subsequent development of the all-in receiver led naturally through the self-contained transportable—more of an indoor set than a portable—to the present compact console receiver, designed without any intention whatever for outdoor use. This has perhaps riveted our attention overmuch on the manifest excellence of the console design which retains all the advantages of all-in operation and compactness of the original portable.

By J. ENGLISH.

*Some frank admissions and good suggestions, with reminders of how the all-in receiver can be injected with the new blood of recent technical developments.*

Consequently, we need to be reminded that there is still quite a lot to be said in favour of the portable receiver, by which I mean something light, compact and efficient, not a makeshift multi-valver crammed into a suitcase with a cheap battery supply as an afterthought.

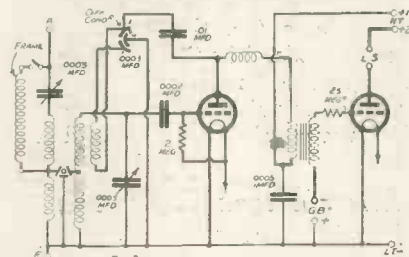
unkind, dance music in the evening or an interesting bag of foreigners of surprising strength. Then there is the simpler knockabout portable for broadcast or short-wave phone reception, with which the keen experimenter obtains a wealth of interest and fresh ideas. Its versatility must be experienced to be realised.

### It Can Be Done

You may well ask at this point—is it possible to build portables sufficiently advanced on the older types to satisfy modern requirements? Personally, I think it can be done, by injecting the new blood of recent technical developments and reclothing with the latest ideas in construction. For example, the new iron-cored tuning coils provide better selectivity and sensitivity, such ideas as Automatic Tone Balance, more realistic reproduction, and, more important still, the Q.P.P. and the "Class B" output stages for large volume with small H.T. consumption, thus solving one of the major problems of the portable.

Then, again, the possibilities of interchangeable chassis design brings along something new in portables, a light-weight and powerful portable that

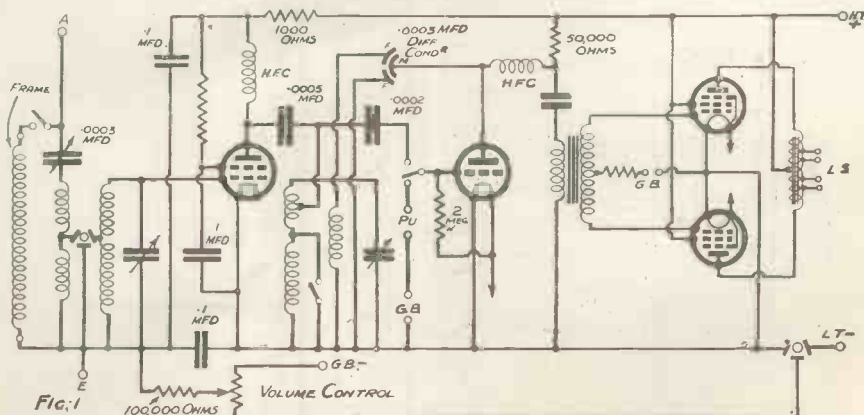
### A.T.B. FOR QUALITY



Automatic tone balance for quality results on distant stations is included in this up-to-date though simple circuit.

For instance, a really portable and powerful receiver would not be without its attractions for this year's vacation; your favourite hobby on tap whenever the weather proves

### AN UP-TO-DATE CIRCUIT AND H.T.B. ECONOMY



In this design provision is made for an ordinary or a frame aerial, and the incorporation of a modern output stage results in a great economy of H.T.

## Better "All-In" Results by Using Modern Components

can be readily converted into a permanent console receiver for either battery or mains operation. After all, a portable is only used as such for a few weeks in the summer, and without the possibility of such conversion it becomes something of a "white elephant" for the rest of the year. Even the knockabout portable can be designed for quick conversion into a powerful permanent set for local station reception.

Before passing your final judgment on the portable, I should like you to consider just a few concrete suggestions on its make-up and construction on these new lines.

### Alternative Aerials

For instance, what do you think of the circuit of Fig. 1? Rather ambitious for a portable, you may think, but an up-to-date set must have an up-to-date circuit, and this one can give you excellent selectivity, range and power for quite a small H.T. current consumption, thanks chiefly to the special output stage.

Notice that provision is made for working from either a frame aerial or an open aerial, the former as a portable and the latter as a permanent receiver.

The tuning condensers can be either two separate solid dielectric ones, preferable from the portable point of view, or a light-weight dual ganged unit.

As regards the detector stage, you can now obtain the special tone-compensating transformer with a centre-tapped secondary for feeding into the output stage. The output choke or transformer will, of course, be chosen so that you can match up either the moving-iron speaker of the portable or the permanent-magnet speaker of your indoor installation.

### Changing Valves

Alternatively a special Q.P.P. moving-iron speaker can be used for the portable without the choke or transformer output, the latter being incorporated in the permanent speaker. Some moving-coil speakers are light enough for portables.

Another economical idea is to use a variable-mu valve in the H.F. stage for the console receiver, substituting an ordinary S.G. for the portable, thereby saving some milliamps. of H.T. current.

You then get all the advantages of the variable-mu's volume control without its expense merely by rotating the portable (i.e. the frame aerial) about its axis. The variable grid-bias arrangements necessary for the variable-mu valve will, of course, be disconnected when the set is used as a portable.

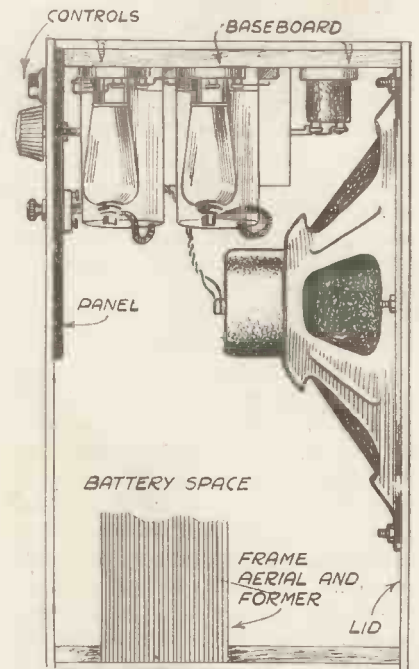
### Interchangeable Chassis

For the knockabout type of portable I would suggest a circuit of the kind shown in Fig. 2, which allows for conversion into a powerful local station set. Where the latter is to be battery-operated, the Q.P.P. output

stage of Fig. 1 can be substituted with advantage.

Here again we have the optional frame aerial—open aerial input to a normal detector stage.

I expect you will have gathered by now that my conception of the construction of the new portables is based on the interchangeable chassis, a compact receiver unit built on to a panel-baseboard assembly. This is

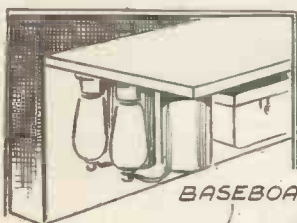


Packing in all the parts of a portable is not an easy task, but much space may be saved on the lines suggested here and in the accompanying article.

so planned that it fits snugly into the portable case as well as into the permanent receiver cabinet. The general idea is roughly indicated in the accompanying diagrams. Notice that the controls project through the side of the case for easy operation without opening the lid, on which the loudspeaker is mounted.

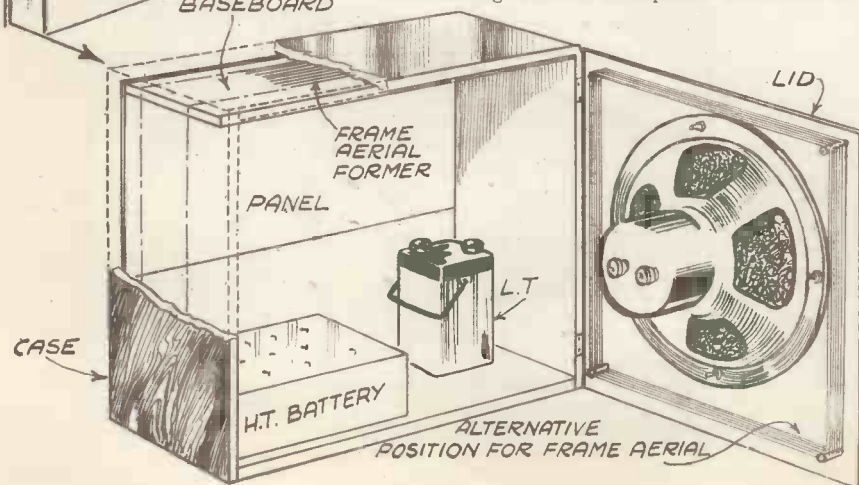
### Cabinet Suggestions

The layout of components is chosen to allow sufficient clearance for the speaker chassis in the portable without wasting cubic space. For the receiver of Fig. 1, I would suggest a carrying case measuring some 15 by 12 by 7 in., either a fibre case or a special wooden one of your own construction. The self-contained frame aerial can be wound on a light wooden or cardboard skeleton former fitting closely inside the case, or on the lid of the case itself.



### THE SUGGESTED LAYOUT

In this arrangement, like that above it, some of the components are upside down on a baseboard, thus leaving room for loudspeaker and batteries.





# IN PASSING

## Assorted Jottings on Radio Themes

**T**HE thorough cooking of Radio Toulouse—I understand that it was nicely browned all over—directs the mind irresistibly to the conclusion that it resulted from *salotage*, a blessed word which covers a multitude of dirty bits of work not always perpetrated by the fellows who actually suffer for it.

It is not true that four gendarmes excitedly and repeatedly arrested twenty-three citizens who were known to possess *sabots*. There is no more truth in the other *canard* that a drunken trianglist tried to strike a match on a talks director of a very inflammable nature in a studio furnished in celluloid. No, our Gallic friends ascribed the bonfire to a burning cigarette-end carelessly thrown down by some artiste. How trite!

I want to know why I cannot light a pile of dried rubbish, kerosene, gunpowder, tar, straw, petrol, and gun-cotton, even with the aid of a blowlamp, whereas other people can put a dying fag-end on a chilled steel floor and have the whole outfit a white-hot inferno in ten minutes!

### Fifty Thousand Records

The Press stories about the B.B.C.'s elaborate arrangements for a super-library of gramophone records, numbering up to fifty thousand, sound a bit ominous. It would take Chris. Stone fourteen years to work through such a repertoire even if he played ten every day of his life, including birthdays, mail days, pay days, rainy days, washing days, and pancake days.

Perhaps we are to have more intervals filled with musical oddments hurriedly selected by the un-

happy announcer, or more gramophone concerts while Eric Maschwitz is scouring the country for the obscure spiritual successors of Marie Lloyd, Little Tich, Chevalier (the English one), Alf Lester, etc.

A library of 50,000 records appals one to think about it. Even my own modest few score have become a problem. We began with an alphabetically indexed booklet wherein we entered the names of the pieces and the numbers of the pages in which they rested in their albums.

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**The Radio Toulouse Fire—Storing Gramophone Records—Salesmanship Jargon—When You May Sing—German Programmes—Broadcasting the Nightingale.**

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But as the number grew, efficient members of my family re-arranged them in the albums; hence when I feel like a spot of Tchaikovsky, I may find, after reference to my book, that I have put on "The Maid of the Mountains."

### Specification Craze

I have remarked before upon the craze for radio set specification, such

**TOO  
TRUE**



"I cannot light a pile of dried rubbish . . . whereas other people can put a dying fag-end on a chilled steel floor and have the whole outfit a white-hot inferno in ten minutes!"

as "chromium-plated chassis, dial-wiper, self-tuner"; but never have I seen such a jargon as our local

"dee-ler" has seen fit to apply to some perfectly ordinary receivers.

### "Gangster Condensers"

For example, "Every condenser a gangster. Free-volting power batteries deliver to best vacuum-enclosed plates and filaments. Super-screening throughout. Insulation jacketing of cables a speciality. Metres gauge a standard feature. All types fitted with open access speaker and overstrung fret. 'That was Radio Paris—that was.'"

That, I submit, is salesmanship gone mad. It is better to stick to a proven set and a passable face with a pipe stuck in it as a guarantee of good faith. I wonder what baccy these pipe chaps smoke! Some of them have purely shag faces!

### Over Rigorous?

I have much respect for the Performing Rights Society because it protects a once very helpless and much-abused class—composers. But during the process of the recent test case, from which they emerged victoriously, justified by law in their statement of their rights, I wondered sometimes whether they have not been just a few degrees too rigorous.

For example, you may sing "Round the Bend of the Road" in your bath, but the P.R.S. won't let you do the same in a public bath and/or wash-house. Again, you may croon "Sonny Boy" over your cocktail at home, but not in the "private bar" of the "Skewbald Cow." Yet, again, you may drug the (common) sense of the public by playing a loudspeaker upon them, if you are a radio dealer, but not if you deal in grub or booze to be consumed on the premises.

### "Public Performances"

I believe that radio music, shot from a loudspeaker, has been used to scare birds from fruit-trees. This is a "public performance" indeed, open to all Nature, tramps, and wicked

## Should the Nightingale Be Blattnerised?

little boys intent on scrounging. Let the lawyers chew over that.

Moreover, I have read that the loudspeaker has been freely employed in the cowshed and the henhouse, as an incentive to greater productivity in the dairy line. Is it illegal to play copyright music to Guernsey cows and Buff Orpingtons? And are cows and chickens people, or public, within the meaning of the Act?

I pause for a reply—as Mark Antony said to the undertaker, having asked for a rebate on Cæsar's funeral costs on the ground that the undertaker was going to get valuable publicity out of the job.

### Cigarettes With Sets

One has not hitherto been prone to suspect the burgesses of Preston, Lancs., of possessing the sense of realism and the logical mentality of the Latins, or the Oriental genius for fitting the punishment to the crime. Therefore it is with high glee that one

### THE PIPE HABIT



"I wonder what baccy these chaps smoke."

learns that the retail radio dealers of that delectable city, having observed that cigarette coupons will purchase radio receivers, have agreed to present cigarettes to buyers of radio receivers. What could be fairer?

The cigarette trade, however, stands to benefit the most. Folk will buy fags for wireless sets, but they will not buy sets for the privilege of getting free fags!

### Teutonic Oratory

Ever since Hitler succeeded in "bull-dozing" that fine old Red Sandstone Hindenburg there has been a terrific spate of Teutonic oratory from the German stations. The damp has come right through my wall-paper!

I consider that the U.I.R. ought to insist on Continental broadcasting being passed through desiccators:

I object to having to wear a mackintosh when I turn my superhet loose on Germany.

### Real Humour

Winston's speech on St. George's Day, in so far as it referred to the

### A RADIO SCARECROW



"Music shot from a loudspeaker has been used to scare birds."

B.B.C., was such as could not be equalled by any professional humorist known to me. The thought of Sir John Reith perspiring freely lest Winnie should say anything irreverent re the Indian, yclept Gandhi, is one of those things which recur to one in one's darkest hour and makes it light. "Irreverent"! A clear proof of genius.

Even the Mahatma's goat, milkless though it may well be, seems to catch a little of the irradiated glory which has been shed on its owner by the descendant of Marlborough.

### The Unsociable Bird

I suppose that an attempt to "de-bunk" the nightingale would be regarded as the act of a Philistine, a Vandal and an Iconoclast. Good! Here goes!

Reconstructing the attempt of the B.B.C. to achieve an audition of the brainless, tuneless, ill-timed screech-cum-whistle made by the nightingale, picture the engineers hopefully haunting the hawthorns of a certain sequestered vale, holding their microphones behind them and trying to look like the men of Maschwitz prospecting for local talent.

The unsociable bird which gets up at night to make a noise—how the other birds must hate him!—stands up, shoots out its cuffs, and remarks to its wife in an *aria*, "Worms are not as long as they used to be in my young days."

The engineers "freeze," standing like scarecrows, the only movements about them being the flapping of their

plus fours. The microphone thrills at the requisite frequencies, and all the machinery and organisation of the B.B.C. revolves and creaks.

The nightingale is on the air! Poseurs hear it and swoon. Poets hear it and feel sore at Shelley and Keats for having forestalled them with their Odes.

### The Coming Crop

For the rest of us, we hear it and say "Isn't it lovely!" And the bird is only stating a case about worms, augmented with a few brief notes on the Coming Caterpillar Crop!

The B.B.C. is slightly but unmistakably Victorian in some of its beliefs, the strongest and strangest being that the British Public likes to hear nightingales. In fact, that is on all fours with the belief that we like to hear Honegger's works, and especially "new works never performed in England."

This persistent effort to make us nightingale-minded and cacophony-conscious may ultimately deposit a film on the glory of the First Great Director who so ably has created the Order of the Private Bath and the Mural Tablet.

### A Surprise Item

I leave the subject with a practical suggestion. Let the nightingale be Blattnerised once and for all time. Then, as a Surprise Item, announce the performance and at once broadcast the Two Owls, Screech and Hoot. The mistake could be explained by

### SCREECH AND HOOT

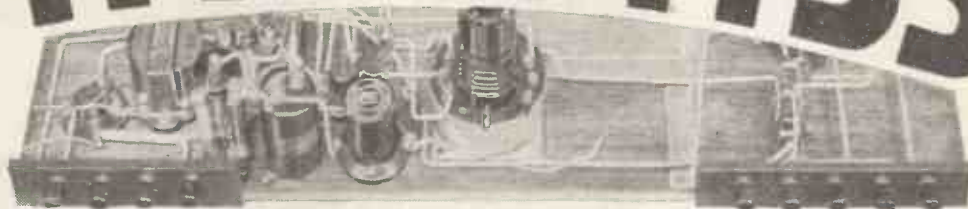


"It sounded almost like Stravinsky"

pointing out that the O.B. Engineer responsible thought it must have been the nightingale because it sounded so beautiful, almost like Stravinsky.

BE SURE OF YOUR  
**MODERN WIRELESS**  
Place a Regular Order for it.

# All About BAND-PASS



**I**N my previous article I explained how it is that two coils, when each is tuned to a station, can be made to interact with one another to produce a band-pass filter which, as you know, is a modern method of producing extremely high selectivity in a set, and I also mentioned that another way of coupling

By **L. E. T. BRANCH**,  
B.Sc., A.I.C.

*This month our contributor concludes his survey of the various methods and devices employed in obtaining high selectivity by band-pass circuits.*

have tuned circuits at all in a wireless set is because they are the only means we have for tuning in to only one station at a time. Of course, an ideal circuit would do this perfectly, whereas we all know quite well that a single tuning coil and variable condenser does this very imperfectly—it is usually so far from perfect that

## CAPACITY COUPLING

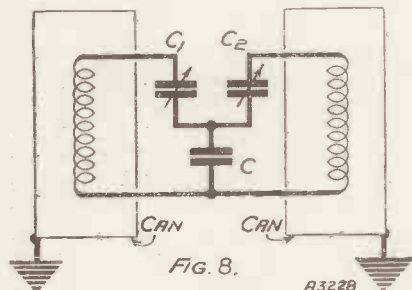


FIG. 8.

A3228

Completely screened coils may be coupled together by means of a single fixed condenser.

the two circuits together is by using a fixed condenser.

### Complete Screening

If we wish to couple the circuits solely by means of the fixed condenser, then it is necessary to use two coils which are completely screened from one another, as illustrated in Fig. 8, where you will notice they are tuned by means of the two condensers  $C_1$  and  $C_2$ , and the fixed condenser  $C$  forms part of each tuned circuit as shown more clearly in Figs. 8a and 8b. This method is called the capacity-coupled method, and any properly screened coils can be used such as Colvern or Varley.

The methods which I described in the previous article are called in-

ductively-coupled methods, so we have these two broad classes of filters: those known as capacity-coupled filters, and those known as inductively-coupled filters. It will now be interesting to examine the merits of each of these kinds of filters, and then we shall see why the best filters are those which incorporate both methods.

Now the reason why we have to

## COMMON TO BOTH

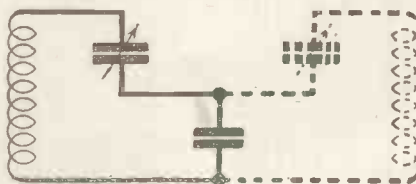


FIG 8a

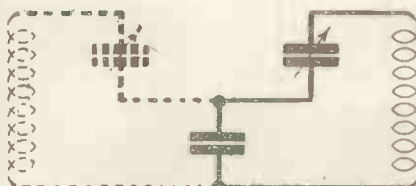
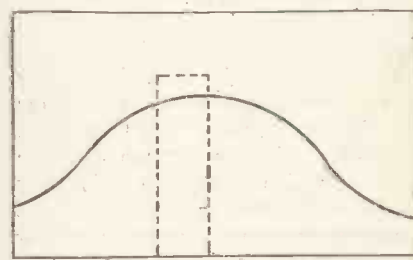


FIG 8b

A3229

Where two coils are coupled by a fixed condenser, the coupling condenser is common to both the circuits.

## A TUNING IDEAL



A3230

FIG 9

The "ideal" tuning curve has the "square top" 9 kc. wide, shown by the dotted line. A simple circuit tunes broadly in the manner of the full line curve.

when we make a set which consists of a simple detector followed by one or two L.F. valves we can almost always hear neighbouring stations when we are tuned in to the station which we really want to hear, but the important point is that there is always one spot on the dial at which the station which we wish to hear is loudest and the stations on either side are weaker the farther they are away on the dial.

### The Resonance Curve

In other words, the simple circuit has a resonance curve for a given station which always has a shape something like that shown by the full line in Fig. 9. Now since, as I explained in the previous article, all

## Combined Filters Give Constant Band-Width

the stations in Europe should be so arranged that their waves differ from one another in frequency by 9 kilocycles, the ideal curve is that shown in dotted lines; moreover, it is not enough that it ought to be like this at any one point on the dial, but it should be so at every point on the dial.

### VARIABLE SELECTIVITY

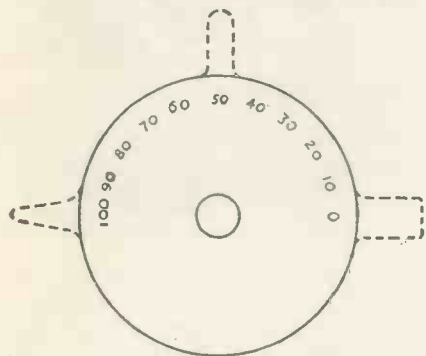


FIG. 10. A3231

When tuned circuits are coupled inductively, extreme selectivity is obtained at the top of the dial, but flat tuning at the lowest wavelengths.

Now the advantage of a band-pass filter is that it has a resonance curve which is very similar in shape to that of the ideal which is shown in dotted lines in Fig. 9, and it is for this reason that band-pass filters can give such a wonderful selectivity. However, it is easy enough to make a filter which will give this very desirable result at one point on the dial, but it is quite another matter to make a filter which gives this kind of result at every point.

### Inductive Linking

Let us first consider inductively-coupled filters. It does not matter which of the various methods is used, the result which is obtained merely depends upon the amount of interaction which is arranged between the coils themselves (for a description of the different methods you must refer to my article of last month).

Suppose that we so adjust the interaction either when using the method in which the coils are unscreened or one of the methods in which screened coils must be used, so that the resonance curve of the filter is correct at, say, 365 metres—that is to say, at this wavelength the width of the curve is exactly 9 kcs., then we shall find if we measure the width which the same filter gives at a higher or a lower wavelength that it is not

9 kcs. at any other point on the dial, in fact, it is found to be about 15 kcs. at 200 metres and about 5 kcs. at 600 metres.

This is illustrated in Fig. 10 and we see that the variation is quite considerable. Of course, we could adjust the amount of interaction so as to make the width 9 kcs. at, say, 600 metres, but then it would be about 15 kcs. at 365 metres, and about 25 kcs. at 200 metres, or if we were to so arrange it that the width were 9 kcs. at 200 metres then it would be 5 kcs. at 365 metres and only 3 kcs. at 600 metres.

### An Opposite Effect

Of course, if we could adjust the amount of interaction at different wavelengths we could obviously get over this difficulty, but although this has been suggested from time to time no one has been able to devise a practical method for doing it; further, owing to the developments which have led to the combining of the two classes of filters, the necessity for such adjustment has been completely obviated in a way which I will next explain.

The interesting point we have now to consider is that a capacity-coupled filter works in exactly the opposite

### TUNING DISCREPANCIES

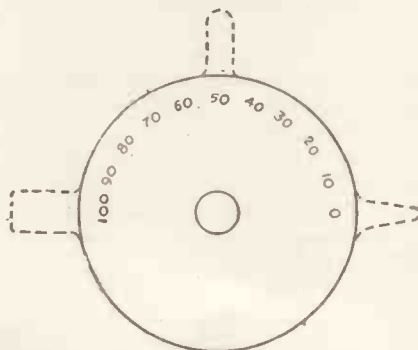


FIG. 11. A3232

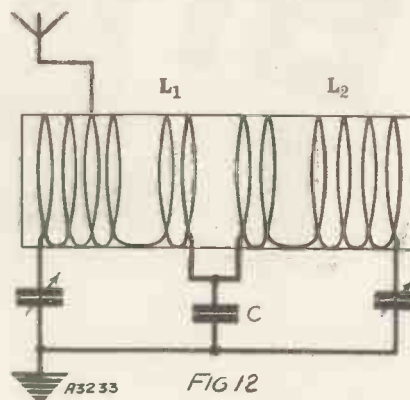
With capacity coupling between two tuned circuits constant "band-width" is still unobtainable, but the "peaked" tuning occurs at the bottom of the dial.

way to an inductively-coupled filter. This is illustrated in Fig. 11. For example, if we choose a size of fixed condenser C (usually about .01 mfd.) so that the band width is 9 kcs. at about 365 metres, then at 200 metres the width will be only about 5 kcs., whereas at 600 metres it will be as much as 15 kcs.

If you refer back to the figures which I have given for inductively-

coupled filters you will see that this variation is in the opposite direction. It is clear, therefore, that if we can combine the two kinds of filter into one, we ought to be able to obtain a constant band-width of 9 kcs.

### MIXED COUPLING



By correctly combining inductive and capacity coupling, a band-pass filter with constant selectivity characteristics can be obtained.

One of the simplest circuits which combine the two kinds of coupling is that shown in Fig. 12, where the condenser C has a value of about .03 mfd., and a very small but very accurate amount of interaction is present between the magnetic fields of the coils  $L_1$  and  $L_2$ . It is because this amount of interaction must be exceedingly accurate that coils for this kind of filter are sold as a completely assembled unit containing both long and short waves all correctly spaced from one another.

### With Screened Coils

Two very well-known units which have been brought out for this purpose are the Varley Square Peak Coil and the Lewcos Band-Pass Filter. When it is desired to obtain the same result in the case where the coils  $L_1$  and  $L_2$  are completely screened from one another, as in the case of Fig. 6 of my previous article, then the small coupling coil or coils are made quite small with just the correct number of turns, so that when a fixed condenser is included, the band-width remains at 9 kcs. for all wavelengths.

Whether the unscreened or the screened coils are used, we see, therefore, that it is quite a simple matter to obtain almost ideal selectivity at all wavelengths so long as accuracy is observed.



ON THE

# SHORT WAVES

by  
W.L.S.



**L**AST month I occupied most of my space by remarks about theoretical circuits, and the manner in which some of them might be improved. This month I want to come down to more practical politics, and talk about the small details, as well as the broad outlines, of layout.

### Deep Thinking

We are all most illogical about this layout business. Those of us who pride ourselves on taking more care than most people, think deeply over our theoretical circuit; then we choose the very best and most suitable components that we can get hold of; and finally end up by mounting them rather hurriedly on the first bit of wood of convenient size that comes within reach.

It is a very rare thing to find the most enthusiastic constructor trying one layout, scrapping it, and trying another just for the fun of comparing results. But surely we have a lot to learn.

Suppose a motor-car manufacturer used component parts that were all above reproach, but mounted them all over his chassis so that the lighting wires were twice as long as they need be; the petrol feed had to go round all sorts of awkward corners; the seats had to be removed before the tool-box could be unearthed, and so on. What should we think of him?

### What is What

Surely such little inconveniences would not be at all serious compared with the troubles resulting from a bad layout in a radio receiver; yet we all scream at one and quietly tolerate the other, which is far worse!

*Matters of interest in every branch of short-wave reception seem to flow from the pen of "M.W.'s" short-wave expert.*

*This month he advises you in his characteristic, entertaining style upon such important points as baseboard layout, correct wiring, and aerial coupling, and also tells you how to calibrate your receiver.*

Let us start "from A" with a single-valve short-wave receiver, and see just what is what.

The first thing that confronts the astonished signal after it has arrived down the aerial lead-in is a tuned circuit. This tuned circuit has an important job to perform—the most

numbers are not large, we can produce the highest impedance by using as much inductance and as little capacity as possible. But the ohmic resistance of the arrangement has got to be kept as low as possible. This implies the use of a good coil, wound with reasonably thick wire; a good variable condenser with real connections to the fixed and moving plates; and good connections between the two.

### Key to the Situation

Some people get into a confused state of mind and imagine that by using thick wire, heavy gauge condenser plates, and specially clean and nice connections, they will be lowering the impedance of the tuned circuit. Don't you believe it!

My advice to anyone starting off on a short-waver is to regard this tuned-grid circuit as the key to the whole situation. Connect the short-wave coil straight across its variable condenser by leads that are as short as possible, and with the minimum number of breaks, in the shape of terminal connections, in the way.

Mount the coil "in the clear"; keep its mounting "low-loss"—not too much ebonite or bakelite about it—and make the coil as nearly "air-supported" as possible.

### A Reasonable Manner

Fig. 1 shows our tuned circuit arranged on the baseboard in a reasonable manner, ready for hitching on to the grid condenser and earth. Do see that the variable condenser is connected directly across the coil. So many people connect the coil across grid and filament, then (almost as if by an afterthought) connect

### THE TUNED CIRCUIT

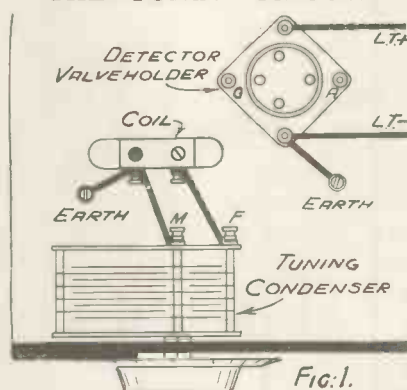


FIG. 1.

Keep wires short by joining the condenser terminals direct to the coil. The above arrangement reduces wiring to a minimum.

important in the whole set. We may sum it up by saying that it has got to offer the very highest possible impedance to a signal at the frequency to which it is tuned.

On short waves, where turn-

their condenser across the same two points, or as near as they can get to them.

I have even met a case in which the coil went directly from the grid condenser to L.T. negative, while the

mentioned the fact that it *must* be the fixed vanes of the condenser that are connected to the top of the coil, and the moving vanes to the earth end. That should be sufficiently obvious to go without saying.)

ALMOST COMPLETE

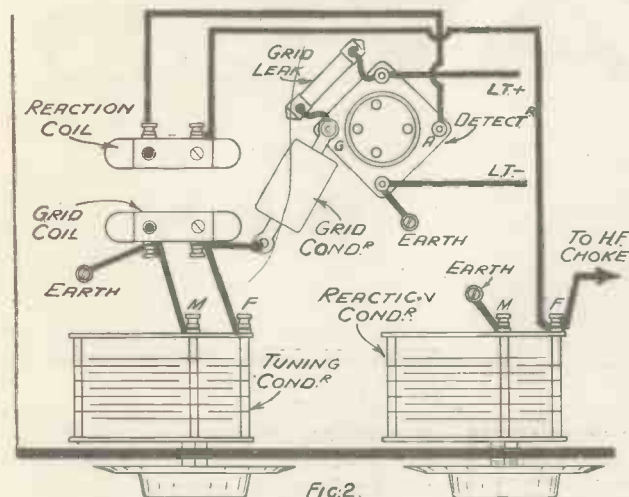


Fig. 2.

This is the second stage in the arrangement of layout, and shows the grid condenser in an ideal position for short "wiring."

condenser went from grid condenser to some other L.T. lead somewhere in the set, and had to wind its way round through half a mile of wire, and a dirty L.T. switch before it got back to its coil. The tuned circuit, in short, wandered all round the baseboard.

Just look at your short-waver, and, if it has got anything of this sort in it, bury your head in shame for a moment before putting things right. Lest you should smile and say, "It doesn't make a noticeable difference anyway," let me tell you that it makes all the difference in the world. You will find, when things have been put right, that the set will oscillate twice as freely; that the wavebands will have changed considerably; and that you will *hear* things, now.

**Ideal Arrangement**

So much for Item 1—the Tuned Circuit—and don't treat it lightly.

We are referring all this time to a simple, common-or-garden single-valver. The next point, in order of importance, is the grid condenser. Not so much the condenser itself, or even its value, but how it is used. The ideal arrangement is one of those small condensers fitted with tags, one tag being soldered right on to the grid terminal of the valve holder, and the other on to that most important joint between the top of the coil and the "top end" of the condenser.

(By the way, I have not even

and of reducing the efficiency of our tuned circuit.

Look for a moment at Fig. 2, showing the second stage in the proceedings, the wiring of the grid condenser in an ideal position. The same diagram shows the reaction coil, duly wired up, and practically finishes off our single-valver.

Now, being Irish by nature, if not by extraction, I am going backwards again to the aerial. One can make a lovely tuned circuit, couple it up beautifully to the detector, and then spoil the whole show by using a rotten method of aerial coupling.

If you prefer capacity coupling, take the aerial through a small preset condenser or a midget type variable to the grid-condenser end of the tuned circuit, or a tap on this circuit. But *do not* use too big a capacity. And, again, if you use a flat preset condenser, don't screw it right down on the metal baseboard. Raise it

a quarter of an inch in the air, at least.

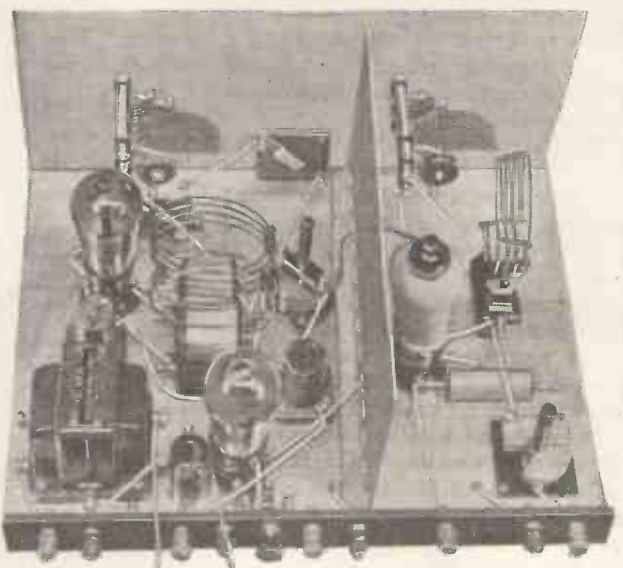
There is, of course, no method by which we can couple an aerial to our tuned circuit without introducing a certain amount of damping into it; but we can keep the damping reasonably small. Contrary to the usual opinion, the golden rule is not to couple the aerial as tightly as we possibly can without stopping the set from oscillating. Loose coupling gives much better selectivity without any appreciable loss of signal-strength, and makes the set much easier to handle on account of the absence of "blisters"—my pet name for flat spots.

**Inductive Coupling**

Personally, I always prefer to use inductive coupling, by means of a small untuned coil coupled not too tightly to the grid coil. There is no need to use a third plug and socket for this, since the same size will generally serve for the whole wave-range. The coil can be wound with four or five turns of thickish wire, self-supporting, one end of it going to the aerial terminal and the other end directly to an earthed spot on the baseboard. Variable coupling is seldom necessary for this coil.

I had better mention, by the way, that there is not much to choose, in the way of general results, between a

AN EXEMPLARY SHORT-WAVER



Here is a typical example of efficiency in design. A tuned parallel-fed S.G. stage precedes the detector in this case and ensures excellent amplification. Note how the tuning coils have been arranged at right angles to eliminate interaction.

big outside aerial loosely coupled and a small indoor aerial capacity-coupled with a rather larger allowance of

## Layout Cannot Receive Too Much Care

condenser than usual. But the indoor aerial must be a good one.

Don't put up any old length of wire draped round the picture rail and call it an indoor aerial. String it across the room, as far away from the walls as possible, and at least a foot or eighteen inches down from the ceiling. A single wire slung "in the clear" in this way is better than all the barbed-wire entanglements that wind their way in and out of alcoves and finish up near the point at which they started.

### Series-Fed Circuit

There is only one more point that needs elaborating. Assuming that the series-fed circuit shown last month is being used, it is necessary to take as much care about the wiring of the reaction coil and condenser as we have done about the main tuned circuit.

The "live" end of the reaction coil should go to the plate terminal as directly as possible (see Fig. 2 again), and the other end should go straight to the reaction condenser. From this latter joint the lead to the H.F. choke should be taken, and the other side of the choke will simply go out, via the phones, to H.T. positive.

L.T. wiring is all that is left, and here, again, the wiring should be done sufficiently carefully and well to ensure that the valve really has its 2, 4, or 6 volts available. Even the external wiring to the L.T. battery should be as heavy and as short as possible. 1.9 volts is not usually good enough—we want 2 volts.

### Breaking the Rules

Last month I had a letter from a reader asking me why I never went into "really minute details" about this layout question. Well, I think you've got them this time! And in case anyone should now go to the other extreme and say that all this minute detail doesn't matter, let me contradict them flatly in advance and say that one simply cannot take too much care over it.

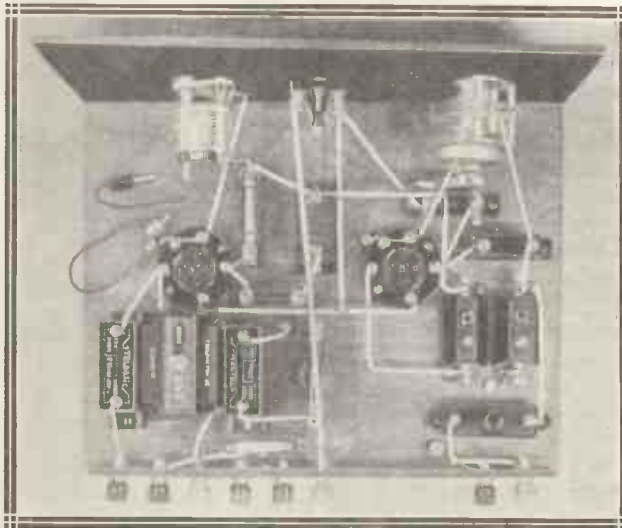
Readers with sets that break all the rules I have given will probably point out that they get excellent results just the same. My only answer to that is that if they will turn from their evil ways and start again, they will find out, for the first time, what "excellent results" really are. And with all this I will lay down

my hammer and descend from the tub, which has received many good resounding thumps.

As a matter of fact, I think one can learn more about radio, and particularly short-wave radio, by trying to get the very last milliwatt (or even microwatt) from a humble detector than from all the experiments with multi-valvers that the mind of man can devise. For one thing, the smallest improvement seems to show up at once. With a superhet, for instance, one gets so used to ear-smashing signals that one almost loses the desire to improve it. But

known transmissions as accurately as possible. For instance, with the smallest coil one will probably be able to place W 2 X A D, some of the 25-metre stations, and possibly even some of the 31-metre stations right at the top of the condenser. Plot a curve as carefully as possible on squared paper, ignoring points that are obviously right off the curve, and you will then have no more trouble in spotting newcomers.

Do the same with all the coils, and try to make sure that there is no variable element about the set that is likely to upset your calibration.



### SHORT WIRING IN PRACTICE

In this case certain points are wired direct to copper foil, thus considerably reducing the lengths of wires. The layout follows very closely that indicated in Fig. 2.

take a valve away and try to do as well with the remaining four as you were previously doing with five, and you will learn something. When you've learnt it, take another valve away and go one better!

Now for some more general remarks upon the short waves themselves, as distinct from the instruments used for harnessing them. "Conditions"—yes, here's the awful word again!—at the time of writing are average, and, I think, are likely to remain so for quite a long time. As our Eleven-Year Cycle proceeds, now on its upward course, I think we shall notice fewer and fewer spells of really bad conditions.

As the number of active stations increases, it is becoming more and more difficult to identify them without long waits for announcements, and, as I have mentioned elsewhere in this issue, I strongly recommend every listener to calibrate his receiver.

All that one has to do is to settle down to one coil and to log all the

Take all readings on telephony stations with the reaction condenser set just below the point of oscillation; see that the aerial coupling is always the same; and, if possible, check H.T. and L.T. voltages from time to time.

### Forget the "Metres"

If your tuning condenser is of a reasonable size, you will have no difficulty in drawing a curve that is sufficiently clear for you to distinguish between 31.28 and 31.38 metres, particularly if you do the whole thing in kcs. and forget the "metres" altogether. Although their distance apart on the dial is the same, it seems easier to find 9,560 and 9,590 kcs. than their corresponding readings of 31.38 and 31.28 metres! Thirty kcs., in short, is a more workable quantity than .1 of a metre.

Next month I want to go into greater detail about this point. For the present, just make a start and see if it does not give you a greater interest in your set.

## HELPFUL IDEAS FOR THE PRACTICAL MAN

*Simplifying Metal Working—Obtaining Correct Ganging—Distant Switching—Improving Reaction Control.*

### Making Metal Boxes

THE construction of metal boxes for eliminators or complete sets usually offers some difficulties to the home constructor.

The simplest method of constructing these boxes is to employ angle brass or thin angle iron for joining the top, sides and bottom together, merely cutting the sheet metal to the exact length and width.

The various sections can either be bolted to the angle pieces with nuts and bolts or, as an alternative, bifurcated rivets may be used.

### Trimming Gang Condensers

It is quite often found that a receiver using ganged tuning gives results which are not up to the standard expected.

This is very frequently due to the small trimmers fitted on the gang condensers being carelessly or incorrectly adjusted.

It is desirable for these trimmers to be set at a low capacity—that is, unscrewed as far as possible. If they are set at a high capacity the set will not tune to as low a wavelength as is otherwise possible.

The trimmers should be adjusted when listening to a fairly weak but steady transmission at the lower end of the medium waveband. If

reaction is fitted, this should be set as near zero as possible.

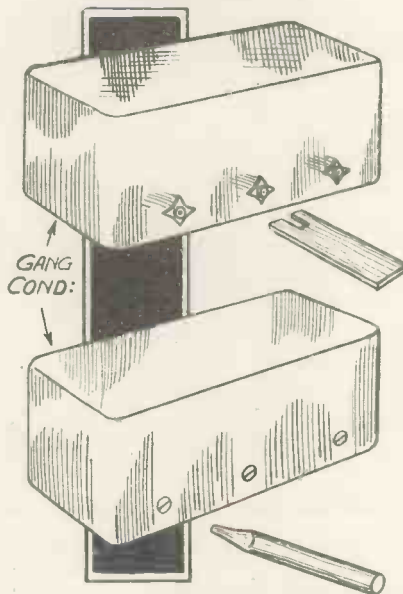
It should be noted that the adjusting screw or star wheel of the trimmer is often in direct contact with the fixed vanes of the condenser sections.

In any case, even if this is not so, it is very desirable that the hand or any metallic object be kept away from the trimmers while these are being adjusted.

If the trimmer has a screw adjustment, a wooden rod with one end shaped similar to a screwdriver should be used. If the trimmers have star wheels, a thin, flat strip of wood, slotted at one end will be suitable.

With these implements it will be found that very accurate ganging can be achieved.

### A GANGING TIP



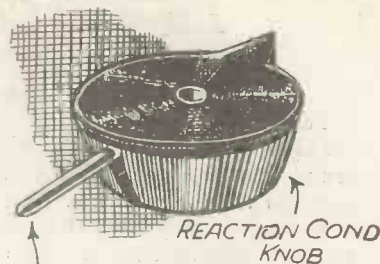
It is always advisable when adjusting the trimmers on ganged condensers to keep the hand away from the component. A slotted or shaped strip of wood forms a satisfactory "remote control."

### Simple Control

Those who charge their own accumulators often have a spare cell. When this is the case, the following is a very simple way (intended mainly for temporary use) of switching the set off in a room remote from that in which the set is kept. Two 2-volt accumulators are wired in series, and twin flex leads are also wired in series with them and the L.T. terminals. These leads (providing they are not extremely long) can have an extra L.T. switch at their ends.

The extra 2 volts of L.T. makes up for voltage drop in the long leads. It is necessary to measure the voltage across the set's L.T. terminals with a voltmeter to see that it is exactly 2,

### FOR EASY HANDLING



### CELLULOID COATED KNITTING NEEDLE

Fine control of reaction is easily obtained if the control knob is equipped with a simple lever device such as can be contrived from a knitting needle.

and to have a series rheostat for adjusting this voltage.

The set's L.T. switch is, of course, always left in the "on" position.

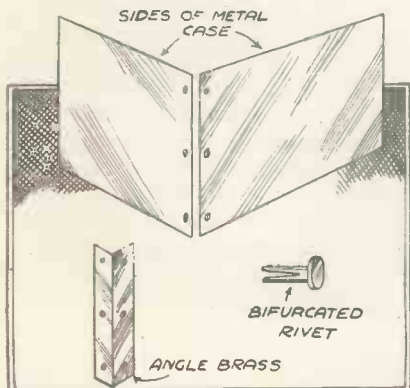
### Reaction Control Knobs

In their craze for neatness and compactness it is often said that component makers are very remiss in fitting such small knobs to reaction condensers. The control of reaction is a very delicate operation, and if slow-motion dials cannot be used, then something better than the present knobs should be fitted.

One very good plan is to drill a hole in the knob at the opposite side to the pointer and fit in it a short length of celluloid-coated knitting needle, secured by a dab of Seccotine. For purposes of visibility, it is best to choose a needle which is light and bright in colour.

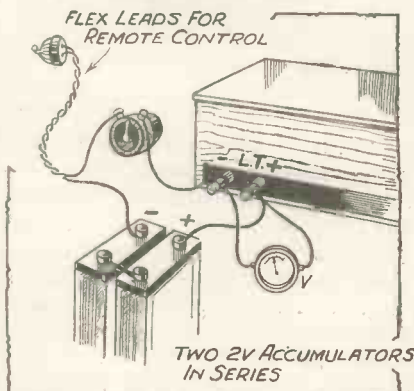
The extra length not only gives an increased leverage for overcoming the internal friction of the spindle movement, but there is no longer any need to maintain a fatiguing grip on a small knob, as a slight movement of the finger tip will control any movement in a much more delicate manner.

### FOR MAINS UNITS



Metal boxes can be readily constructed with the aid of sheet metal and brass or iron angle pieces. Nuts and bolts can be used as an alternative to rivets.

### REMOTE SWITCHING



The volts "dropped" in the resistance of extra long leads to a remote switching point may be "recovered" by connecting another cell in series with the L.T. circuit which is being switched.

# BEFORE BROADCASTING BEGAN



THE present-day radio amateur enjoys facilities for reception and technical appliances which the pioneers of 1919 would have regarded as too fantastically good to be true. Apart from the apparatus which is nowadays at our disposal, the greatest point of difference between the immediate post-war days and these resides in the wealth of signals which now enriches the ether—almost an embarrassment of riches, unfortunately.

## A Comparison

Then, combing the ether was like looking for the sixpence in a Christmas pudding (except on 600 metres); but now the signals pour in freely and identification or elimination is the problem rather than discovery.

Moreover, for results much less in volume, but possibly more gratifying to our less satiated radio appetites, we went to incredible lengths of tinkering and niggling. In a word, we really did make our sets, components, case, and all except the telephones.

We made our batteries and even our crystals, sometimes. We french-polished our cabinets, made our screws of brass rod, soldered all permanent connections with the sure and certain touch of gipsy tinkers, and wound our coils, turn for weary turn, by hand. But in order to bring you up to 1919, I will present a cinematographic review of some aspects—high spots—of my own radio experience before that year.

## The Coherer Works

A crazy coherer, with a de-coherer made from a shilling buzzer, suddenly chatters into action after weeks of dumbness, and a morse inker delivers a few dots and dashes to home-made paper tape on a hand-propelled roller. Incredulous, vaunting joy!

The Eiffel Tower time signals are fetched in on a bit of carborundum and what seemed like 200 miles of wire on a cardboard tube as big as a mangle-roller. Sole witness: the lady who came to wash the "smalls."

Some reminiscences of exciting days when constructors made most of their own apparatus. Components were often unobtainable or fantastically expensive, and morse signals from Eiffel Tower were then considered to be highly interesting.

From  
A SPECIAL CORRESPONDENT.

She was entirely unimpressed and was understood to say that I might "catch the place afire."

## Fleming Valve

Great disillusionment on finding that a Fleming two-electrode valve, in spite of all those batteries and that horribly complicated circuit, couldn't do any better than carborundum.

The War came and knocked the bottom out of all our world; the Government prohibited amateur radio, and the Post Office took away our darling doo-hickeys—for a few months, as we thought.

DOT  
AND  
DASH  
DAYS



Long before there were any concerts to listen for, amateurs found great interest in communicating across space by means of simple telegraphic apparatus of this kind.

Flicks of nightmare. Thirty-six hours at a stretch, intercepting enemy signals, with a raging toothache for company. Twelve hours of ceaseless waiting, at night; reception of bad morse at twenty-five words a minute, with an air raid in the neighbourhood and, as a background, the steady

tramp, rumble, chink, of men, horses, and guns massing for the first Somme show.

The Armistice message of Nov. 11th, 1918. I have the very valve, and a carbon copy of the message as taken, in my possession now! And then—1919 and all that.

As I have indicated, short of growing our timber, and digging and smelting ore, we really made our sets, beginning with the baseboard or, later on, the cabinet. I will remark, in passing, that a french polisher is, in my opinion, born—not made.

As to inductance coils, the long solenoids which we either "tapped" or worked with a sliding contact were wound on ebonite formers or cardboard tubes. "Honeycomb" and "pancake" coils were introduced later, when we argued learnedly about the various formulæ according to which they were constructed.

## Impregnated Coils

These coils had to be smothered in wax, varnish, and other magic compounds, all guaranteed to improve signals, and then baked in an oven. Mine used to stink and stick.

Condensers were fairly simple propositions once we had worked out the thicknesses of the dielectrics, size and shape of vanes, etc., for the required capacities. I used to bank heavily on two well-known mathematical processes: "Trial and error" and "Hit or miss." It is extraordinary how accurate a little intelligent blundering can be when one is experienced in rule-of-thumb working!

Compared with present-day "Kit" assembling, amateur radio of 1919 was a messy business, but, I should think, a more satisfying hobby to the bred-in-the-bone tinkerer.

## More Enterprising

Some of us even used to try to make accumulators and dry cells, and at one time there was a craze for mineralogy, born of the hope of finding the perfect crystal. In fact, I think that we were more enterprising in those days, and we certainly worked harder at our play.

We had to sweat, or there would have been no signals. We used to make and freely use wavemeters then, but how many amateurs do so now?

## The Longest and Highest Aerials Were Best

The longest and highest aerial allowed by the regulations was, of course, the ideal, and this opened up a world of experiment and ingenuity. I used "frame" aerials, my largest being four feet square, and the smallest a nine-incher harnessed to seven valves requiring 300 volts H.T. With a map and a compass I used to enjoy myself immensely amongst my frames until Mr. W. W. Burnham began to broadcast gramophone records from his private station at Blackheath, when I deserted science and morse in favour of music.

### Speakers that Hopped

Some of the early loudspeakers were quite good, but so far as my experience went the small ones were apt to hop about the table under the influence of loud music.

Here are tables showing a comparison of some 1919 type valves with present-day types (2 volts):

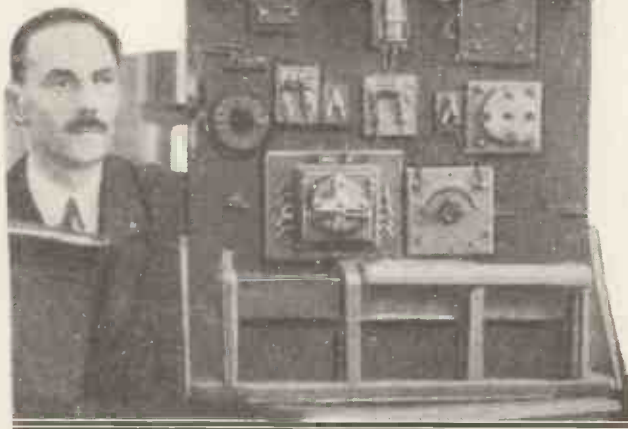
1919 VALVES	Q.	V.24	R.
Fil. volts ..	5.0	5.0	4.0
Fil. current ..	0.45	0.75	0.7
Anode volts ..	200	60	100
"M" value ..	45	6	9
M/R ..	0.3	0.3	0.225

	V.24	PX.4
Fil. volts ..	5	4.0
Fil. current ..	0.75	1.0
Fil. watts ..	3.75	4.0
"M" value ..	6.0	5.0
M/R ..	0.3	6.0

As regards the prices of valves, some of those charged for early receiving valves were £3, £1 15s. 6d., £1 12s. 0d., £1 6s. 6d. and 17s. 6d. Hence, a burnt-out valve was a financial bombshell.

### WAR-TIME PRACTICE

The huge receiving set shown to the right was originally built in 1913. It was constantly modified to keep it up to date, and was one of the first amateur sets to incorporate valves. A Potsdam, Berlin, amateur transmitter constructed the apparatus below, in 1919, and it will be seen that huge inductance coils were then still in vogue.



opening of the "Conférence Européenne des Radiocommunications," at Lucerne.

The following two very momentous decisions were unanimously carried at this important U.I.R. meeting:

(1) To ask members to undertake steps in their various countries to cause the various governments to pass laws prohibiting the radio distribution

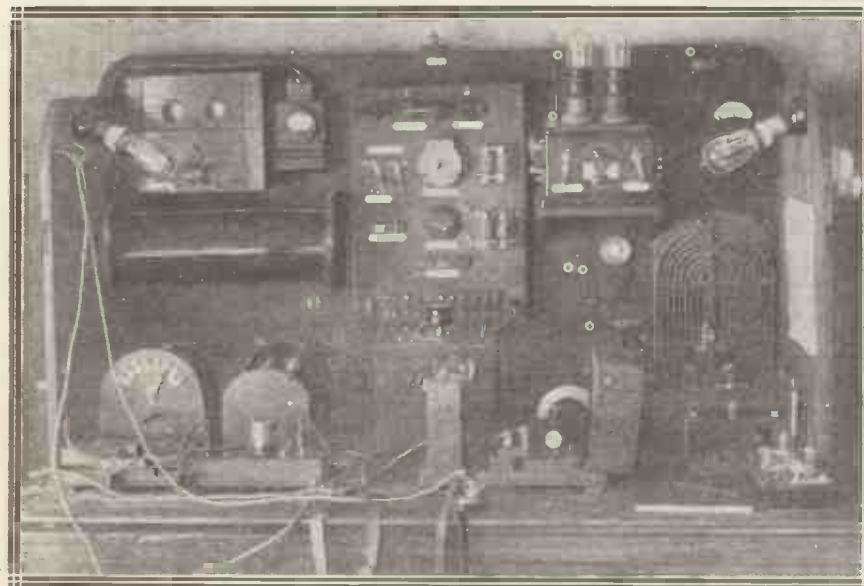
companies from using the broadcasters' programmes. The U.I.R. are of the opinion that the programmes broadcast by their members are the property of these, and consider it not right that third companies are able to distribute these programmes to their subscribers without even asking permission of the programme owners.

### Radio Propaganda

The second important decision is very necessary at the present moment. It concerns the "propaganda inadmissible," which is being radiated by numbers of stations throughout Europe at present.

The U.I.R. have at last attempted to define this propaganda, and say: "The U.I.R. considers the repeated broadcasting of programmes or all communications which are specially intended for listeners in a foreign country as an unpermissible act, if the foreign country finds cause for protest, and if the programmes run the risk of being harmful to the good relations of two countries."

This is my own translation from the French, and I adhere to the phraseology to show how very carefully the thing is worded.



PRESENT DAY	H.2	P.2	L.P.2
Fil. volts ..	2.0	2.0	2.0
Fil. current ..	0.1	0.2	0.2
Anode volts ..	150	150	150
"M" value ..	35	7.5	15
Mu. Cond. ..	1.0	3.5	3.85

If we equate the filament wattages of modern valves with those of 1919, the advances made are clearly illustrated. I give one example:

\*\*\*\*\*  
 \* LUCERNE DECISIONS \*  
 \* Late News of the Wavelength \*  
 \* Conference. \*  
 \*\*\*\*\*

THE International Radio Union—which is commonly known as the U.I.R.—held its annual meeting exactly a week before the



**W**E are all concerned with preserving our records from undue wear. We use well-designed pick-ups having light damping and adjustable weight; tracking is carefully arranged, and needles selected to give the best results. But there is one thing, however, which is very often overlooked, and that is—needle changing.

There seems to be a widespread opinion that needle manufacturers are guilty of a "terminological inexactitude" when they state that a needle should be used once only; that they are simply trying to increase their sales.

**Convincing Photographs**

Quite definitely this is not so, and if the question is carefully examined it will be seen that they are endeavouring to persuade us not to "spoil the ship for a ha'p'orth of tar." No matter how good the pick-up or how perfect the tracking, worn needles can ruin a record.

The photomicrographs show several types of needle in various stages of wear, and it does not require much stretching of the imagination to appreciate the potential cutting and chipping effects of the worn surfaces. Take, for instance, needle "C" in one of the photographs. This is a

**A 250-CYCLE NOTE**



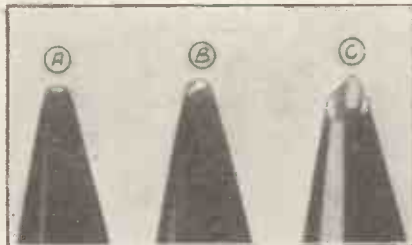
To facilitate the photographing of this steady note recording, the grooves of the record were filled with chalk.

*"Use each needle once only" is often considered merely good sales talk. That it is actually for the good of the record user is well demonstrated in this account of needle wear.*

By F. N. GANDON.

case of bad wear to an ordinary loud-tone needle after playing four 10-inch records (both sides). The point has disappeared completely, and in its place we find a somewhat lengthy hump with flat shoulders on each side. The hump is "U" shaped and fits snugly into the record groove, while

**DEGREES OF WEAR**



A is an unused needle and B a similar needle after playing one side of a record. C shows the bad wear after this type of needle has played eight sides.

the shoulders ride on the top of the groove walls.

At first sight this might appear to be a satisfactory arrangement, for with the needle fitting tightly in the groove it is to be expected that it would take off the maximum sound. It does—and other things as well, unfortunately.

**A Different Matter**

Assuming that the sound track was stretched out in a straight line and had no recording in it, then this worn needle might do little harm. But it is a very different matter when recording is present and the sound track curled round in ever-diminishing circles.

One of the photographs shows part of a sound track in which is recorded a 250-cycle note. Now imagine our worn needle ploughing its way through this and it is not difficult to see what happens.

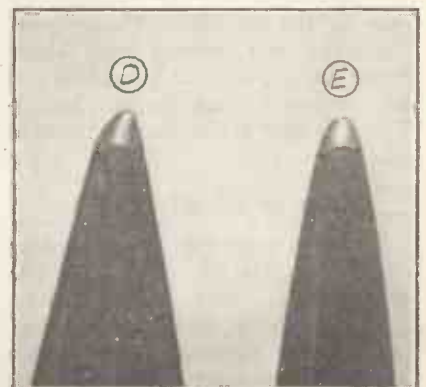
**Negotiating Bends**

When the needle arrives at the sharp twists and turns it cannot respond as if it were made of rubber and keep the hump straight in the groove. The hump becomes twisted across the track slightly and the business ends of its sharp edges take shavings off the sides. Also it would appear from experiments which have been made that when the hump becomes twisted there is a tendency for the needle to be forced upwards out of the groove. Although this may not be so drastic as to make it leave the track altogether, it does not improve matters to have the needle jumping about in this way, both from the wearing and reproducing points of view.

There is another point which may be mentioned here concerning pick-up heads which reverse to facilitate needle changing. It sometimes happens that when these are lifted at the

*(Continued on page 557)*

**COMPARING TYPES**



Both these needles have played four sides. D is a medium needle and E a soft tone needle. Note the absence of shoulders.



**L**EIPZIG is only of secondary importance compared to the big Berlin Radio Exhibition to be held in August. But the custom remains for a number of firms, especially those interested in export, to be present at Leipzig, and quite a few regularly produce new sets for the Fair.

### Trend of Development

These are usually based on the experience gathered from the radio exhibition's new models and, on the other hand, usually show the trend of development for the coming radio exhibition.

In the recent show the "Ferroton" struck one as quick work in commercial development. This set—a three waveband, three-valve set—is the first commercial set to use the newly-developed "Ferrocart" coils. The same firm was showing a battery receiver combined with moving-coil loudspeaker for 138.0 marks, with valves.

Speaking of three wavebands, this has been incorporated in numbers of sets, and at Berlin, next August, we will probably be exclusively treated to this type of set like we were last year to the superhet. These three-waveband sets operate from about 20-50 metres, and then medium and long waves. Some makers include 16-55, others a few metres more or less.

### Empire Short-Waver

I noticed a few short-wave stations actually marked on the dials of one of these sets; they showed British Empire, Vatican, Zeesen, and a number of other stations. The British Empire short-waver seems to come in very well in various parts of Germany. Asking one manufacturer

*The British Radio Show is due in August, so particular interest attaches to this review of new German radio products shown recently at Leipzig. Some very ingenious gadgets were on view, as detailed below*

*By OUR SPECIAL CORRESPONDENT.*

to my mind, by including the gramophone turntable in the back of the set and placing it a pretty steep angle. The angle is so steep that hardly any extra space is occupied, and, on the other hand, the pick-

up has just enough weight to keep in the groove of the record. I would not believe my eyes that a gramophone record could play properly like that, but it did!

about the grand idea of a three-waveband set for big towns, with their bad interference and indoor aerials, he said, in so many words, "We've got the British Empire station!"

Reico had an interesting new set on view, using a special type of tuning

### FOR ALL WAVELENGTHS



This new Reico set is arranged to switch to short, medium, or long wavelengths, and is evidence of Germany's growing interest in the short waves.

circuit and three valves—three wavebands, too. The tuning-dial is illuminated with a different colour according to the waveband in use. A reading lamp is incorporated on the face of the set.

There are one or two receivers I would like to refer to as they contain interesting new features. One by Schaub is a one super-circuit tuned three-valver, combined with loudspeaker (moving coil) and with gramophone turntable and pick-up. The whole set is mounted on a disc for easy turning, and is not larger than the usual table set.

Schaub had the idea of the season,

### Slabs of Crystal

Another set I would like to draw attention to is by the well-known loudspeaker firm, Neufeldt and Kuhnke. These manufacturers produce the new crystal slab loud-speaker, which uses slabs of crystal instead of a membrane, and as these are directly in circuit the tone is better than any other mechanical means.

Their new receiver is a two-valver with the performance of a three-valver. It uses the Loftin-White circuit (they have acquired the European rights, I am told) and a Farrand inductor loudspeaker.

This set has the most interesting tuning dial I have yet seen. It is placed on the right side of the set, and is viewed at a right angle by means of an enlarging mirror hinged to the side of the set.

### Interesting "Gadget"

This same firm had another interesting gadget, but this has nothing to do with the set. It consisted of a small adapter for old-type electromagnetic loudspeakers. It is nothing but a small extra speaker covering the range of frequencies from 8,000 to 11,000 cycles, which is usually the band cut off by other loudspeakers.

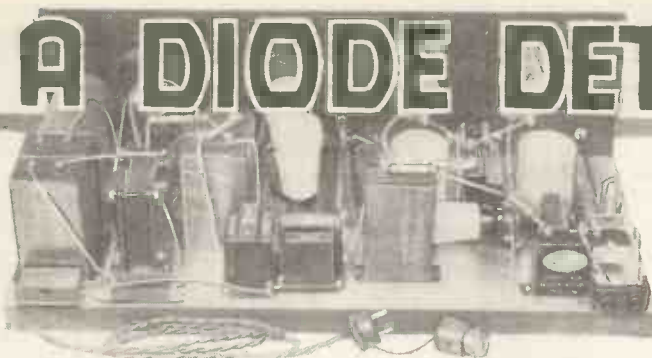
Other set manufacturers were showing the same sets as at Berlin last

*(Continued on page 557)*



# USING A DIODE DETECTOR

*There's a thrill about getting foreigners, but their programmes leave something to be desired when entertainment is the main consideration.—*



*—If foreign programmes sometimes pall, try quality reception of the home stations by the method here advocated*

By C. J. DARK.

**I** WONDER how many constructors of wireless sets sometimes get bored with Continental stations? We have all passed through the days when the reception of the available foreign programmes was the end to which all our efforts were directed.

It has been good fun, certainly, but aren't we getting just a little tired of Dutch, German, French, Italian, or Swedish eloquence? And their gramophone records! And their dance music! The germ of boredom is beginning to bite you! I thought so. Now suppose we get back to **LISTENING**.

## Why Not Try It?

Believe me, the home stations are worth tuning-in; they aren't just two roaring patches on the dial, to be passed with the utmost speed and contempt, as we jump from a Yankee record from Poste Parisien to interminable and incomprehensible speech from Leipzig or Warsaw. In other words, why not try quality listening?

But there's a snag in this business: Frankly, the average two or three-valve sharpened-up reaction set doesn't appeal to me, for once tone quality has become one's chief wireless interest one looks with horror upon that reaction knob, and upon that very-last-ounce, super-efficient circuit. You will learn—from horrid experience—that reaction, by increasing the volume of the low notes out of all proportion to the increase given on the high notes, produces a very unpleasant form of distortion.

## The Same Material

Though I have said that the average two or three-valve set isn't good enough, it is equally true that most satisfying quality can be obtained from the same material differently

arranged. Quality isn't, by any means, a matter of price.

Now, to the set. In a word, it is a diode. That is, we are to employ a valve purely as a detector, and not, as is usual, as a combined detector and amplifier. The detector is the heart of every set, and a diode in this position gives advantages over all other forms. It is practically impossible to overload it, and rectification is nearly perfect.

## Rectification at the Plate

The circuit shown in this article is an adaptation of two well-known forms of diode detectors—one of which is of recent origin.

It will be seen that the input from the aerial circuit goes to the plate of the valve, while a lead is taken direct to the positive of the filament, from the grid. The purpose of this last connection is to give an initial impulse to the electron stream from the filament—the current, by the way, that is taken from the accumulator is entirely negligible. Rectification, then, takes place at the plate of the valve.

The H.F. chokes form a barrier to H.F. currents from the aerial and

confine the H.F. to the first valve. The rectified current (think of this as the grid-current of your old detector) passes through the leak-resistance to L.T. negative.

This last is very important, because the rectified current builds up a negative bias, which varies with the H.F. input. This negative bias is, obviously, applied to the second valve automatically, and no additional bias is required. In this way, the two valves are linked together with extraordinary efficiency and simplicity.

## Quite Conventional

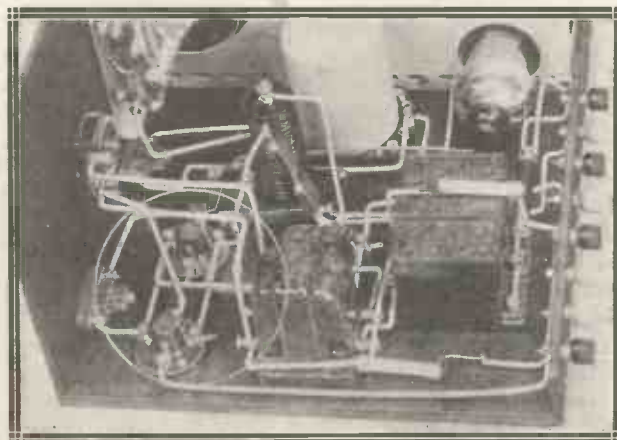
It will be seen that the rest of the set is quite conventional, but there are one or two important points to be considered. Beginning with the output valves—the most popular of these have an anode resistance of from 3,500–4,000 ohms—to get the best from these valves it is essential that the speaker should be matched to the valve by a choke or transformer. A speaker of 1,000 or so ohms should be used with a filter choke tapped at one or two points, the most suitable being found by trial.

It must be remembered that these valves need—to give their highest power output—a speaker impedance of from 9,000–15,000 ohms. It is rarely appreciated that bad distortion can occur from the fact that the speaker impedance is too low for the valve. A low resistance moving-coil speaker should, of course, be coupled through its incorporated transformer.

## Tone Control

These remarks regarding matching apply with increased force when one of the new high-efficiency pentodes is used. In addition, some form of tone control is advisable.

## FOR QUALITY AND DISTANCE



The advantages of diode detection are employed to good effect in the "Diodion," a recent "M.W." design which has attained great popularity. It dispenses with grid batteries altogether and has no reaction control, yet gives excellent performance both as a local and distance receiver.

## Practical Hints on Distortionless Detection

The intervalve coupling calls for little comment except to say that a rising characteristic should be aimed at, rather than a flat response, in the transformer.

This rising characteristic is useful for two reasons: the first, because the tuned circuit will inevitably cut the higher notes to some extent, and the second, because a too-large proportion of low notes will tend to overload the power valve before the higher notes attain the needed amplitude to give satisfactory volume.

### Road to Success

This produces a very common form of distortion, which is easily recognised when a violin is heard at quite small volume, while the piano accompaniment is badly distorted by the overloading of the valve on the lower piano notes. A low-frequency coupling that rises in the bass should be avoided.

To return to our diode detector, one road to success with this valve is to feed it with a good fat signal and control the volume before the second valve with a potentiometer in place of the grid resistance. However, this arrangement is by no means necessary and volume can be quite satisfactorily controlled by means of a small condenser in the aerial.

With regard to selectivity, though this form of diode is, I believe, the most sensitive of the diode circuits, it must be admitted that tuning will seem very flat after the razor-edged types now so popular. But, keeping in mind the fact that we are seeking two programmes only, it is necessary only to reach a degree of selectivity that will separate any two Regional stations.

### All That is Required

There is no real difficulty about this. The aerial coupling coil can be varied, and a tapping can be taken down the tuned coil to the input condenser. One or both of these measures will do all that is required.

The set that I am using at this moment follows exactly the theoretical diagram. Selectivity is just adequate, and no more.

My outdoor aerial—in West London—is merely a wire extending down

the house wall from an upper window! Practically equal results are obtained from a short indoor aerial.

The aerial coil needs no comment beyond the advice to those who always prefer to make up their own, to abandon the long wave if their situation makes it possible. 5 X X isn't worth while with two low waves within reach.

### Matchbox Transformers

The input condenser  $C_1$  should not be larger than .0001, but a variable with this maximum is useful as an additional volume control. The filter condenser  $C_2$  should be kept towards minimum. The L.F. transformer need not have a primary inductance of more than 50 henries or so, but must be capable of carrying the current of  $V_2$  without serious change of inductance. A few such transformers are available, but the modern mania for matchbox transformers has made the majority of manufacturers either shy of producing them or of advertising them.

It must be remembered that, as the diode does not amplify, the second valve is responsible for most of the amplification in the set.

I wish to insist strongly that the choice of the power valve is closely bound up with the L.F. coupling, and to illustrate the subject with a few simple calculations. The power valve will—according to type—be fully loaded with a signal on its grid of from 6 to 9 volts. Now suppose that the signal required is 6 volts (this corresponds to grid bias), and a 1:3 transformer is in use, then, obviously, 2 volts is needed at the anode of the second valve.

### A Little Arithmetic

If, then, the effective amplification of the second valve is 24 times, the voltage on its grid is  $\frac{1}{24}$ th of a volt. Now, this voltage can be obtained with the poorest aerial system at considerable distance from the twin stations. But suppose we substitute a high efficiency pentode and a 1:6 transformer, and use the set with the same initial signal.

We have 2 volts on the anode of our second valve, and this is multiplied by the transformer ratio, which gives us 12 volts on the grid of the pentode. This is a swamping value for the pentode, as this operates with a bias of 3 volts at 120 on the anode and screen!

It is perfectly clear from this simple calculation that a serious attempt should be made to arrive at a balance between the needs of the output valve and the input

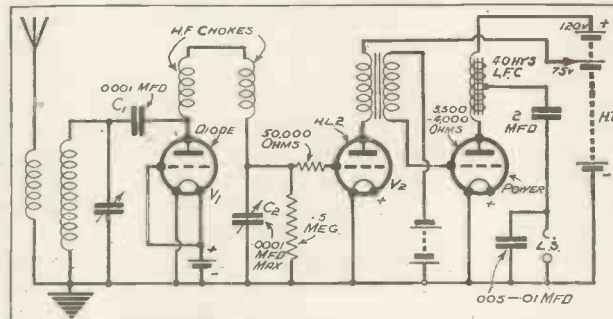
from the aerial. This is not really difficult, and a quality set that is balanced in this way can always be dead in tune. The use of a little arithmetic from one end of the set to the other will save much effort and disappointment.

### Lasting Satisfaction

It has been said that really satisfying quality is impossible without elaborate and expensive material. I do not agree with this view.

Certainly, the very best cannot be cheap, but a battery set and a modern loudspeaker, coupled with a little intelligence and enthusiasm, will produce a quality of tone that is, even in the ears of a musician, a real pleasure and a lasting satisfaction.

### A CIRCUIT FOR QUALITY



The man who considers faithful reproduction the most important feature of a good set design will find this detailed specification of a high-quality receiver irresistibly attractive

The H.F. choke is one of the most critical components. A poor choke in this position may result in very indifferent signals. Failing a really first-class article, two chokes should be placed in series.

Suspecting that the choke I was using in this position was inadequate, I placed in series with it a choke from the junk box. This resulted in a remarkable increase in available signal-strength.

With regard to valves, the diode is not critical. Almost any type that is on hand can be used, but a medium impedance valve can be relied upon to give satisfactory results.  $V_2$  should be of H.L.2 type with an amplification of from 25-30.



# QUESTIONS ANSWERED

## Baffle Size

S. D. (Beckenham).—“I have just purchased a moving-coil loudspeaker and desire to use a flat baffle. What size of baffle ought I to employ to give a good reproduction of frequencies down to 50 cycles?”

It is usual to design a baffle so that the shortest path between the back and front edges of the cone itself is not less than one quarter the wavelength of the lowest frequency reproduced.

The wavelength of sound is equal to the velocity in feet per second divided by the frequency. In your case the baffle size works out at about five and a half feet square, which makes a rather cumbersome flat baffle. Probably a slag-wool treated cabinet with an open back would be more convenient and as effective. The B.B.C. uses cabinets of this type.

## Conversion to “Class B”

H. M. (St. Helier).—“I wish to convert my existing push-pull receiver to ‘Class B.’ Can I do this simply by inserting a ‘Class B’ valve in the output stage, or must I purchase special ‘Class B’ components?”

“Class B” amplification calls for a special type of input transformer which differs from the usual push-pull instrument in that the primary to secondary ratio is stepped down and not up. That is to say, the secondary, which is a split winding, has fewer turns than the primary.

In “Class B” the secondary has to carry current, since the output stage operates on the grid current portion of the valve’s characteristic. The intermediate or first L.F. valve is one capable of handling power and may be of a type similar to the one often used in the output stage of a triode amplifier.

The “Class B” input transformer has to be carefully designed. It must be able to carry a primary current of several milliamps. without marked loss of inductance, and the secondary winding should have a low D.C. resistance so as to obviate any appreciable voltage drop between the grids of the “Class B” valve and the centre tap.

Also, it is extremely unlikely that

## TECHNICAL QUERIES DEPARTMENT

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A postcard will do. On receipt of this all the necessary literature will be sent to you, free and post free, immediately. This application will place you under no obligation whatever. Every reader of MODERN WIRELESS should have these details by him. An application form is included which will enable you to ask your questions so that we can deal with them expeditiously and with the minimum of delay. Having this form you will know exactly what information we require to have before us in order to solve your problem.

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the characteristics of your output transformer would enable it to match up with the “Class B” valve.

## Using a Westector

J. J. C. (Upminster).—“In fitting a Westector to my three-valve set would I lose anything in amplification and ought I to use an additional L.F. stage, thus retaining three valves as well as the Westector?”

The Westector is a non-amplifying device as opposed to a rectifier of the grid-leak type, which both detects and amplifies.

Since the Westector functions

purely as a diode detector, it is desirable to employ a further stage of L.F. in order to retain the same volume level.

One of the advantages of the device is its ability to deal with large input voltages, and it is, therefore, specially suitable for use as a second detector in superheterodyne circuits.

The ordinary grid-leak rectifier will not handle big inputs satisfactorily, unless it is arranged as a “power” detector with a high anode voltage, which, of course, cannot be achieved in an economical manner with battery H.T.

## Transformer Ratio

R. E. (Chatham).—“I recently purchased a moving-coil loudspeaker from a friend and now find that I have to use a step-down transformer between the output valve and speaker terminals. My friend tells me that he believes the impedance of the coil to be 8 ohms. How can I determine the correct ratio output transformer to use?”

First of all you must know the “optimum load” of your particular output valve. This you can obtain from the valve makers. Suppose you are told that it is 12,800 ohms. Divide this by the loudspeaker impedance (approximately 8 ohms in your case), and then take the square root of the answer. This will give you the transformer ratio required.

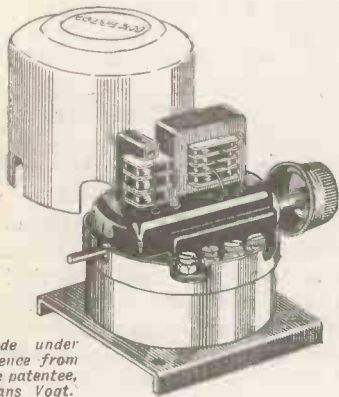
In other words, we have:—

$$\begin{aligned} \text{Ratio required} &= \sqrt{\frac{\text{Optimum load}}{\text{Speaker impedance}}} \\ &= \sqrt{\frac{12,800}{8}} \\ &= \sqrt{1,600} = 40. \end{aligned}$$

Hence, in this example, the ratio should be 40 : 1.

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# RADIO NOTES and NEWS of the MONTH

MR. NOEL ASHBRIDGE, the Chief Engineer of the B.B.C., has already left London for Lucerne, accompanied by a number of high officials of the B.B.C. He will represent Great Britain at the International Broadcasting Union meeting, where the problem of wavelengths and interference will again be tackled.

### Europe's Reshuffle

Before he left, Mr. Ashbridge forecast a change in the wavelength of practically every European broadcasting station, including all B.B.C. stations.

In an interview, Mr. Ashbridge said he would be chiefly concerned with the question of wavelengths. "We hope to discuss the question very thoroughly and draw up a new plan to replace the existing Prague Plan," he stated.

### Autumn Changes

"When I return I hope that the broadcast authorities of Europe will have reached an agreement," he went on, "and that I shall be able to bring home a copy of the new Lucerne Plan in my pocket. Listeners need not fear that the wavelength will be altered immediately, for even after we have reached an agreement, it may be some months before it is put into force."

### Nottingham's Record

As we go to press, we learn that the number of wireless receiving licences in force at the end of April was 5,536,300, representing a net increase of 38,700. Further investigations of the latest statistics show that Nottingham is as wireless-minded as any other centre of the country, for during April no fewer than 3,713 licences were taken out there for the first time, or renewed. There were 43 new issues to blind listeners; while 452 licences were allowed to lapse. All told, there are now 73,637 licences in operation in the Nottingham area, being an increase of 13,025 on the same period of 1932.

### Quarterly Licences?

It is understood that the Postmaster-General is being asked to

allow the wireless licence of 10s. to be paid in instalments of 2s. 6d. The Post Office appears to think that about two million people evade payment of licence fees.

It is thought that many more poor people would be wireless fans—that is, legal wireless fans—if they could pay quarterly, as the motorists do. This is a good idea, and it is hoped that the Postmaster-General will give it his sympathetic consideration.

### An All-Canadian Programme

We learn that Major W. Gladstone Murray, of the B.B.C., who is at present acting in an advisory capacity to the Canadian Radio Commission, has announced that on July 1st an All-Canadian National Programme will be broadcast throughout the British Empire, and that a similar broadcast will be made from Australia on Australia Day.

Major Murray has been a great success in Canada, and it is understood that strong efforts are being made to keep him there; but there is no truth in the rumour that Major Murray will be resigning from the B.B.C. As a matter of fact, the B.B.C. couldn't get on without him.

### West Regional Burglary

Our condolences to Mr. E. R. Appleton, the West Regional B.B.C. Director. Recently his home was burgled and a wireless set stolen. At the time, Mr. Appleton was accompanying a party of journalists on a visit to the new West Regional transmitter at Washford Cross.

Unfortunately, the thieves also took away Mr. Appleton's dress suit, his wife's fur coat, and all the children's clothes. Worse still, papers were also taken, including M.S.S. of a new work by Mr. Appleton entitled "Outline of Religion for Children."

### Serving Wales

Incidentally, the new West Regional station has passed all its tests, and is now on the air. It appears that the

(Continued on page 557)

**RADIO NOTES AND NEWS OF THE MONTH**  
—continued from page 556

station was built on the English side of the Bristol Channel because the B.B.C. engineers found that Wales could be served much better from Somerset than from Wales itself.

The estimated service range of the Regional transmitter—i.e. the range to which it can provide a good reliable service both during day and night—is about seventy miles.

**Waves from Space**

The old story of mysterious wireless waves from far beyond the solar system has broken loose again in the American Press, for it appears that Mr. Karl Jansky has made the discovery that certain wireless waves appear to emanate from the centre of the Milky Way.

It is said that thousands of American wireless fans have started a new craze of trying to translate these mysterious waves.

**T.U.C. and B.B.C.**

The Trades Union and Socialist Movement is still dissatisfied with the B.B.C. and the broadcasting facilities offered to the Movement.

Recently the Joint Council, which represents the Trades Union Congress, the Socialist Party and the Parliamentary Group, set up a sub-committee to consider the question of getting more broadcasting facilities for Socialists. Should they fail, there is an alternative idea based on the renting of broadcasting facilities from Athlone, or one of the Continental stations, for Sunday afternoon broadcasts. As well as a musical programme, this would include a political address.

**Parliament and the Charter**

It is reported in the "Daily Herald" that a question is shortly to be raised in the House of Commons concerning the duties of the Governors of the B.B.C., despite the fact that these duties are clearly outlined in the B.B.C.'s charter.

According to the "Daily Herald's" Wireless Correspondent, there is no question, however, that the forceful personality of the Director-General, Sir John Reith, dominates the whole administration of Broadcasting House.

**NEEDLE POINTS**  
—continued from page 551

end of a record, the head becomes turned over slightly, and when put back on to a new side the needle is at an angle. If this is already well worn, it is obvious that the sharp edges have an excellent opportunity for doing their worst.

Examining the other photographs it will be seen that in the case of the loud needle played once and the medium and soft needles played four times each, there is no evidence of "shoulder." This is because the former has not yet worn down far enough and the latter are too thin to overlap the groove. This does not mean to say that they will not cause wear, as there is still a sharp-edged hump, but it is not so formidable as the loud needle with its "shoulders."

For general use the medium needle is undoubtedly the best from the point of view of record wear, for its stouter build reduces "shudder" to a large extent and its point is fine enough to prevent "shoulders." Mention has not been made previously to the various long-playing needles at present on the market, but the same effects apply equally to these if they are used to excess.

**RADIO AT LEIPZIG FAIR**  
—continued from page 552

August. There were one or two new constructions, but I think I have given my readers the titbits.

Home-recording apparatus absolutely flooded Leipzig last year, but was pretty well absent this year. Seemingly, the cheap and shoddy makeshifts have gone and there remain only the more expensive and well-made systems.

**Overcoming Interference**

The new shielded aerial down-lead cables were well to the fore, so were the many anti-interference appliances developed for application to the apparatus actually producing the interference. Apparently popular favour had turned somewhat. In many cases a shielded aerial down-lead is preferred to a long and strenuous search for the source of interference, which, when once cured, probably appears in another form within a few days' time.

(Continued on page 558)

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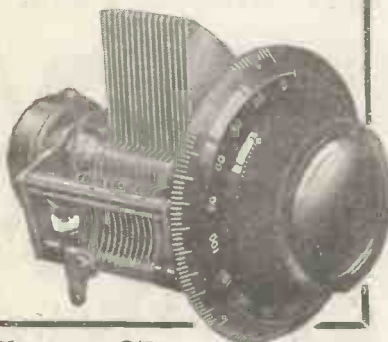
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**CHUMS**

JUNE Issue Now on Sale - 1/-

**RADIO AT LEIPZIG FAIR**  
 —continued from page 557

A new type of aerial is being advocated for use in big towns. This consists of a vertical bamboo on a chimney and a short vertical wire from the top of the bamboo to a few feet above the roof, and then shielded down lead right to the set.

If it is an all-mains set, further precautions can be taken by stopping all interference currents coming in through the supply wires. These aerials are expensive, but very often nothing else will help.

Passing the Siemens' stand, I saw a few interesting new developments along lines which, though having nothing to do with radio reception, have a lot to do with studio design and therefore transmission. The Siemens' people have produced two new meters, one for measuring re-

verberation in a given room or hall, and the second for measuring noise.

The first meter shows reverberation direct in so many seconds. It works quite simply. A note is sounded via loudspeaker in the hall or room; only when this stops coming from the loudspeaker does the meter start working, a thermo "cross" being used which causes a direct marking by a galvanometer in seconds.

The meter consists of all necessary gadgets such as microphone and batteries, and is portable. The second instrument also consists of a microphone, and again batteries are provided. It is concerned with the measurement of noise.

In closing I would like to refer to the new automatic mains clock by Siemens which can be coupled to an automatic receiver for the Nauen time signal, on 18,000 metres. Once in every twenty-four hours at 1 a.m., when the famous Nauen "Onogo" time signal is broadcast, the clock is automatically regulated.

**ON THE TEST BENCH**  
 —continued from page 526

and improved version of their famous Indigraph slow-motion dial fitted with a micrometer adjustment.

This new Indigraph is the ideal dial for short-wave sets.

Its "direct drive" is beautifully smooth, and this, with its ratio of 9:1, enables very close tuning to be obtained, but in addition there is the micrometer adjustment which can be flicked in and out of gear in a moment.

This has the extraordinary ratio of 600:1. "Hair's-breadth" tuning is hardly sufficiently descriptive to describe the microscopic capacity changes that can be made with it.

Indeed, vane movements much smaller than can be seen by the eye are easily controlled, as easily, in fact, as "degree" movements are with a normal well-designed dial.

Short-wave enthusiasts will un-

doubtedly "fall" for this new Igranite Indigraph.

**New Blue Spot Loudspeaker**

We have had the opportunity of testing the new 22P.M. Blue Spot loudspeaker, a handsome instrument built into an attractive oak cabinet.

It embodies the 29P.M. Blue Spot unit, which is a permanent magnet moving-coil of exceptional merit.

Its main feature of design is a new method of speech coil and cone assembly which enables a closeness of gap providing great sensitivity to be obtained (in conjunction with the efficient magnetic system) with no liability of fouling.

That such precision of design has been accomplished with no sacrifice of reliability and, in fact, with unusual robustness of construction is certainly yet another feather in the cap for Blue Spot.

The 22P.M. speaker is a fine instrument and our tests plainly indicate that it can be regarded as such irrespective of its price—which is only 45s.

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**"M.W.'s" RECORD REVIEW**

—continued from page 478

in "modern" arrangement and orchestration there is a clever performance of *O Star of Eve* and a bit of *Caprice Viennois* on Brunswick 1470. Wayne King and Orchestra put a new circuit into an older chassis, as it were, with attractive results.

**Orchestral Items**

Before leaving "orchestrals," there are two serious pieces to be heard. One is the *Storm Music* (from "Ivan the Terrible") and *The Tumblers' Dance* (from the "Snow Maiden"). This disturbing music of Rimsky-Korsakov epitomises restless, turbulent Russia, and the London Symphony Orchestra play it splendidly on H.M.V. DB1698. The other is *Capriccioso Italien* (Tschaikovsky) on Decca Polydor, LY6066-7. Light-hearted music this, with many a dainty passage. The Berlin State Orchestra are the performers. There is one delightful record of *general* appeal in the C Minor Quartet (Brahms). Hear the *Romanze* move-

ment played by the Léner String Quartet on Columbia LX229.

**Songs for Everybody**

Essie Ackland is one of our very best contraltos. She sings *Great is Jehovah* and *Know'st Thou The Land*, on H.M.V. C2535. This record is certainly one to keep. Here are two magnificent tenor performances: *Siciliana* ("Cavalleria Rusticana") and *Lebwohl, Mein Blütenreich* ("Madam Butterfly"). Julius Patzak, of the Munich Opera, is quite outstanding on Decca Polydor PO5007. I believe the next two to be so well sung as to lift them out of the ephemeral class to which they really belong. They are *In Santa Lucia* and *More Beautiful Than Ever* by a fine bass, George Doshier (Sterno 1150), and *My Darling* and *Sweetheart* by Eric Bertner, Brunswick 1467. Here, again, is fine singing and a real understanding of his song.

**Satirising The Programmes**

Have you heard *Crazy Commentaries* and *Pancake Tuesday Throughout the Empire*?

Here are two very clever skits on the outside broadcast. H.M.V. B4375 will provide many laughs for many months.

**FAULTS I HAVE FOUND**

—continued from page 498

have not previously digested its truths.

And now for the context.

After a pick-up has given long service, gramophone reproduction may sooner or later begin to fall off both in quality and volume; you may save yourself a lot of time and trouble if you suspect the pick-up *first*.

A simple test will show up the condition of the pick-up and remove any doubt that may exist as to its efficiency.

With the amplifier switched on, stroke the needle firmly with the thumb in both directions—i.e. from the centre of the record outwards and from the circumference of the record inwards.

If the pick-up is in proper condition you will obtain the same response in the speaker with each stroke; but it is far more likely that one stroke will give a loud response, while the other will produce practically no noise in the speaker.

The cause of pick-up failure is

nearly always the same, and the safest plan is to return it to the manufacturers for adjustment and repair.

When the armature is suspended on rubber, this in time perishes; this does not allow the needle to move freely in the record groove, and also prevents an adequate restoring force which should normally be present in order to bring the needle back into dead centre between the pole pieces of the magnet when at rest.

**The Only Cure**

The only cure is to renew the perished rubber, and unless you are familiar with the design of your pick-up, don't meddle with it.

Reverting for a moment to the "text," it is an excellent plan to have your pick-up renovated by the makers every twelve months; it only costs a few shillings and ensures a proper input to your amplifier at all times.

If you have an all-mains D.C. set, and have been troubled with valves burning out prematurely, you should check the filament current and see that this is exactly that which the valves are rated to pass.

I am referring to modern sets, of

(Continued on page 560)

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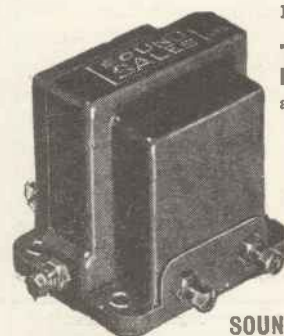
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**FAULTS I HAVE FOUND**

—continued from page 559

course, with indirectly-heated valves with the heaters joined in series.

I have come across several cases of repeated burn-outs, which have been due to excessive filament current passing, even though the mains tapping on the receiver is correctly set by means of an ammeter.

The cause of the trouble turned out to be one valve whose heater resistance was considerably above normal, and which therefore needed abnormal voltage before the meter would read correctly.

Since the heaters were connected in series, the other valves had to take excessive current and consequently were short-lived.

It is interesting to note that the faulty valve and the cause of all the trouble was the one valve that was not likely to burn out, since it was not being overrun.

Like so many wicked old sinners—it outlived its betters, but was, of course, found out in the end.

**THE FUTURE OF "POSITIVE DRIVE"**

—continued from page 538

cost, notably in the power transformer, rectifying valve, smoothing condensers and voltage-dropping resistances.

It would seem that such a reduction becomes definitely practical with the aid of positive drive, more particularly in its "Class B" form. It is true that to feed a "Class B" output stage from a mains H.T. circuit presents a number of special problems, chiefly because of the great fluctua-

tions in the load, but ways of overcoming them are being developed.

For example, much can be done by means of the newly-introduced neon ballasting tubes, although this method has the apparent drawback that it raises the average load on the H.T. supply to the level of the *maximum* demand of the output valve.

**A Promising Line**

A promising line of research appears to be a combination of a modified form of this method with H.T. circuits possessing better "regulation"—i.e. less variation of voltage with load, probably using gas-filled rectifiers of low resistance.

The lower H.T. voltage may also be expected to introduce problems in the way of getting adequate decoupling of the earlier stages without the aid of the comparatively high resistances now employed, but these problems should not be insoluble. Probably much could be done by using inductively wound decoupling resistances, instead of the present purely resistive types, without an appreciable increase of cost.

Is this the ultimate application of positive drive? No man can foresee the future, but such speculations are fascinating to all of us. How long it will be before we can judge of the correctness of our attempts at prophecy we cannot tell, because it all depends on the valve makers, and they are a very secretive lot. This much, however, the writer does definitely know: the research staffs are already at work on the problem.

**NEXT MONTH'S "M.W."**

Full constructional details of a highly-efficient Portable Receiver incorporating "CLASS B" Amplification.

On Sale July 1st. One Shilling.

**SECRETS OF THE HIGH K/C'S**

—continued from page 482

when they are encountered, and this is often effective so long as the coupling control is placed ready to hand and not in some inaccessible spot in the innards of the set.

**Worth-While Scheme**

For example, the circuit shown in Fig. 2 is one I often use, and I find it definitely worth while to put the little series condenser C<sub>1</sub> actually on the panel well away from the tuning dial for hand-capacity reasons, but still within easy reach.

This condenser, of course, is not, strictly speaking, a coupling control in the ordinary sense; but that, in effect, is its function, so I may perhaps be pardoned for so describing it.

**Earth Lead Troubles**

This method is quite good for shifting flat spots due to resonances, fundamental or harmonic, in the aerial, but it usually fails with those due to similar effects in a lengthy earth lead. These are apt to be very puzzling, and at first sight hard to deal with, since a series condenser will probably make the L.F. side of the set misbehave.

However, a simple cure can usually be obtained by inserting a loading coil (25 turns of any gauge from 22 to 28 S.W.G. on a 2-inch tube) in series in the earth lead, with a shorting switch to remove it when not required.

And there I must leave the subject, for although there are still many things I should like to discuss, I can see this article is running to a length which will bring frowns to the editorial brow!

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