POPULAR WIRELESS, February 1st 1930.

REGISTERED AT THE G.P.O. AS A NEWSPAPER.

HIGHEST RADIO CIRCULATION IN THE WORLD

# Popular Wireless

Every Thursday PRICE 3d.

No. 400. Vol. XVI.

INCORPORATING "WIRELESS"

February 1st, 1930.

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*OTHER SPECIAL ARTICLES THIS WEEK*

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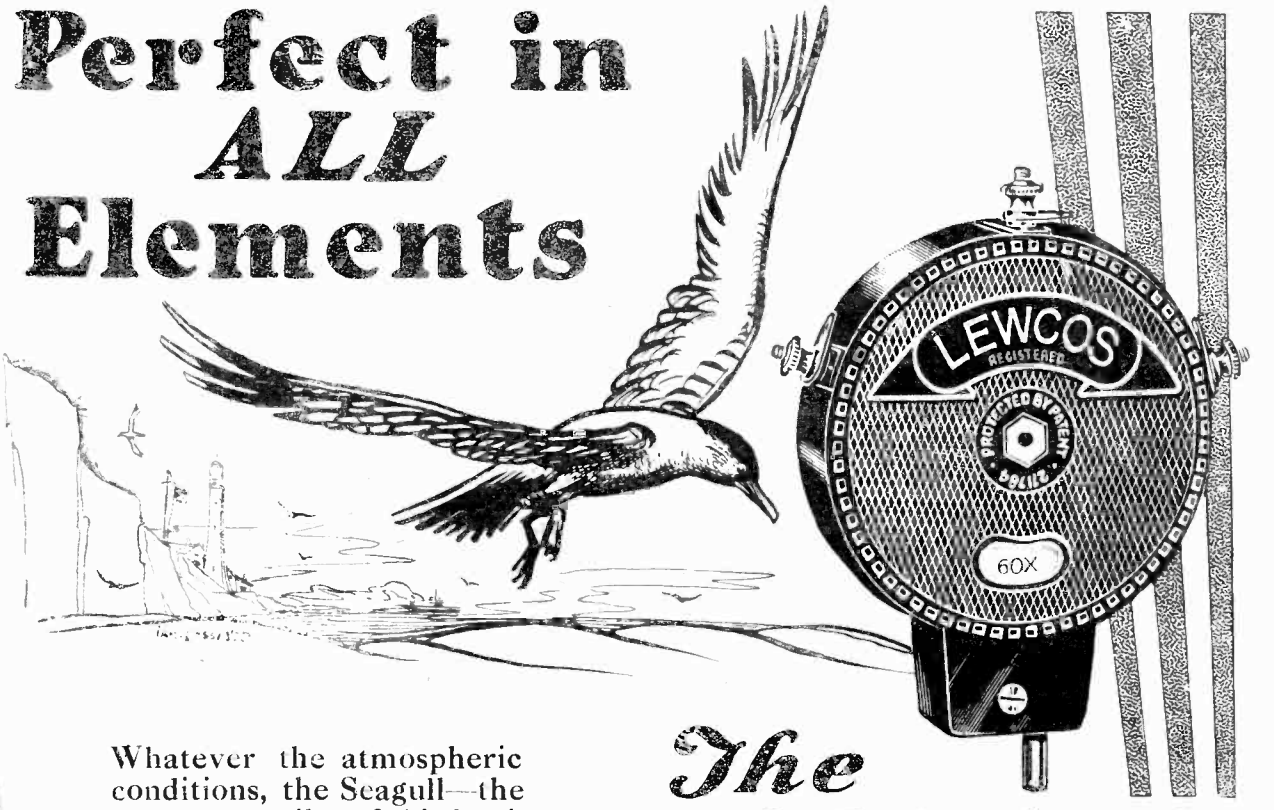
S.G.'s FOR ORDINARY SETS. USING METERS
THE LIFE STORY OF REGINALD FOORT, F.R.C.O.
(No. 10 of a very popular "P.W." series)

# Perfect in ALL Elements




Whatever the atmospheric conditions, the Seagull—the most versatile of birds—is perfectly at home on land, sea, and in the air.

The Gull is not alone in its ability to conquer the elements, for the Lewcos "X" Coil is renowned for its capacity to separate music from adverse atmospheric conditions. When the ether is vibrant with interfering and jambing transmissions, the Lewcos "X" Coil will enable your set to clarify reception. A fully descriptive leaflet (Ref. R.34) will be sent on request—WRITE FOR IT TO-DAY.

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LEWCOS CENTRE TAPPED COILS and the H.F. CHOKE can also be used for this Receiver.

PRICES
Centre Tapped Coils.

| | |
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| Ref. C.T. "25-75" .. .. | 3 6 each |
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**LEWCOS RADIO PRODUCTS FOR BETTER RECEPTION**

# Popular Wireless

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Chief Radio Consultant:
CAPT. P. P. ECKERSLEY, M.I.E.E.
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P. R. BIRD, G. P. KENDALL, B.Sc.,
A. JOHNSON RANDALL.


**JUST TOO BAD!**
**"BACKWARD BRITISH"**
**THE FOUNDLING**
**A NEW SOCIETY**

**WHEN TO RECHARGE**
**A COLD CHESTNUT**
**RADIO CRITICISM**
**TEN TO ONE!**

## RADIO NOTES & NEWS

### Impertinent Question.

ONE month gone already—and nothing marvellous happened! Just the old flux of time and weather. Well, plenty more months! Let 'em *all* come! 'Specially the warm ones, full of holidays and flowers. All of which gibbering prompts me to wonder what has happened to last year's inventions—all the "x-stoppers," "cold" valves, generators without "input," sets without aerials, and so on. All on the hob, warming up, and will be dished up again, no doubt.

### Just Too Bad!

A "RADIO HINTER" called "Phyvenno," who enriches a "daily" and means frightfully well, fires off two shots which I think you ought to know about. No. 1. "*An indoor aerial is very seldom any good.*" This shot made such a bang that "Phyvenno" was scared; he reckoned that folk would contradict it, and he wished he had not put it in italics. So he shoots in the opposite direction. No. 2. "I know you will say to me, 'But I am using an indoor aerial and get wonderful results.' Yes, perhaps you are. But the wonderful results would be very much more wonderful and even more staggering to you if you put the set on an efficient outdoor aerial." And thus he balances the account and is safely back again on thick ice.

### The Backward Britisher.

MR. BRADLEY MARTIN, writing in the "New York Sun" on the subject of "A Picture of British Radio," has evidently got a hair in his brush. Here are some of the smudges which result: "The use of light sockets is out of the question." Quite wrong. "British sets employ very few valves." Has he seen the latest trade catalogues? "There are approximately 2,500,000 receiving sets in England. Of these all but a few are head sets." Yes! There's my loud speaker, and another in Manchester! And Mr. P. R. Bird is trying to save up enough to buy one, because he hears that they really do work wonderfully! Oh, Mr. Martin! Where did you get it all?

### Radio Club Note.

SOUTH-EAST Londoners may be interested to have particulars of the Faraday Radio Club, which meets at the Walworth Men's Institute, The John Ruskin L.C.C. School, Beresford Street, S.E.5, on Thursdays from 7.45 p.m. till 10 p.m. The hon. sec.—who wants more members—is Mr. J. H. Payton, 39, Penton Place, S.E.17, and the fee for the whole session is one shilling.

### Better Late Than Never.

I KNOW something of what the Post Office ought to feel like when it delivers a letter posted in 1903, for I have just found a letter dated November 3rd. (caught at the back of another in one of those (*hem*) clips) which I have never dealt with. Verily, my name must be Mud upon the lips of Mr. W. F. Wilbee, High Street, Botley, Hants, who wishes to get into touch with E. J. (Portsmouth) who wrote to us some time ago about his "Short-Wave" Two. If E. J. should see this, I hope he will respond and so redeem my reputation.

### The Foundling.

R. S., who lives on the river bank, tells me that during a high tide the basement of his house was flooded, and that after the water had subsided he found on his doorstep a P.M.3 valve covered with mud and grease. He gave the castaway a bath and put it into service, where it "said its piece" quite well. He has since had it furbished up by its makers and now it is leading a respectable and useful life. I hope that R. S. will never have anything worse left at his door.

### Up-to-Date Morticians.

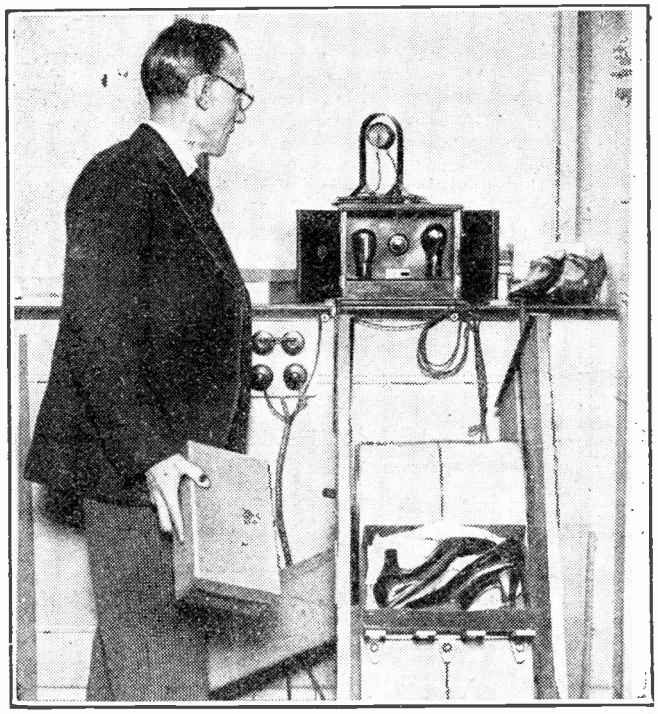
AT a recent meeting of the New Jersey State Funeral Directors Association a resolution was introduced, recommending the establishment of a special radio programme of music for use during funeral services. Surely a somewhat grisly idea! Suppose a wedding-party tuned it in by mistake. The "Telegraph and Telephone Age" flippantly suggests the use of a portable gramophone instead, pointing out that a selection of records could be carried, "suitable to the funeral of any kind of corpse from a bootlegger to a modern saint."

### Proof of the Pudding.

OUR way of controlling and financing broadcasting seems to work about as smoothly as anything can in this wicked world, and it is financially sound at bedrock. But the U.S.A. method of "free for all," though it may suit the American listeners, does not always produce what gold-diggers call "pay dirt." In fact, the

*(Continued on next page.)*

### OH, NO! HE'S NOT!



Glancing at this photograph you might think he was going to heave his H.T battery at his set! Not a bit of it!
He's a shoe salesman, and the "set" is a microphone gadget, down which he tells the stock-room all about the kind of shoe he wants. Below the "set" you will see a pair that have just arrived in response to a microphoned request.

# NOTES AND NEWS.

*(Continued from previous page.)*

Federal Radio Commission announces that eighty broadcasting stations report an annual loss of £2,000 or more. Well, eighty less stations over there would never even be noticed.

### Larger Hats at Tallis House.

THAT technical gang have been going about recently with an air of mystery and a sort of bloated appearance which seemed to say, "Verily, we are the people and wisdom shall die with us." Having enticed Mr. Rogers out of his vacuum with an old bicycle lamp labelled "Cold Valve," I induced him to divulge the cause of all the bursting hat-bands. It seems that the Research Department has been enlarged and that much new personnel and apparatus has been installed. I suppose it's O.K.—but I wish that poor old "Ariel" could get a little attention sometimes.

### A New Society.

ALWAYS glad to give a "leg up" to a new radio society, I do not hesitate to respond to the request of the Ebbw Vale and District Radio Society that I mention its advent. It meets on Thursdays at 7.30 p.m. in the Lesser Workman's Hall, Ebbw Vale, and its hon. sec. is Mr. G. R. Scott Farnie, Lloyds Bank House, Ebbw Vale, Mon. I have reason to believe that the society is making great use of "Pentode's" articles. Good luck to them!

## SHORT WAVES.

**TWIN RADIO PROGRAMMES—Likely to prove a howling success.—"Daily Mirror."**

* * *

**NEED ANY ASSISTANTS?**

**Wife (awakening her husband): "The early morning radio setting-up exercises are on. You left the radio turned on when you went to bed."**

**Tired DX Fan (after a hard night): "Please be quiet. I'm doing my daily dozin'."—"Radio News."**

* * *

**"When valves fall sick" runs a headline in the "Leeds Mercury."**

**Well, who wouldn't?—with all these talks about Economic Potatoes, and so on.**

* * *

**UNDOUBTEDLY!**

**We received a letter from a reader the other day, who wrote as follows: "I know my batteries are O.K. as I do not use them, since I run my set from the mains."**

* * *

**It is reported that burglars recently made a big haul of wireless components in a London suburb.**

**Let's hope this will be a lesson to them.**

* * *

**Mrs. Bangs (confidentially): "Yes, we bought this radio set on instalments last winter."**

**Mrs. Bings (with some curiosity): "I suppose you've nearly paid for it, then?"**

**Mrs. Bangs (hesitatingly): "Well, about as far as the second valve."—"Radio News."**

* * *

**"Have you an old set 'parked' away?" we read in the "Bristol Times."**

**No, but if we had our way we should have—several.**

* * *

**It is said that broadcasting has shortened the lives of several popular songs.**

**That's one feather in its cap, anyway.**

### Short-Wave Query Answered.

W.L.S.'s query as to the identity of W 2 X B H, which works on a wave-length of about 60 metres, has been answered by F. T. C. (Streatham). The owner of the station is C. G. Unger, 183, Vermont St., Brooklyn, New York. We are much obliged to F. T. C. for his trouble and in future we'll look more carefully in the Radio Amateur Call Book. Can he tell us anything about Turin's nightingale?

### When to Re-Charge.

MY remarks under this heading on January 11th moves "Scot" (Clydebank) to ask how my method of telling whether the L.T. battery needs recharging would work if the set were not filament-controlled. Pretty feebly, I should say! If I had such a set I should use the voltmeter in preference to calculations, or a hydrometer, even though the drop in the discharge curve of an ordinary accumulator is fairly swift. "When this notice is covered by the water it is unsafe to pass across the river," said the signboard. "Yes," said the Scot, "but suppose a mon canna read!"

### Cold Chestnut.

A GREEK and an Egyptian were boasting about the wisdom of their ancestors. "Why," said the Greek, "during recent excavations in Athens they found copper wires thirty feet below the surface. That proves that the ancient Greeks had telegraphs." "Pooh!" replied the Egyptian. "Why, in digging near Alexandria they found absolutely nothing at a depth of sixty feet. Don't that prove that the ancient Egyptians had wireless?"

### Anti-Noise Invention?

REPORT hath it that Dr. James Robinson, the inventor of the Radiostat, has hit upon a means of rendering rooms sound-proof. Apart from the desirability of such an invention in these days of "Oh, that next-door's radio," the blessings of a still house or office would be tremendous, and I hope that Dr. Robinson will give the Radiostat second place. By the way, a company for the development of the Radiostat has been formed in Canada.

### New Radio Society.

MY attention has been directed to the newly-formed "Ministry of Pensions Radio Society," one of the few societies I have heard of in connection with a Service Department, though probably plenty exist. I understand that the membership is large and enthusiastic, besides being a supporter of "P.W.," which hereby sends the boys its best wishes. Will they let "Ariel" have a list of any "remainders" or "throw-outs" which the Department may have for disposal on easy terms; secondhand pensions not objected to.

### The Great Conversion.

FURTHER evidence that America is softening! First we hear of a company formed for the purpose of ousting jazz, and now here is actually a member of the Federal Radio Commission pleading for the "old songs of country, home, love and romance." (*Loud sobs from the Wall Street gentleman on the right.*) Nay, more! He begs broadcasters not to encourage American boys and girls to smoke cigarettes. Yep! Export those "Camels" and "Lucky Strikes" to European kids. Finally, he pleads that the farmer shall be immune from the perils of jazz. I am glad he did not have to ask for jazz to be eliminated from church music!



### Buried Aerials.

W. J. C. (Ventnor, I. of W.), in a letter as pleasant as the lovely island of Vectis, tells me that sets for use in connection with buried aerials are shortly to be placed on the market. This is excellent news for my pup, who fancies himself as a resurrectionist and is already in training. His ambition is to bring up the main sewer, I think. Meantime, one waits.

### And Yet Another Road.

BUT the B.B.C. certainly does provide unknown geniuses with a chance of obtaining public recognition before they are dead, though up to the present no startling discovery has been made—probably because the geniuses are "faddy" and won't broadcast or be broadcast. So the works of dead geniuses continue to be the backbone of the programmes. Talking of music—which I wasn't—will someone kindly tell me what is wrong with my ears? A Stravinsky record got into my house by mistake and was clapped on to the grammy. I had a bad time trying to convince the kids that grammy really was not running backwards.

### Radio Criticism.

RADIO "critics" of professional type are springing up like objectors at a City meeting, and there is in progress quite an amusing competition for pride of place on the scroll of priority in this kind of work. Some of the commentators, being men of ripe experience, unerring good taste, and with a knowledge of the proper functions of a critic, make very good reading; but I notice that much of the so-called criticism is simply a catalogue of the items, arranged under two heads, viz. what the "critic" liked and disliked. We want less references to "I." At random I pick the following specimen of acute criticism: "The Mendelssohn programme was welcome, not forgetting the ever-sweet 'A Midsummer Night's Dream.' *We don't hear this often.*" (My italics).

### Ten to One.

IS it not surprising that in Italy, where the regime is so strict, the "pirates" outnumber the payers by ten to one? According to the "Popolo D'Italia," Milan, there are a million radio receivers working in Italy and one hundred thousand people have paid the licence fee. Evidently there is a chink in the Dictator's armour!

**ARIEL.**

# WHERE QUALITY GETS LOST

**Is your set a sieve ? Does it leak notes in every stage, so that you get a mere travesty of the original input by the time it arrives at the loud speaker? You may not realise it, but there are very few sets which can claim to be "note-tight," and to give out in amplified state exactly what is put into them. This article shows the main "holes" through which notes escape on their way through a typical broadcast receiver.**

**By C. E. FIELD, B.Sc.**

THERE must be a very large number of wireless enthusiasts who have purchased loud speakers as a result of a demonstration of excellent reproduction (perhaps at the last Radio Exhibition), but are unable to obtain the same results when they try their newly-acquired speakers on their own sets.

Why is this?

It is almost certainly because their sets are at fault, but there is no reason why every owner of a loud speaker should not be able to do it justice.

As readers are probably all aware, distorted results from a receiving set may be produced by *overloading* (usually the result of employing too small a valve in the last stage, or too little high-tension voltage), or by the *unequal amplification of different notes.*

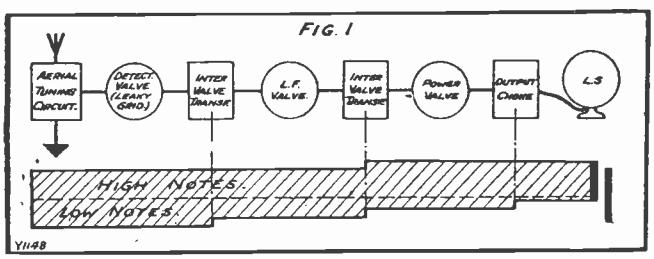
### High or Low Pitched.

The first form of distortion will not occur providing that the correct types of valves are used, and that the correct high-tension and grid-bias voltages are applied.

The second form, however, is not so easily dismissed.

By the unequal amplification of different notes, we mean, in general, the reproduction of notes round about the middle of the pianoforte range at much greater strength than very low or very high notes. This gives rise to distorted speech and music, which differs according to whether it is high or low notes which are suffering from lack of amplification.

We may make a good guess as to what is wrong with our reproduction, if we know that the speaker is a good one, and that the set is not over-running, for if the results sound high-pitched and "thin," the probability is that the low notes are not being reproduced at full strength, while a muffled, booming tone would indicate that the highest notes were weak or absent.




**Here is shown an ordinary old-fashioned detector and 2 L.F. transformer-coupled set, which, as you see, has a rooted objection to low notes, and believes the piccolo is the only instrument worth hearing.**

The diagnosis of the cause of unnatural reproduction is not quite so straightforward as this, for it must be remembered that an absence of "boominess" in results which are not unnaturally high-pitched does not necessarily mean good reproduction, but may, and very often does, indicate an absence of *both high and low notes.*

Here it should be pointed out that the term "high notes" includes notes which are well above the ordinary musical range, but which are present as part of lower notes, forming what are known as "overtones."

An absence of high notes is particularly noticeable in the reproduction of speech, for without them sounds such as *s*, *z*, and *th* are almost entirely absent—an effect which is responsible for most of the lack of distinctness in talking-picture reproduction. The characteristic stringy tone of a violin is also lost when high notes are not faithfully reproduced.

An absence of the low notes produces the nasal "gramophony" tone with which we were all too familiar a few years ago (but which is certainly not a feature of a modern gramophone), and gives a twangy quality to a piano, and a metallic note to drums.

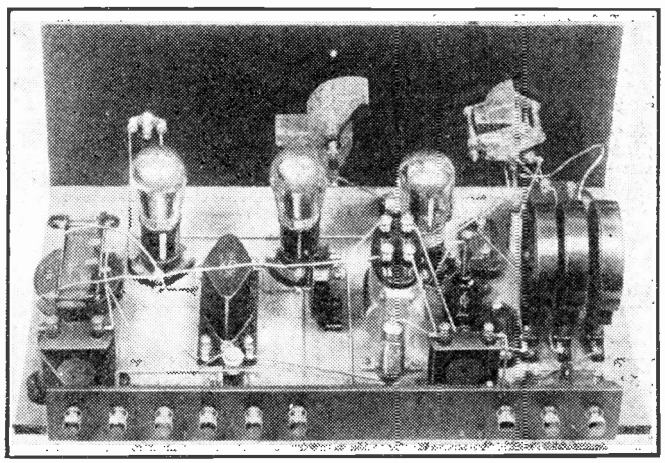
### Where the Low Notes Go.

Now, where do these notes get lost ?

We will take as examples two or three typical circuits and endeavour to obtain a sort of bird's eye view of what happens to notes on their way through the receiver from the aerial to the loud-speaker.

Look, for instance, at Fig. 1. Here is shown, in simplified form, for reception from a local station a loud-speaker circuit consisting of a detector, low-frequency amplifier, and power valve, transformer-coupled throughout, the output of the last valve being choke-coupled to the speaker.

(*Continued on next page.*)



**Unless special precautions are taken, as in the case of the "Magic" Three, two transformer-coupled stages may prove very unsatisfactory from the point of view of quality.**

## WHERE QUALITY GET'S LOST.

*(Continued from previous page.)*

Beneath the diagram you will see a chart consisting of two lines with a shaded portion between them.

The distance between these lines represents the range of notes reproduced by the set, a rise in the bottom line indicating a weakening of low notes at that point in the set, and a fall in the top line showing a cutting-off of high notes.

Following the signals through the circuit we see that all goes well until we come to the first intervalve transformer, when there is a weakening of low notes.

### Almost Inevitable.

This is an almost inevitable result of transformer coupling, but with a well-designed modern transformer the effect may be quite negligible. A poor transformer, however, such as has been assumed in this circuit, may completely spoil otherwise good reception.

Many transformers give a little extra amplification to high notes—a feature which is usually advantageous, though not generally very noticeable.

This is assumed to have taken place in the second transformer, in Fig. 1, in addition to a further reduction of low notes. The weakening of low notes is produced when the primary winding of the transformer possesses only a low inductance, i.e. is wound with comparatively few turns of wire, and as transformer wire is very costly, this is usually the way in which the price of a transformer is reduced.

Thus often a cheap transformer will result in high-pitched reproduction.

Returning now to the circuit, we see that after passing the last valve our signals suffer yet another weakening of low notes in the output choke, the cause being exactly the same as in the case of the transformer—too few turns of wire on the winding.

### Nasal Speech Quality.

It is obvious that the final results from this receiver would be very seriously lacking in bass notes, and the effect would be made slightly worse by the extra assistance given to high notes by the second transformer.

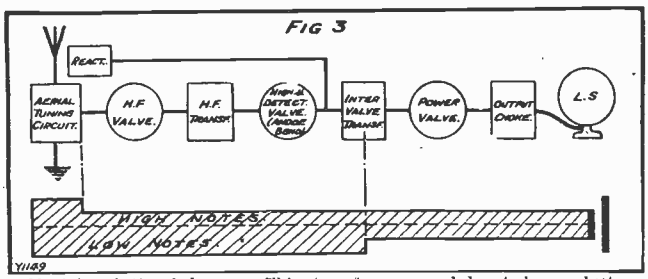
Speech from this receiver would be very clear and articulate, but would possess a harsh, nasal quality. Orchestral music would lack body, and the piano and the drums would sound tinny.

In Fig. 2 is shown another circuit. This time the constructor, with the best of intentions has discarded transformers, and employed resistance-coupling with high-amplification valves. Otherwise the circuit is similar to that shown in Fig. 1.

From the chart below the circuit diagram we see exactly the opposite effect to that obtained in the first circuit. There is a drop in the amplification of high notes at each resistance-capacity coupling.

A good output choke has been assumed, so that low notes are reproduced faithfully throughout.

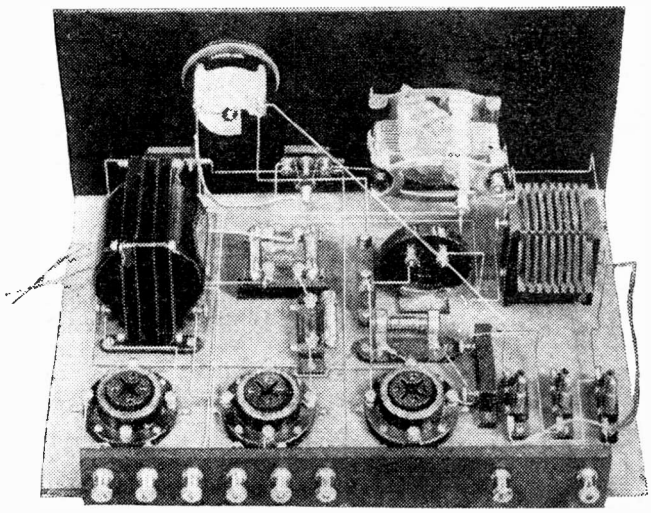
Speech from the set would be low-pitched, possibly boomy, and would sound "woolly," as if the speaker had a sack tied over his head, while orchestral music would tend to resemble that from a military band on account of the faulty reproduction of stringed instruments.




**Obtaining better balance. This transformer-coupled set has a better sense of proportion, and although some high and low notes are lost it reproduces the rest of the notes of the musical scale more nearly in their correct relative values.**

The reason for this high-note loss is to be found in the very high values of anode resistance and grid leak employed. If, in each case, these two resistances had been 100,000 ohms and 2 megohms respectively, results would have been excellent.

The circuit shown in Fig. 3 is supposed to be constructed for the reception of a few Continental stations, or for the cutting-out of a powerful local station.



**A well-designed set, having resistance and transformer coupling, which is scientifically designed will give quite a good response curve.**

### Where the Set Fails.

It consists of a high-frequency valve, detector, and power-valve, reaction being employed to provide selectivity. The constructor has argued, we will suppose, that, since he is employing a high-frequency stage, the signals received by the detector will be strong enough to allow him to use anode-bend rectification, while as he is not employing an intermediate stage between the detector and the power-valve, a transformer should be employed, rather than resistance coupling, to give the necessary signal strength for loud-speaker operation.

He has employed a really good output choke and intervalve transformer in order to ensure the reproduction of low notes. When we look at the chart, however, we see that first of all the high notes are considerably weakened before the first valve.

This is an effect which is produced when tuning is made excessively sharp by means of reaction, and can, of course, be avoided by keeping the reaction coupling to a minimum. Whether the required degree of selectivity can be obtained depends, of course, upon the situation of the set with regard to powerful local stations.

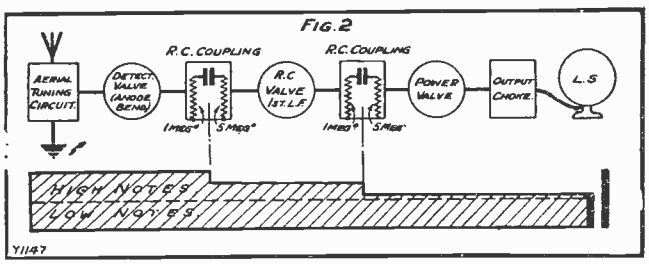
Passing on through the receiver we find that, in spite of the fact that a good intervalve transformer is employed, there is at this point a loss of low notes.

### Anode Bend.

The cause of this is the fact that anode-bend rectification by means of a high-impedance valve has been used, for no transformer will give good results when preceded by a valve having a working impedance (as this one might have) of perhaps 60,000 ohms.

Good results would have been obtained if a general-purpose, or low-frequency amplifying valve had been employed as a leaky grid detector, or if a low-impedance valve specially designed for an anode-bend detector had been used.

These examples may serve to show how easy it is to spoil otherwise good reproduction by a careless selection of components, and in conclusion it may be restated that it is within the power of every amateur to construct a set which will do justice to any loud speaker.




**"Good stuff this bass" is the slogan of this set, which has no time for any form of high-note instrument, and turns a deaf ear to the harmonics of the piano, violin, flute, etc.**

## FOR YOUR NOTEBOOK.

**It is often a good plan to connect the mounting of an electrical pick-up to earth.**

* * *

**Bell wire or fairly stout insulated D.C.C. wire such as No. 22 gauge, is more suitable for long loud-speaker leads than the flex which is so frequently used.**

# CAPT. ECKERSLEY'S QUERY CORNER

**Under the above title, week by week, Captain P. P. Eckersley, M.I.E.E., late Chief Engineer of the B.B.C., and now our Chief Radio Consultant, will comment upon radio queries submitted by "P.W." readers. But don't address your queries to Captain Eckersley—a selection of those coming to the Query Department in the ordinary way will be dealt with by him.**

### M.C. Loud-Speaker Limits.

P. D. (West Drayton).—"Is there any limit (apart from the current-carrying capacity of the wire in the pot) to the sensitivity which can be obtained in a moving-coil loud speaker by increasing the strength of the field?"

No! I suppose there's no limit to the field you could get if the wire could carry the current.

But, of course, in practice, the limit is the heating of the wire.

### "Heterodyning Orchestras."

P. S. (Davenport).—"If two orchestras were to play together in one room, the result, while perhaps unpleasant, would not be distorted, nor would the music be accompanied by a high-pitched whistle.

"Why then should signals be distorted, or heterodyned as it is called, when two neighbouring radio stations transmit items, for surely this amounts to the same thing, except for the radio link?"

What do you mean by distorted? With wireless, and if two stations are too close together, then the upper frequencies of one get muddled with the upper frequencies of the other and produce more frequencies. This produces a nasty noise, and people call it distortion.

It would be just the same listening to one of these stations as if you had one orchestra going while the upper wind, strings, piccolos, etc., of another orchestra were played (playing a different tune) on top of the orchestra you wanted to hear.

Just the same you would get a horrid noise, and if you call it distortion it is distortion. If you call it anything it's the same in both cases!

### Why Foreigners Fade.

L. W. (Ipswich).—"Is there any theory explaining the reason for distant stations fading?"

Yes, rather—but do you want me to do it all again? All right!

Above the earth there's a layer of charged particles which acts as a reflector to wireless waves. The transmitting aerial sends out rays parallel and rays at an angle to the earth's surface.

The ray parallel which does not fade is the one you get from your local station. The rays shooting upwards hit the electrical layer and are bent down to earth to come in at distant stations.

But the reflecting power of the layer varies, and is sometimes good, sometimes poor, and so the down-coming ray is weaker and stronger, depending on how the layer's feeling about it! Hence fading.

In broadcast waves the layer is ineffective in day-time, and so one gets better—albeit fading—signals at night. See the B.B.C. handbook, which has a very good article on the subject—I wrote it!

### Wave-length and Service Area.

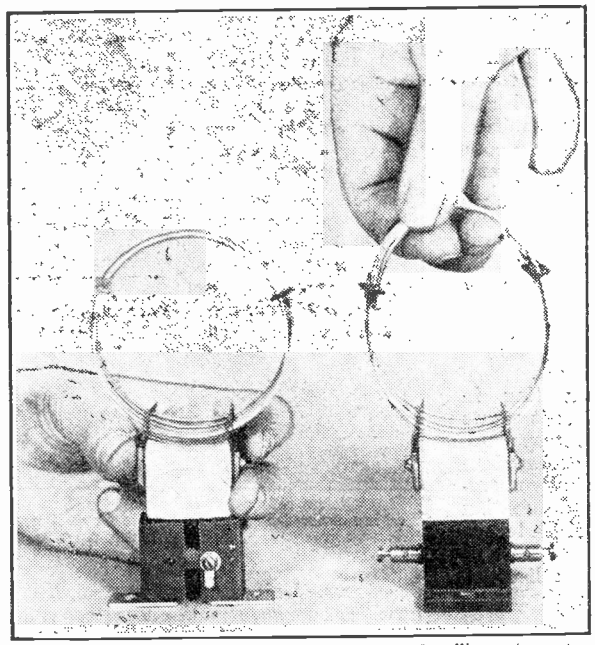
N. C. M. (Harrow).—"Why is the 'service' area of a long-wave broadcasting station greater than that of a low-wave station using the same power?"

Any wave travelling over the surface of the earth gets feebler and feebler as it travels away from the station. Its rate of decay, if the earth had a very large effective conductivity, would be simply according to inverse distance—i.e. if the strength was 1 at 10 miles it would be ½ at 20, ¼ at 40, and so on.

But the earth has a finite conductivity, and energy is lost by its effect and things on the earth, houses, hills, trees, mountains, etc., etc., so that the waves may be of strength 1 at 10 miles, ⅓ at 20, ¼ at 40, and so on.

If the wave-length is made shorter and shorter the losses in the earth are greater and greater, and so a wave dies away not only more quickly than by the inverse distance law but more quickly as it is shorter. So the service area of long-wave stations is greater.

## DON'T KILL THAT COIL!



Attention! There is a right and a wrong way of pulling out a coil. ON THE RIGHT—WRONG! ON THE LEFT—RIGHT! You can't expect a coil to "keep in shape" unless you put the pressure on the holder, and not on the wire.

### The Effects of Rain.

P. T. S. (Manchester).—"Does rain affect reception?"

Yes, with an outdoor aerial, and in Manchester especially, because it deposits soot on the insulators.

Some rain is charged with electricity, too, and makes crackles when it falls on a bare aerial, but this is rare. Rain on a dry *earth* improves things, but, in general, rain does not (except indirectly and after a long time) affect reception.

### Copper or Iron for the Aerial Wire?

P. T. (Norwich).—"Is it essential to use stranded copper wire for an aerial? I have a quantity of galvanised iron wire. Would there be any objection to my using this?"

Stranded copper wire is useful for aerials because it will stand a lot of swaying about in the wind without mechanical breakage.

Galvanised iron wire would not only be liable to chafe, get hard-drawn and break if used out-of-doors, but wherever it is used would be electrically less efficient than copper wire, because of its much higher electrical resistance.

When uncoiling the new wire, keep it free from kinks if you can. Use stranded copper or phosphor-bronze wire for an outdoor aerial, make it all up ship-shape, and don't bother about it any more in spite of the gales!

# WHAT THE PUBLIC WANTS.

**A trenchant article discussing the policy of the B.B.C.**

**By THE EDITOR.**

THE question of "what the public wants" is one which will always exercise the minds of those who have to cater for the public, whether it be in connection with newspapers, books, theatres, food, or broadcasting. There is one school of thought which has for its slogan: "Give the public what it wants," and there is another school of thought which has for its slogan: "Give the public what's best for it."

### The American Way.

The former slogan is chiefly in evidence in the United States, where everything possible is done to pander to the taste of the public. Especially is this noticeable in American ideas of theatrical entertainment. But while, on the one hand, it would not be an exaggeration to say that American business men who cater for a public which patronise cinemas, theatres and newspapers, provide—on the average—entertainment which does not primarily aim at improving public taste, either by forceful or persuasive measures, there are other organisations in America which doggedly persist in endeavouring, if not by persuasive, then by forceful measures, to make the American public take something which it doesn't want.

Uplift societies are admittedly more numerous in America than they are in Great Britain; and although we have no wish to be unduly controversial, it is an admitted fact that Prohibition was brought about in the United States by the energetic propagandist methods of a minority which, because of its very methods, eventually brought about probably one of the most amazing pieces of legislature which the world has ever known. Hundreds of thousands of people—in fact, millions would not be an exaggeration—were made to tolerate—or, at least, to put up with—something which they did not want.

In connection with broadcasting in America, giving the public what it wants is a policy which has pretty full sway; and, consequently, observant critics of American broadcasting methods are practically unanimous in saying that American broadcasting is not on such a high level as British broadcasting. Whether American broadcasting is more *popular* with American listeners than British broadcasting is with British listeners is a moot point.

### Sir John Reith's View.

The above views have occurred to us after reading an article by Sir John Reith, the Director-General of the B.B.C., on "The Business Management of Public Services," which he wrote recently for the journal of the Institute of Public Administration. In the course of his article, Sir John deals with the policy which he admits has caused a good deal of friction with the listening public; in short, the policy of giving the public not what it wants, but what it should have.

"To set out to give the public what it wants," writes Sir John, "is a dangerous and fallacious policy, involving almost always an under-estimate of the public's intelligence and a continual lowering of standards."

Sir John frankly expresses his preference for the monopoly system in British broadcasting, though he is careful to add "subject to certain safeguards in the public interest."

"In some cases," he states, "it is essential; in others, at least highly desirable. Its absence is often unfortunate and even disastrous. Unified central control, if it be absolute enough, should ensure concentration and preservation of effort, and the most economic administration. It should, in fact, imply and supply the highest degree of efficiency in every sense of the term."

Sir John draws as an example the fact that one hears a good deal that is absurd about the advantages of competition as a stimulus to effort. Some advantages of competition are obvious and, in his view, much more so are its disadvantages in waste, undercutting and overbidding. There are other forms of stimulus which bear heavily upon the monopolist. The very fact of monopoly is a stimulus, believes Sir John, or, at any rate, it is so to the right kind of people.

Sir John considers that, paradoxically enough, the policy of giving the public what it wants, although a dangerous and fallacious policy (involving, as we have already stated, an under-estimate of the public's intelligence and a continual lowering of standards) turns out to be not the monopolistic system but the competitive system that is obliged to play for safety.

### A Wise Policy.

It is not insistent autocracy (says Sir John), but wisdom that suggests the policy of prosecuting carefully and persistently a basis of giving people what you believe they should like and will come to like, granting, of course, discretion and understanding on the part of those who carry out the policy.

As our readers know, that has been Sir John Reith's policy ever since the early days of broadcasting. It would have been easy enough to have given way to all the critics of broadcasting and to have followed the line of least resistance by giving the public what it wants. Undoubtedly, by not following that line, the B.B.C. has incurred at times storms of displeasure and disapproval, but after a period of years we can sit back and take stock of the situation and, with some pride, realise that the policy of not kow-towing to the public has been, on the whole, justified.

### The Best.

Mr. Aylesworth, the President of the National Broadcasting Company of America, himself admitted that British broadcasting methods were superior in many ways to American ones. From a progressive standpoint at any rate, and certainly from an educational standpoint, British programmes are probably the best in the world.

What is the alternative? Giving the public what it wants! But how can we ascertain definitely what the public really wants?

The only way is by noting whether the patronage of the public increases or decreases; and the evidence points indubitably to the fact that, year by year, the listening public grows; that, on the whole, it does like what the B.B.C. provides in the way of entertainment, education, etc., and that Sir John Reith's policy, although tinged with that *bete noir* of every Britisher, autocracy, is nevertheless one which, in practice, has certainly turned out to be reasonably satisfactory and definitely better than the American policy of pandering indiscriminately to a noisy public minority.

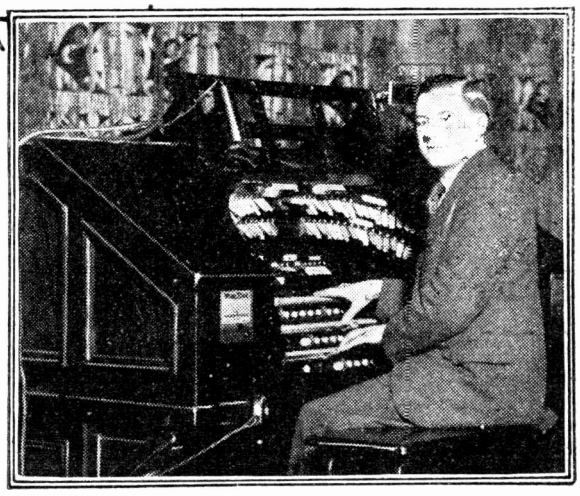
## COLD COMFORT?

This wireless set was taken by the Hon. Mrs. Victor Bruce to accompany her on her motor-dash from Lapland to Monte Carlo. She is here shown warmly clad for the first stages of the run.

## LIFE STORIES OF FAMOUS BROADCAST STARS No 10

# TRYING TO SUIT BOTH THE EAR AND THE EYE

*by* REGINALD FOORT



MANY wireless listeners seem to think that learning to play the cinema organ has taken me years. In reality, it took me only a day, or rather, a night.

Before I turned to the cinema, I had for many years played the organ in a London church. Then, after a time, I tired of the routine and monotony of this, and looked round for fresh fields to conquer.

A friend suggested the cinema organ, I made a few enquiries, and was eventually engaged to play at the opening of a new cinema in the North.

I arrived at the hall four days before the public were to be admitted, and found to my astonishment that the organ had not yet been erected.

### The First Experience.

It was not ready for me to play upon it until twenty-four hours before the performance, and than I sat down to master what was to me an entirely new instrument as speedily as I could.

On the opening night I was able to play perfectly. Within nine weeks they transferred me to the West End of London.

My previous organ experience had stood me in good stead, but I think it was my being a pianist as well that counted in the end, for the American cinema organ as little resembles its church sister as a trumpet does a saxophone.

I had studied under a pupil of Paderewski, and for some time had made my living by playing at concerts and by teaching. Then, finding piano playing not very lucrative, I thought I would try the organ.

My present work is truly fascinating, and especially so when I am aware that the "mike" overhead is alive and listening.

### Realistic Railway Effects.

Playing for the wireless makes one feel a superman. Not only is there the knowledge of an incredibly vast audience, but even the organ makes one feel rather regal.

I sit at a console that has hundreds of stop keys arranged in a semi-circle above the four manuals or key-boards, played by the hands and feet.

We have all seen a cat playing the piano by walking up and down; I do very much the same thing, although not so discordantly.

Wonderful though the console is, with its pistons, gauges, stops and electric lights, it is but a very small part of the organ's entire mechanism.

Hidden behind the grilles the audience sees and listeners imagine, are numbers of large chambers packed with pipes, bellows, a motor, a blower, and action parts of every description.

The organist controls all these in effect, and the effects and music as well. With various keys and stops. I am able to imitate steamboat whistles, surf, wind, rain, thunder, aeroplanes, motors, horses hooves, fire bells, telephone bells, klaxon horns, pistol shots, crockery smashing, birds, and practically every other outstanding sound of the world.

A short time ago, I discovered a new way of imitating the sound of an express train leaving a station, and it must have been good, for when I gave it for the first time the audience burst into a salvo of applause, and the next day several letters of praise were forwarded from Savoy Hill.

**In this notable contribution to a very popular "P.W." series, the well-known cinema organist, Mr. Reginald Foort, F.R.C.O., describes the incidents that led to his being heard by millions of listeners, and some of his experiences as an "outside broadcaster."**

Again, with the organ, one is able to play anything from an overture to a fox trot with a freedom and completeness unknown to any other solo musician. I can play from memory or improvise as I please.

But, as I have already indicated, my greatest pleasure lies in playing to a wireless audience, when I forget those in the cinema and play to the unseen ones alone. Incidentally, preparing my broadcast programmes is my most difficult job. I am now beginning to get accustomed to it, but in my early days, when I was the first and only organist to broadcast, the strain was terrible.

Mr. Reginald Foort.

The music played in the cinema must fit the picture, and the advent of the talkies has in no way altered my own personal position.

A death scene demands a sad tune, a ballroom scene a foxtrot, and so on. In the ordinary way, cinema music is made up from little snips of hundreds of pieces, but for the wireless audience this would never do.

### Time and the Pictures.

A listener cannot see the picture: he wants to hear a piece of music right through. And searching for material that will suit the picture when played at length is a nerve-racking task.

As a rule, I succeed. Only on two occasions can I remember anything going wrong.

When "La Bohême" was being shown, I found that the Overture to "William Tell" exactly fitted some of the scenes, so I included the piece in my programme.

Unfortunately, at the time of my broadcast, the film was either running too fast, or had started a minute too late—it was out of place.

I was just in the middle of the tempestuous finale when I glanced at the screen. I have never felt so foolish in all my life. I was playing that uproarious music as an accompaniment to the death scene!

### Buster Keaton and "Carmen"!

One evening, in order that the main film in the cinema should not be spoilt by the accompaniment, it was arranged that two interest pictures—whose allied music did not matter so much—should be shown, and the main picture, a Buster Keaton comedy, kept until after the broadcast.

Unfortunately, on the day of this particular relay, the management decided to have four programmes instead of three, and so, to make the programmes shorter, the interest pictures were cut out, and my musical arrangement ruined.

The programmes having been published, the B.B.C. refused to allow any alterations. I could do nothing but carry on, and so listeners heard nothing of that broadcast save laughter. But it was more at me than at the film.

While Buster Keaton was falling off trains and generally fooling about, I was playing the "Flower Song" from "Carmen!"

LATEST BROADCASTING NEWS.

# REGIONAL SCHEME PROGRESS.

## AN ARCHBISHOP'S POINT OF VIEW — BIRMINGHAM FEATURES — DIGNITY IN THE CHILDREN'S HOUR—LANCASHIRE COTTON FAIR—A PRACTICAL TALK.

IT is understood that the full alternative programme service will begin from Brookmans Park in the second week of March. At the same time 5 G B will drop its title of Daventry Experimental, and assume that of Midlands Transmitter.

Negotiations between the B.B.C. and Birmingham civic authorities about the orchestra are still going on. The general position in the Midlands is also claiming special B.B.C. attention. It is reported that Mr. Gladstone Murray, the Information chief at Savoy Hill, has recently visited Birmingham, Nottingham, Leicester, Wolverhampton, Shrewsbury, Coventry and Leamington.

### An Archbishop's Point of View.

The Archbishop of York is to open a new series of "Points of View" talks in the London studio on Monday, February 10th. He will be followed a week later by Lord Grey of Falloden. Another notable speaker is coming to the microphone on Sunday, February 9th, in the person of Mr. Frank Hodges, M.P., who is to make an appeal to Welsh listeners on behalf of the Abertillery and District Hospital.

### Birmingham Features.

An important musical programme will be performed for 5 G B listeners in the Birmingham Studio on Sunday evening, February 9th, when a performance of Berlioz's Oratorio "The Childhood of Christ," will be given by the Studio Chorus and Symphony Orchestra, under the direction of Joseph Lewis, with Kate Winter (soprano), Eric Greene (tenor), Robert Maitland (baritone), Joseph Farrington (bass) taking the solo parts.

This work, which was first broadcast about two years ago, is rarely presented to the public. It is an expansion from a shorter work known as "The Flight into Egypt" which was originally a complete work, but now forms the second part of the whole work which has been arranged as a trilogy.

Another musical event in the same week worthy of mention is a symphony concert to be relayed from the Town Hall, Birmingham, on Thursday, February 13th, when Dr. Adrian Boult will be the conductor. The programme includes the overture to Mozart's opera, "The Magic Flute" and Gustav Mahler's "Song of the Earth." The soloists will be Astra Desmond and Steuart Wilson (tenor).

### Dignity in the Children's Hour.

For some reason or another the happy and successful little functions arranged by those who run the Children's Hour at the various stations of the B.B.C. to mark important occasions such as Christmas, the anniversary of the opening of stations, etc., have been discontinued, without enhancing the dignity of the officials whom the children were so proud to meet on those occasions.

It has been left to Scotland to reintroduce these children's parties for members of their Radio Circles, and one has already taken place in the Cowdray Hall, Aberdeen: Glasgow's Radio Circle is giving a party in the Albert Palais de Danse on Saturday, February 15th; while Edinburgh has planned theirs to come off at the Albyn Rooms in March.

### Lancashire Cotton Fair.

From the earliest days the B.B.C. has consistently displayed a desire to help any cause which has for its object the advancement of national progress.

Such an example is the Lancashire Cotton Fair, which is to be opened in the City Hall, Manchester, on Tuesday, February 11th, when, and during the following three weeks, attention will be drawn to the activities of one of the principal industries not only in the north, but of the whole country.

The fair has been arranged by a committee representative of all sections of the industry—including mill-owners and trade union representatives—whose prosperity affects the wellbeing of such important centres as Oldham, Bury, Blackburn, Preston, Bolton, Rochdale and Burnley, to mention but a few of the chief towns around which the cotton mills of Lancashire are clustered.

The opening speeches of the Fair, on Tuesday, February 11th, will be broadcast throughout the Northern Region, and also from 5 G B, and further attention will be called to it by the inclusion of several evening talks and special programmes which are to be broadcast during the first week of the event.

One such special programme includes a play entitled "Progress and the Builder," which depicts the work of Samuel Crompton, whose name is famous for the improvements which he devised to the spinning jenny which brought so much prosperity to Lancashire.

### A Practical Talk.

A good deal of importance is attached in certain quarters to a talk to be broadcast from the London studio on Thursday morning, February 13th, on the subject of bread made from English National Mark flour.

It has the approbation of the Ministry of Agriculture which will supply all applicants with information as to the nearest place from which National Mark flour can be obtained.

## TWO HUNDRED FROM ONE SET!

No less than two hundred families are supplied with radio from a set installed near Baker Street, London, W., and here one of the loud speakers is shown being plugged in to work from this super programme-provider.

TECHNICAL NOTES. By Dr. J. H. T. Roberts, F.Inst.P.

# NOVEL RECORDING METHODS.

## USE OF MAGNETISED WIRE—THE TELEGRAPHONE, ETC.

SOME time ago I mentioned the use of a magnetised wire for the purpose of recording and reproducing sound, and as this seems to have been a matter of general interest to readers, you will probably like to have some further details of this system, particularly as it is being rapidly improved and is to be adapted for use with talking pictures.

The idea of recording sound by converting the sound variations into magnetic variations and impressing these upon a steel wire or tape is generally believed to be due to Poulsen, the arrangement being originally known as the "telegraphone."

Although a certain amount of progress was made with the telegraphone, it never got really very far, because of the difficulty of amplifying the very feeble reproduction obtained from the magnetised wire; you will bear in mind that all this was long before the invention of the thermionic amplifying valve.

It appeared at that time, therefore, that there was a natural limitation to the practical use of the telegraphone, and investigations along these lines practically ceased.

### Renewed Interest.

With the coming of the wireless valve, however, and the general developments in methods of sound recording and reproduction, attention was again turned to the

(*Continued on page* 1102.)

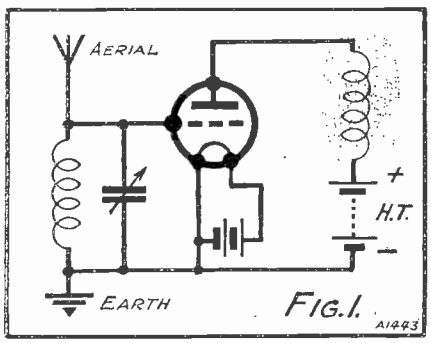
# A RAPID GUIDE TO RADIO

## A JUMPING-OFF SERIES FOR THE NEW AMATEUR

*By "Pentode"*

I HOPE that you now have a fair idea as to what is implied by Rectification or Detection. High-Frequency, or Radio-Frequency Amplification, is merely the magnification of the energy collected by the aerial before it is rectified.

And the valve circuit with which such work can be carried out is of the simplest possible character. You can almost term it a detector circuit without the rectifying



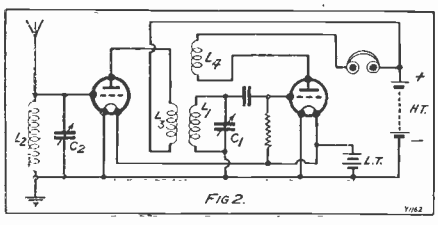

arrangements such as a grid leak and detector or some Grid-Biasing scheme enabling Anode-Bend Rectification to be present.

### An H.F. Transformer.

Supposing a coil were included in the plate circuit of such a simple circuit, what would happen? The complete circuit is then as Fig. 1. And as the oscillating aerial energy made the grid of the valve alternately positive and negative so would the plate current rise and fall.

This would cause a magnetic field (lines of force) to build up and collapse around the plate circuit coil in unison with the aerial oscillations.

This coil can be made the primary winding of an H.F. transformer merely by bringing close to it another coil through which the lines of force could cut and induce current.




The new coil could be the coil of our original detector circuit, and the energy thus fed into it is exactly the original aerial energy amplified by the action of the wonderful thermionic valve.

When two valves are used together in this way there is no objection against using the same H.T. battery and the same L.T. battery, so that the arrangement works out as at Fig. 2.

The coil and condenser that figure in the aerial circuit ($L_2$, $C_2$) are exactly the same as for the straightforward one-valve detector circuit. And the detector circuit still has a coil and a tuning condenser ($L_1$, $C_1$). The condenser is of the same size (·0005 mfd.), but the coil has to be larger, as there is no aerial to add its quota of inductance and capacity in this case.

The coil $L_3$ must be close to $L_1$, in order that as much energy as possible shall be passed over. The two coils can be built up compactly as one component, an H.F. transformer.

### Applying Reaction.

The coil $L_4$ is, of course, the reaction coil, and this can be coupled to either of the two grid coils. If it is coupled to the first one (this will be the aerial coil), the energy from the anode circuit of the detector valve is passed right back to the aerial circuit and can be further amplified by both valves.

There is no great gain in this, and there are disadvantages, so that a coupling with the "intermediate" coil is more popular.

**There is no reason why readers should not read these interesting and instructive articles. Of course, they will have missed a great deal of helpful information, but the articles have been prepared so that they fall into self-contained groups. For instance, this week the subject of H.F. amplification is dealt with in such a way that readers who missed the foregoing articles should still be able to gain a fairly clear insight into the operation of valve circuits.**

**17. HIGH-FREQUENCY AMPLIFICATION.**

It is not essential that an H.F. transformer be used for coupling an H.F. valve to a detector; there is what is known as the "tuned-anode" method. A circuit employing this is shown at Fig. 3.

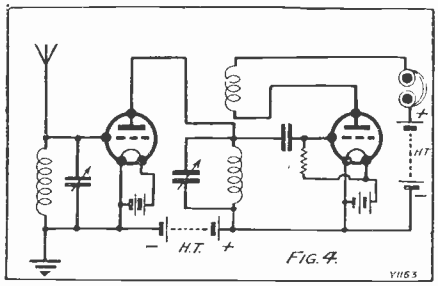
But it is going to make it easier for you to see how this circuit works if we redraw it, giving each valve separate H.T. and L.T. batteries—though please note that this in no way alters the general operation of the arrangement.

Perhaps you can see right away what happens. The aerial energy fed on to the grid of the first valve causes variations in the current which is flowing through the coil that is in the anode circuit.

### Choke Coupling.

The coil and condenser assume their greatest impedance (A.C. resistance) when tuned to the correct wave-length, and it is then that the grid and filament of the detector valve are "tapped" across the "largest" possible voltage developed in the anode circuit of the H.F. valve and, therefore, the most energy is passed on.

You can use an H.F. choke instead of the coil and condenser. An H.F. choke is a coil of wire wound so as to have a large inductance. At the very high frequencies dealt with in H.F. circuits this inductance



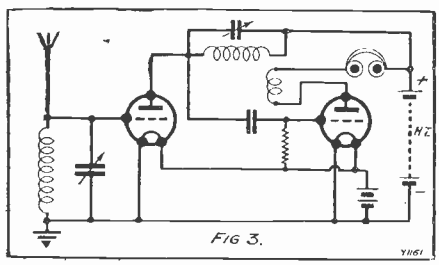

(perhaps some tens of thousands of microhenries) introduces an extremely high impedance.

Thus is the same sort of effect duplicated. The point is even better illustrated when I mention that you can replace the coil and condenser by an ordinary high resistance, say, for instance, a piece of slate pencil of 250,000 ohms or more resistance.

### Using a Resistance.

But *resistance* coupling is not particularly efficient in the H.F. stages. For one thing, to get the equivalent impedance of a good H.F. choke or coil and condenser you would have to have several million ohms, and this would cut down the flow of H.T. current terribly unless colossal voltages were used.

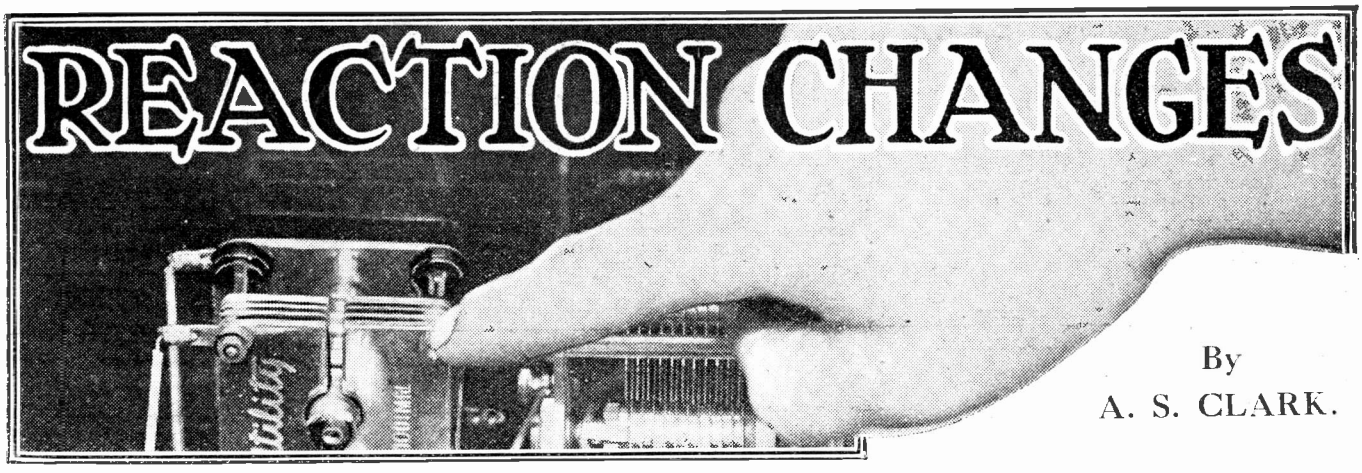
The H.F. choke and "tuned anode" get their impedances with Inductance, and, in the latter case, some capacity, without introducing resistance that will affect the flow of direct current to any great extent.




I fear I am galloping fast now, but I am nearing the end of my series, and must soon leave you to pick up the threads from the regular "P.W." articles.

Don't forget that radio is a logical science and that providing one has a fair idea of its fundamentals one can reason out quite a lot without having to refer to text-books. You have the opportunity to try this out right now with H.F. amplification!

# REACTION CHANGES



By A. S. CLARK.

THERE are still many receivers that employ the original swinging-coil method of obtaining reaction. Some amateurs consider that this scheme is better than capacity control, while others prefer the latter.

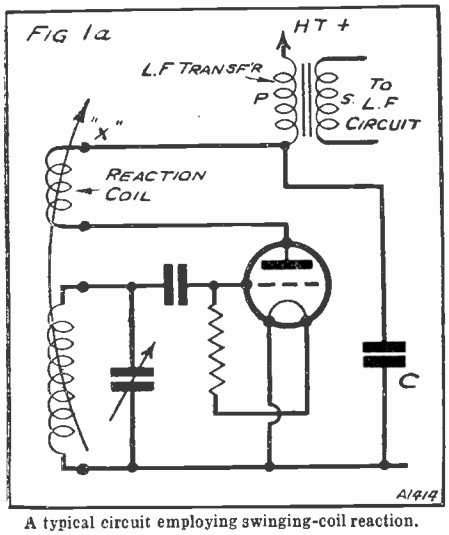
Leaving personal partialities out of the question, capacity reaction certainly scores over magnetic reaction control on several points. These are such as to be of particular interest to those not very skilled in making delicate adjustments of tuning, and condenser control is consequently preferable for domestic receivers.

**It is not difficult to arrange a swinging-coil reaction set to be capacity-controlled, and the alterations are described in this article.**

### Easy Alteration.

It is an easy matter to convert a set with swinging-coil reaction to capacity control, and the conversion is well worth trying. The following details should make it quite clear how one can do it. They apply equally to sets using ordinary plug-in coils, and those in which all-wave tuners of the tapped variety are employed.

The type of aerial circuit does not matter. It will not make any difference whether it is direct-coupled, auto-coupled by means of a tap on the tuned circuit, or whether




A typical circuit employing swinging-coil reaction.

a separate semi-aperiodic aerial coil is provided. No alterations have to be made to the tuned circuit.

Fig. 1a shows the reaction scheme which is almost universal in swinging-reaction-coil receivers. The aerial and earth are omitted since, as already indicated, different methods of coupling may be employed, and it is also possible that the detector valve may be preceded by one or more H.F. stages.

The primary of an L.F. transformer is shown connected in the plate circuit of the detector valve, but it must be appreciated that in some cases it will be replaced by telephones, or the anode resistance of an R.C. unit. Whatever it is, is immaterial so far as the details for converting to capacity-controlled reaction are concerned, and we will assume it is an L.F. transformer for purposes of description.

### For Extra Parts.

Fig. 1b shows the circuit of Fig. 1a altered to capacity-controlled reaction. The only extra components required are an H.F. choke and a reaction condenser. The value of the reaction condenser is not very important, and ·0003 will do for any circuit, but in some cases a ·0001 will be large enough, particularly when plug-in coils are employed.

Mount the H.F. choke on the baseboard near the plate terminal of the detector valve holder, and fix the reaction condenser in a convenient position on the panel. The wiring alterations to make are as follows. Break the wire that runs from one side of the reaction coil to the L.F. transformer.

The point is marked "X" on the diagram of Fig. 1a. Now connect one side of the H.F. choke to the plate of the detector valve and the other to the wire running from the L.F. transformer and which was previously joined to the reaction coil.

The other side of the reaction coil (which is now free), is joined to the fixed vanes of the reaction condenser, the moving vanes going to L.T. —. (The condenser C may be omitted.) This completes all the alterations.

### Final Adjustments.

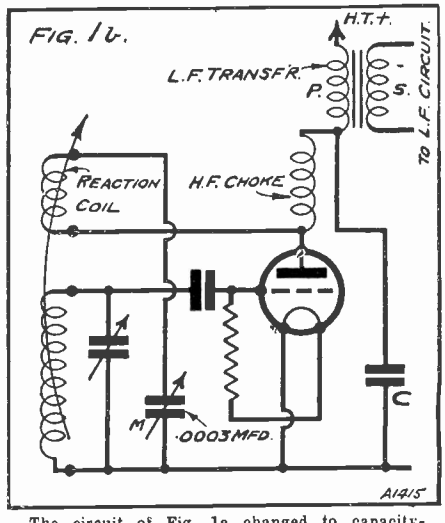
You will appreciate that there are now two means of controlling reaction, the reaction condenser and the original coil holder or reaction knob.

The latter must now be considered merely as a rough control only. It should be adjusted as follows: Set the reaction condenser vanes about one-third the way in, and then adjust the reaction coil so that there is just sufficient reaction to make the set oscillate at any part of the tuning dial.

This applies to both wave-bands in the case of all-wave tuners. The set is now tuned in the usual way, the new condenser being used instead of the original reaction control. As its capacity is increased so reaction will increase, and vice versa.

### Hints on Handling.

Sometimes hand capacity is experienced on the reaction condenser of a Reinartz circuit, and a few hints on overcoming this will not be out of place. Usually the fact of having the moving vanes of the




The circuit of Fig. 1a changed to capacity-controlled reaction.

reaction condenser connected to L.T. — obviates the trouble.

If, however, it is present in spite of this, it will probably be accompanied by a "ploppy" control of reaction, and the following hints will help to put the matter right.

Use a smaller reaction coil. (This applies chiefly when plug-in coils are employed.)

Lower the value of the H.T. on the detector valve.

Use a higher value of grid leak for the detector valve.

Fit a ·0002 series fixed condenser in the aerial lead. (In some sets this will already be incorporated.)

Make sure the L.T. accumulator is not running down.

### THE "MAGIC" THREE.

The Editor, POPULAR WIRELESS.

Dear Sir,—G. E. B. of Port Talbot would have saved himself much trouble, and probably a lot of expense, had he adhered to the value of resistance specified by the designers of The "Magic" Three, i.e. 25,000 ohms. In his letter he states that a 100,000-ohms resistance was used, and that a 300-turn coil is necessary for reaction.

The reason for such a big coil is obvious, for assuming his supply is 120 volts, the voltage on the detector anode when using 100,000-ohms decoupling resistance, and an ordinary L.F. valve may quite possibly be less than 30 volts, when the D.C. resistance of a Ferranti A.F.3 (2,000 ohms) is also taken into account. If G. E. B. will substitute a 20,000 or 25,000-ohms resistance for that mentioned in his letter, he will get all the reaction he requires with the coils recommended, and the results will certainly be more amazing than he is getting at present.

Yours faithfully,
M. E. CHAPLIN.

Ipswich.

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The Editor, POPULAR WIRELESS.

Dear Sir,—I built the "Magic" Three about four weeks ago, and the results are amazing. I am only using the spring mattress of the bedstead for an aerial at present, and I can get a good number of stations, loud-speaker strength.

I am very grateful to POPULAR WIRELESS for bringing into existence such a fine set.

I have since constructed the H.F. unit, and would be pleased if you would inform me just how to connect to the "Magic" Three.

With all good wishes to you and your paper,
Yours truly,
J. B. LEWIS.

Ipswich, Suffolk.

[ED. NOTE: Full details for the connection of the H.F. unit will shortly be given in the "Radiotorial" columns.]

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The Editor, POPULAR WIRELESS.

Dear Sir,—As an old reader of your paper, I feel I must write to say how much I appreciate the "Magic" Three. I have built a good few sets in my time, but this is the best. But to those who wish to hear it at its best, I would advise them to use a super-power valve with output filter in the last stage, using 150 volts on its plate and 22½ grid volts.

I wrote this letter for another purpose as well, and that is as regards the connections to the coil holders. I happened to build an identical set to my own (the "Magic" Three of course), but found on switching on that the X coil didn't tune all the wave-lengths from 230, or thereabouts, to 500 as my own did, and, of course, I was a bit puzzled and sat down to think it out a bit. Then it struck me that the coil holders were mounted differently, and on rectifying this everything was O.K.

Anyone who has built this wonderful set and cannot tune from 230 to 500 metres with a 60 X coil should try reversing the leads to both coil holders,

## CORRESPONDENCE.

# The "MAGIC" THREE.

**A FURTHER SELECTION FROM THE HOSTS OF LETTERS FROM READERS WHO HAVE BUILT THIS REMARKABLE RECEIVER.**

**Letters from readers discussing interesting and topical wireless events or recording unusual experiences are always welcomed; but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—EDITOR.**

viz., aerial side of coil holder to earth side and vice-versa, and the plate side of reaction coil holder to the side connected from the H.F. choke and vice-versa. I always make a rule of remembering that the plate side of reaction coil is connected on the same side as the earth is on the aerial coil holder.

This may not be a very clear letter, but I have endeavoured to explain to the best of my ability, and I think there may be many people who have overlooked this point and have been disappointed with results.

Another point of interest is that of working on the long waves. Well, not having a large enough reaction coil to work Daventry 5 X X properly, I tried shunting a '0001 fixed condenser from one side of H.F. choke (the one nearest the reaction condenser and connected to same) to any point connected to earth. With 250 X coil and .50 or 60 reaction, I found I could oscillate and tune in all the long-wave stations, so I left it in, and found that on going over to the broadcast band again I needed less H.T. and only a 25 or 30 reaction coil, without any sacrifice of volume or tone. I may have bored you stiff with all this, but if my experience will benefit anyone else, I shall be satisfied.

Yours faithfully,
H. W. COOK.

Manchester.

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The Editor, POPULAR WIRELESS.

Dear Sir,—Having put the "Magic" Three to a strong test during the last three weeks, I am thoroughly convinced that its capabilities have no limit.

So far, so good. But I must admit that there is one "snag," and this is undoubtedly shared by many others. In this I refer to the irksome business of opening the cabinet in order to change coils on the broadcast band.

I have, after a few interesting experiments, overcome this difficulty by means of a double-throw three-pole switch, working on large diameter coils of my own construction.

The medium wave, 2 L O, 5 G B, etc., etc., has a tapped coil, and the long wave, 5 X X, Radio Paris, F L, and Hilversum, run on an untapped coil. The same reaction is in use, but naturally with a much tighter coupling on the long wave. Whichever coil is not in use is completely put out of circuit.

Believe me, yours truly,
Maidstone. J. W. KNIGHT.

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The Editor, POPULAR WIRELESS.

Dear Sir,—Having heard quite a few good remarks about the "Magic" Three, I decided to build same a few evenings ago. I was really astonished when I switched on to hear the new high-power station at Rome coming in on the loud speaker at tremendous volume. Up to the time of writing I have received about fifty stations on the loud speaker, and hope for more. I have built at least twenty three-valve sets, but not one of these came up to the "Magic" Three in either volume or purity. I have not tested this set on short waves yet, but hope to do so in the course of a day or so.

Thanking you for such a remarkable set, and wishing your paper every success.

Yours faithfully,
F. G. BARNES.

P.S.— I can cut Liverpool, my local station, out within a few degrees of the dial without a wave-trap.

Liverpool.

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### THE "ANTIPODES ADAPTOR."

The Editor, POPULAR WIRELESS.

Dear Sir,—I have much pleasure in writing to you about the "Antipodes Adaptor." I built the "A. A." a few months ago, and so far I have logged some two dozen stations all over the world. Some of them are 2 X A F, K D K A on 26 metres, G 5 S W, Zeesen, P C J, 7 L O, P C L, 2 P J, Bangkok, Radio Manila, 6 A G, 2 M E, G B X, 1 A B Singapore, etc. The unit works excellently well with the ordinary set. We in Ceylon are unlucky for we are unable to get the proper components from the local dealers.

About 5 S W we here are unable to appreciate its transmissions, for we have to keep up till midnight to hear it, and even after waiting till midnight we are sometimes disappointed. P C J and Zeesen comes here very loud as early as 8.30 p.m., I.S.T., but 5 S W cannot be received so well as 2 X A F on early mornings.

Listeners in Ceylon are eagerly waiting for a day when the B.B.C. will open an Empire S.W. station for the British Colonies. The new Brookmans Park station can be received here after about 11 p.m., I.S.T. at good strength, but atmospherics are very troublesome. At present I am using an S.G. four-valve set, which is very similar to the "Magic" Four which we received by the last mail, only the reaction is different. I will change the circuit when I get a differential condenser. I have been a regular reader of the "P.W." for the last year and a half, and have learnt many things by the help of the "P.W."

Thanking the "P.W." staff, and wishing it success.

Yours faithfully,
Moratuwa, Ceylon. W. T. FERNANDO.

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# SHORT-WAVE NOTES.

**By W. L. S.**

I HAVE several times been asked my opinion as to the best type of detector valve to use for short-wave work, and have invariably replied that it depends largely upon the coupling following the detector, but that my own personal preference is for one of the excellent "H L" type general-purpose valves.

No one seems to have worried, though, about the other valve or valves in the receiver, and I think it worthy of mention that I am using at present as my output valve also one of this type, with an impedance of 30,000 and an amplification factor of 30. Failing this, I often use a "DEL" type with an impedance of about 7,500, in preference to a small power valve.

### Signals Sharpened-up.

This only applies, naturally, to a receiver intended for use with headphones only; quality of reproduction suffers considerably, but signals are considerably improved in strength, and in the case of C. W. (which happens to be what I am keenest on for the next month or so) the signal is "sharpened up" quite a lot. In addition to this we have the advantage of the low anode current taken by the output valve.

Naturally, for loud-speaker work such an arrangement is strongly to be deprecated; the grid-swing that these valves will handle is rather small, and considerable distortion must occur on strong telephony (although it has not yet been noticeable on headphones).

So many readers send in queries of various kinds about the use of A.C. mains units in conjunction with short-wavers that the Editor has asked me to contribute a separate article on this subject.

I must apologise for not answering the letters individually, but hope that the various points will be cleared up in the article referred to.

The "Dorchester" telephony station, reported by several readers as working at various times with the yacht "Elettra," is apparently causing quite a stir in the Antipodes. I have the card from New Zealand which I have, I believe, mentioned previously, and I have had reports by radio from several of the New Zealand enthusiasts, all to the effect that he is stronger than 5 S W and altogether puts out a very fine transmission.

Another new telephony station is Rugby, G B U, who is reported by quite a shoal of readers. He apparently works at irregular times on 33 or 34 metres, and has been responsible, it is believed, for burning out one listener's best pair of headphones.

One of these (a Plymouth reader) is in trouble because he can do anything he likes down to 30 metres, and there he is stuck. He can in no circumstances get lower. A common trouble at first, R. C. A.! Probably you have not quite got the hang yet of the best layouts for short-wavers, and your wiring is too long or too complicated.

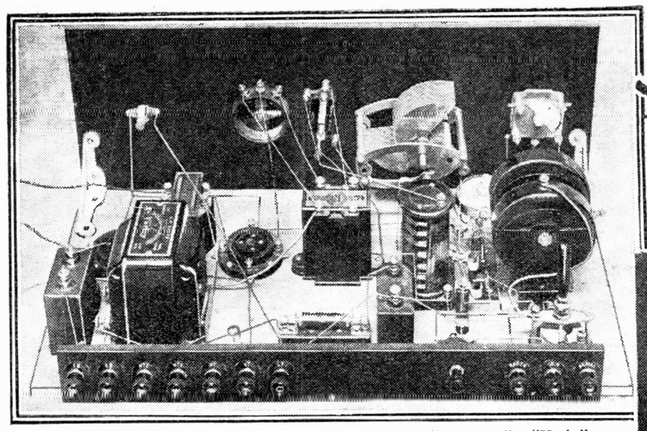
### Keep the Wiring Short.

If you use a series-fed circuit the trouble can't possibly be due to H.F. chokes or anything of that kind. I take it you have tried other valves as detectors? Persevere with improving the general layout and "smartness" of the set, and shorten the wiring as much as you possibly can, and success will arrive all of a sudden.

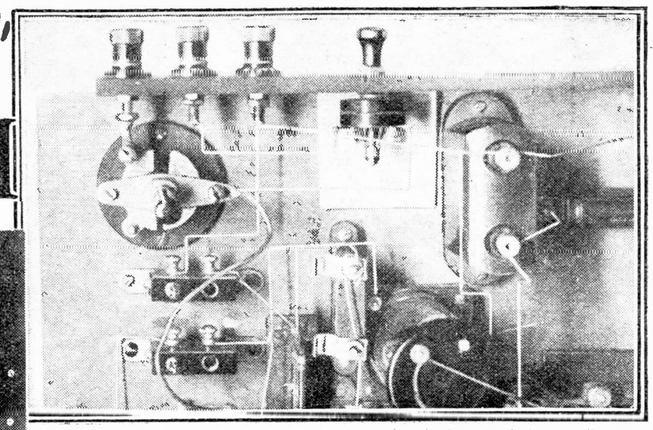
A Loughborough reader reports hearing a station calling W O O on 24·6 metres and announcing "This is G 2 G N calling from the 'Olympic,'" and afterwards the station was heard working with F 8 B Z. Can anyone else throw any light upon this?

Another transmission that has been responsible for a lot of correspondence is that of "Buttercup." This man has been heard working with "Yellow File" now, and with "Buffalo Red" on other occasions. Any further information on any of the above transmissions will be welcomed.

# The "MAGIC" RADIO-GRAM



No matter how you look at it—back view, front view, or any other way—the "Magic" Radio-gram is a winner!



You can look down on to the baseboard—but you've simply got to look up to the set when you hear it!

THIS week we are presenting to our readers that famous receiver, the "Magic" Three, in a new guise. We have already given it in a simple standard form, and also with various refinements which could be added to make it into something of a "de luxe" receiver, and now comes the turn of those readers who are interested in electrical gramophone reproduction.

For them we have designed a radio-gram version of the "Magic" Three, and we have taken the opportunity of incorporating in it many of those special little refinements we have discussed in the past, since no doubt such users will wish to make it something of a "last word" outfit.

At the same time, since it is now some little while since the original appeared, we are taking the opportunity of repeating the design more or less in full, so that those who have not previously tried the "Magic" Three can, if they so desire, make it up like any other new receiver.

Since there may be some of our readers who did not see the original design at all we may as well just run briefly over the circuit details of the receiver portion proper. We will endeavour to do this in as little space as possible, and then go on to the special new arrangements which will no doubt interest all those who have already constructed the set.

### Converting Your Own "Magic."

We should like to explain at this point, by the way, that it is quite an easy matter to add the pick-up arrangement to the existing standard version, as you will see as you go on. In the interests of those who already possess an example of the "Magic" Three in standard form, we have taken care to make the pick-up arrangements as simple and as easy to add as we could, and we actually produced the present receiver by taking the original model and converting it.

The special secrets of the "Magic" Three circuit are chiefly located in the tuning and reaction arrangements of the detector valve. First of all, there is a tuned circuit composed of a standard type of "X" coil tuned by the usual ·0005 mfd. variable condenser. This in itself is a good standard method of getting a satisfactory degree of selectivity, which is further enhanced by the special reaction scheme and also by an adjustment of the grid potential of the detector valve to the best working point by means of a potentiometer.

Then, to make the set suitable for use on short waves without the tuning becoming unduly difficult, there is a fixed condenser of ·0005 mfd. which is arranged for insertion in series with the tuning condenser when required. This is put out of action when not required, in a fashion which you will understand when you look at the photographs and wiring diagram.

This condenser is the one marked $C_6$ and you will observe that it is fitted with grid-leak clips. The idea is that when you do not require the condenser in circuit you insert in these clips a short piece of brass or copper rod or tube of about the same dimension as a grid leak, or failing that a short piece of pencil or wooden rod wrapped in tinfoil, so short-circuiting the fixed condenser and thereby leaving the variable condenser alone in circuit.

**Here's a set that not only beats Records but *plays* Records as well! Literally packed with programmes, it is another triumph for**

**THE "P.W." RESEARCH DEPARTMENT.**

When the condenser $C_6$ is "unshorted," so to speak, it has the effect of reducing the maximum tuning capacity to half its normal value and so renders tuning very much easier on the shorter waves.

We have already mentioned that there is a device provided for the correct biasing of the grid of the detector valve, and you will observe that this takes the form of the potentiometer marked $P_1$ on the diagrams.

### Special Reaction Circuit.

With the aid of this you are enabled to find a grid voltage for the detector valve which gives you the smoothest possible reaction, and since this is usually somewhere half-way between negative and positive, there is a consequent improvement in selectivity for technical reasons with which we will not trouble you at this point.

The reaction arrangement is a special form of the differential method which we introduced especially for use in the "Magic" Three. As the reader is probably aware, differential reaction has the very great merit of having practically no effect in upsetting the tuning when it is adjusted, and the particular form adopted in the "Magic" Three possesses this virtue to a high degree. In addition, it has the particular merit of placing the moving plates, that is to say the spindle, of the reaction condenser at earth potential so that hand-capacity effects are practically abolished.

Differential reaction also gives the receiver perceptibly more sensitivity than the more ordinary form of Reinartz reaction, and this particular feature does more than any other one detail to make the "Magic" Three the remarkable receiver which so many of our readers have found it to be.

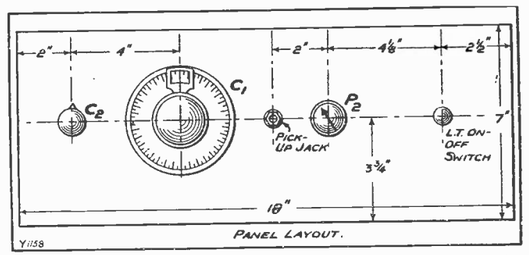
Not merely does it make the set remarkably sensitive and give it an excellent degree of selectivity, but also it makes it most delightfully easy to operate. This naturally follows from the fact that alterations of the reaction control do not upset the tuning to any degree that you can discover on even quite weak signals. Consequently, it becomes almost ludicrously easy to tune in station after station, because you can find the exact point upon your tuning dial and then proceed to adjust reaction to the correct amount required to give the desired strength, without having to go back to the tuning and laboriously check it up once more.

### Power and Stability.

Following upon the detector we have the other main important feature of the "Magic" Three, namely an unusually powerful yet stable L.F. amplifying side consisting of two transformer-coupled stages. In this way enormous amplification is obtained with suitable valves.

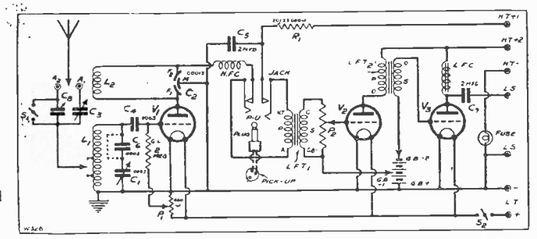
Adequate precautions are of course taken to ensure stability. In the first place, there is what is commonly called an anti-motor boating filter at the detector stage,

(*Continued on next page.*)




The panel is just like the "Magic" Three's, except for the pick-up jack and the volume control (P2).

**Your old Gramophone will be as pleased as yourself with THE "MAGIC" RADIO-GRAM and you can carry on after every station in Europe has closed down!**



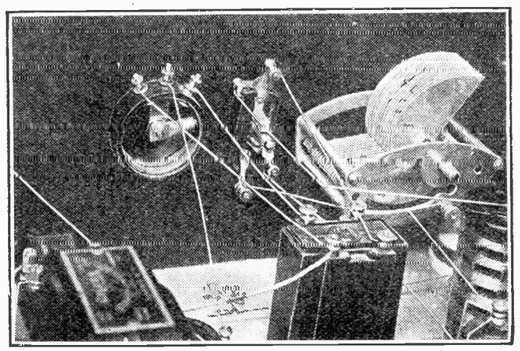
As the original "Magic" circuit couldn't be beaten we "de-luxe-ified" it a bit, and the above diagram shows every detail of the system of connections.

## COMPONENTS AND MATERIALS.

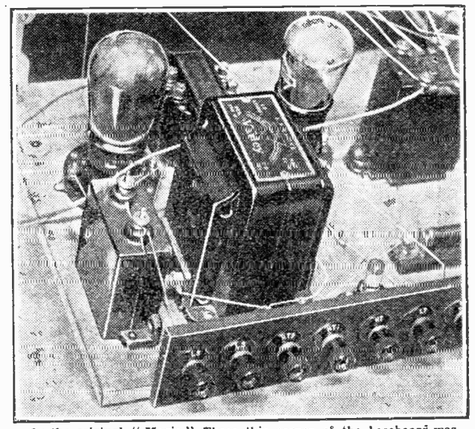
1 Panel, 18 in. × 7 in. (Resiston, Becol, Trolite, "Kay-Ray," Trelleborg, etc.).
1 Cabinet to fit, and baseboard 9 in. or 10 in. deep (Pickett, Raymond, Cameo, Gilbert, Lock, etc.).
1 ·0005-mfd. variable condenser, slow-motion type or with Vernier dial (Lissen, J.B., Lotus, Igranic, Raymond, Burton, Gecophone, Ormond, Utility, Dubilier, Bowyer-Lowe, Cyldon, Formo, Colvern, etc.).
1 Vernier dial, if condenser not of slow-motion type (Utility, Lissen, Igranic, J.B., Lotus, Brownie, Formo, Ormond).
1 ·0001-, ·00013-, or ·00015-mfd. differential reaction condenser (Lotus, Ready Radio, Lissen, Dubilier, Pye, Burton, Utility, Wearite, Ormond, Magnum).
1 L.T. on-off switch (Benjamin, Lissen, Igranic, Lotus, Bulgin, Wearite, Keystone, Burton, Raymond, etc.).
3 Sprung valve holders (Lotus, Igranic, W.B., Benjamin, Formo, Magnum, Wearite, Burton, Bowyer-Lowe, etc.).
2 Single-coil sockets (Lotus, Raymond, Wearite, Keystone, etc.).
1 400- or 200-ohm baseboard-mounting potentiometer (Igranic, Lissen, Ready Radio, etc.).
1 Baseboard-mounting neutrodyne type condenser (for use as series aerial condenser on short waves, not for neutralising). (Magnum, J.B., Lissen, Keystone, Bulgin, etc.)
1 H.F. choke (Varley, Lewcos, Ready Radio, Dubilier, Igranic, Lissen, R.I., Climax, Raymond, Bowyer-Lowe, Bulgin, Magnum, Wearite, Colvern, etc.).
2 L.F. transformers of low ratio, preferably of different makes or types. (R.I. "Hypermu" and Igranic "J" in set). Any good makes. A few other examples are these: Ferranti, Lissen, Brown, Telsen, Cossor, Varley, Lotus, Lewcos, Philips, Mullard, etc.)
1 ·0003-mfd. fixed condenser (Igranic, T.C.C., Dubilier, Lissen, Clarke, Graham-Farish, Goltone, etc.).
1 2-mfd. Mansbridge type condenser (Lissen, Ferranti, Dubilier, T.C.C., Hydra, Mullard, etc.).
1 2-megohm grid leak and holder (Ediswan, Lissen, Dubilier, Igranic, Carborundum, Loewe, Mullard, etc.).
1 25,000- or 20,000-ohm resistance and holder (any resistance of 20,000-60,000 ohms will serve). (Ready Radio, Dubilier, Ferranti, Lissen, Varley, Precision, R.I., Mullard, Igranic, etc.)
1 Terminal strip, 16 in. × 2 in. × ¼ in.
10 Terminals (Igranic, Belling and Lee, Eelex, Clix, etc.).
Wire, Screws, G.B. plugs, fuse, etc.

The list above is that for the standard version. For the "Radio-Gram" form the following additional parts will be needed:

1 Combined series aerial condenser and shorting switch (Wearite).
1 "Double-circuit jack" (Lotus J.K.3, Igranic, Ormond, etc.).
1 ½- or 1-meg. volume control, 3 terminal type (R.I., Gambrell, Varley, Igranic, Rothermel, etc.).
1 ·0005-mfd. fixed condenser with grid-leak clips (T.C.C., Lissen, Dubilier, Mullard, Goltone, Graham-Farish, Clarke, etc.).
1 Output filter choke (Varley, Ferranti, R.I., Igranic, Wearite, Magnum, etc.).
1 2-mfd. condenser (T.C.C., Lissen, Dubilier, etc.).



Perhaps the "P.W." photographer took special care to show these wires clearly, for he runs a "Magic" Three himself, and wants to adapt it for gramophone work as well. Anyhow, every wire to the jack and volume control is very clearly shown on this photograph



On the original "Magic" Three this corner of the baseboard was left comparatively empty, in case it was desired to fit a filter circuit later. And here the necessary choke and condenser are shown in position, forming yet another valuable feature of the "Magic" series.

## THE "MAGIC" RADIO-GRAM.

(Continued from previous page.)

consisting of the resistance $R_1$ of 25,000 ohms, or thereabouts, and the 2-mfd. condenser $C_5$. This is a most valuable aid in preventing battery coupling troubles, and practically removes the risk of howling under normal conditions.

The careful layout of the L.F. side to prevent interaction also plays its part in promoting stability, as also does another little device in the second stage. We refer to the fact that we have provided a connection to earth from the core of the second L.F. transformer, which helps to stabilise the receiver still further.

This is done by taking the lead which runs between two of the filament connections of the valve holders $V_2$ and $V_3$ to the earthing tag provided on the second transformer, which point is marked X on the wiring diagram. Of course, this is not absolutely essential, and with those transformers not provided with an earthing point should be ignored.

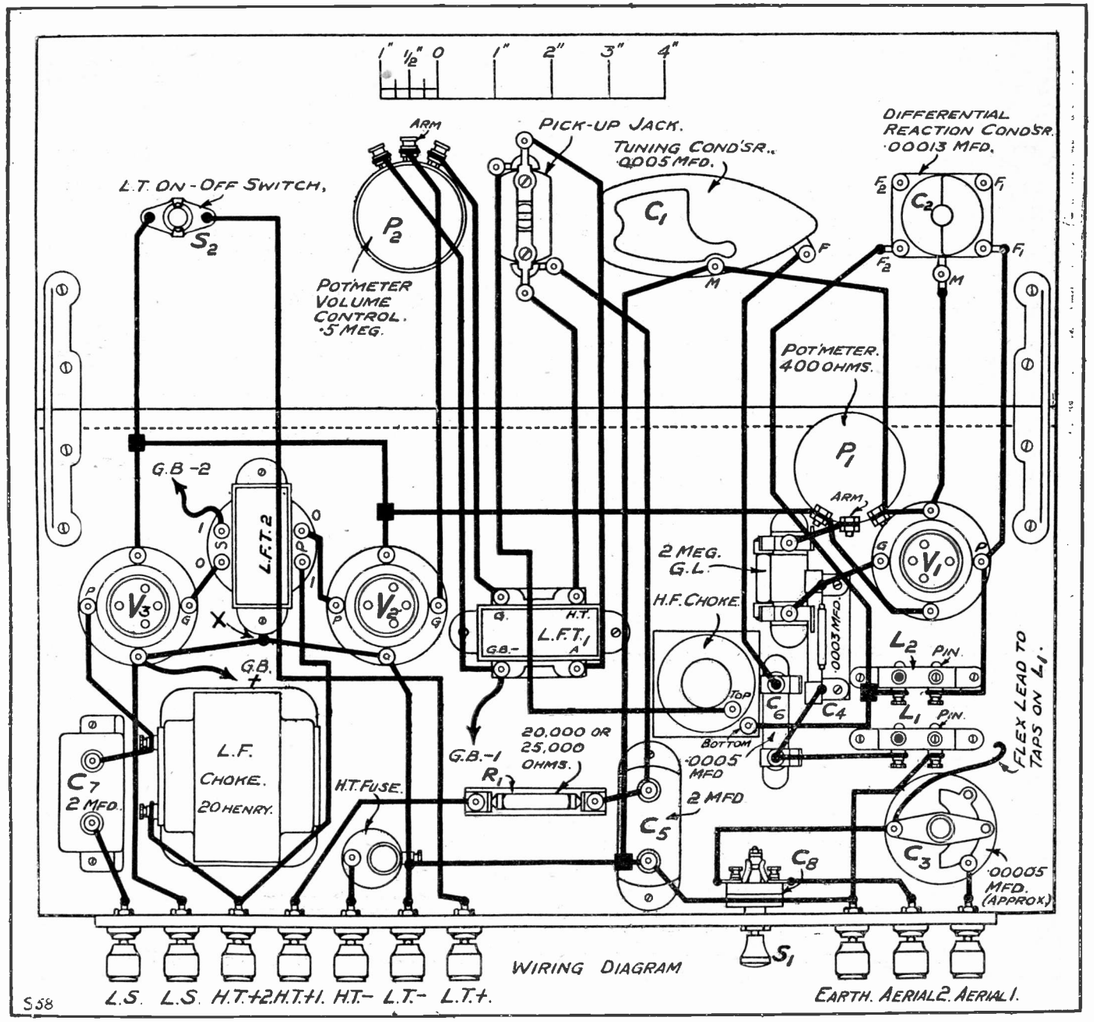
### Special New Features.

Those are the details of the "Magic" Three main portion common to all of its various versions. Now let us just run over very briefly the special features of the particular form. In the first place, we have incorporated two of the special refinements suggested in later articles—namely, an output filter for the loud speaker and a volume control.

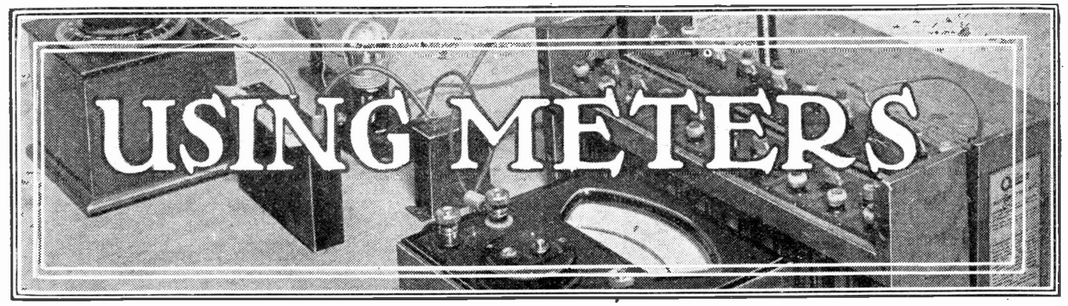
Both these features are very desirable in a radio-gram outfit. The volume control is almost a necessity, because with a sensitive pick-up you are likely to find yourself overloading the last valve in the absence of a volume control, and there would be nothing you could do about it. With the aid of the control you can adjust the volume to a nicety, and give your last valve just as much as it can carry without distortion setting in.

Although not so necessary, the output filter is nevertheless decidedly desirable. A radio-gram outfit is presumably one arranged with considerable regard to the best possible quality, and that means plenty of H.T. on the last valve, which will no doubt be a super power. In such cases an output filter is a great help.

In the detector circuit you will find one further little refinement which we have not previously shown in a "Magic" design, namely, an optional series aerial condenser provided with a switch for cutting it out of the aerial circuit when not required, but these and other points we must reserve for next week's article.






THERE are two ways in which a milliammeter can be used. You can connect it up to show you how much H.T. current the set is using, or you can make it show you whether a valve is overloading, or in some other way distortion is occurring. The two things are not the same.

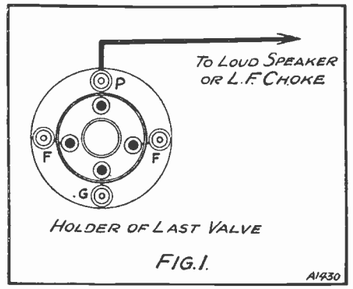
In the second case you want the H.T. current of only the one valve to pass through the milliammeter.

For either task a meter giving readings from 0 to 20 or 30 milliamps will be necessary if your set uses a power or super-power valve. Such a meter will cost anything from about 2s. 6d. up to £7.

### Three Points to Note.

The cheapest kind may answer your purpose, for you will not want laboratory accuracy of measurement.

To determine the total current that is flowing from your H.T. battery or mains unit you connect the device between the negative terminal of the H.T. supply and the negative H.T. terminal of the set.




**This is the wire you have to disconnect in order to insert the milliammeter when you use it to check the power valve's activities.**

That is, you disconnect the negative H.T. lead from the set, and join this to one terminal of the meter. The other terminal of the meter is then connected to the H.T. negative terminal of the mains unit or H.T. battery with a short length of wire.

The reading given indicates the total current passing from the H.T. battery or mains unit. There are three points to note. The set must not be in an oscillating condition (turn your reaction back to zero) or more current than usual may be passing.

If the meter is connected up the wrong way round no reading may be given. And finally, if the resistance of the meter is unduly high the set may howl because a common coupling between its anode circuits has been introduced.

**The listener who operates his set without meters is working in the dark. Meters can tell you exactly what is happening to a receiver and exactly where there is likely to be distortion. And this article explains in the simplest possible way how to choose and use one of the most important of all meters.**

**By G. V. DOWDING, Assoc.I.E.E.**

By the way, don't forget that a tiny meter with a small scale and a thick needle cannot show you anything but approximations. The bigger the scale and the thinner the needle the closer the readings you can take.

In order to test the H.T. current passing to one particular valve in order to test this valve for distortion you must proceed as follows:

If this valve has a positive H.T. tapping on the H.T. supply all to itself you can connect the meter in series with the H.T. lead concerned. But it often happens that the very valve you want to test shares its H.T. tapping with some other valve or valves.

In such a case, or perhaps in any case, it is best to start right at the plate terminal of the valve holder.

Supposing you want to test the last valve, the power valve in the last L.F. stage. (This is the valve that is more often badly overloaded or working under incorrect conditions.)

You disconnect the wire that is on the plate (anode) terminal of the valve holder, and join this wire to the one terminal of the meter. The other terminal of the meter is then connected to the plate terminal of the valve holder.

### Mind Those Filaments!

Of course, it won't matter if you have to lengthen the existing wire by temporarily joining another piece of wire to it in order to place the meter in a comfortable position for reading its needle movements.

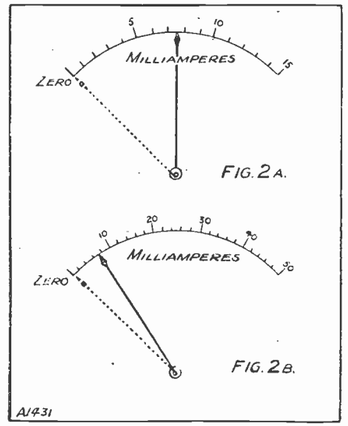
But do be careful that you do not short-circuit anything and burn out the valves. This can only too easily happen, perhaps by touching the plate valve lead against a filament wire or terminal or something else or by touching the metal case of the meter against something. Please note that last point very carefully.

Practically any type of milliammeter can be left permanently in circuit in order to give you indications the whole time the set is in use. The exceptions are those of high resistance (these would drop your H.T. voltage and mess up your anode circuit characteristics) and those of the watch type not having terminals.

Panel-mounting milliammeters suitable for permanent connection can be obtained from Messrs. Bulgin, Ferranti, Sifam, Ward & Goldstone, and other well-known firms.

### Scale Sizes.

An extremely useful type, but one that is rather more expensive than the simple kind, is the one that has three ranges, 0–5, 0–10 and 0–25 milliamps. These three ranges are valuable because while the first gives you a wide needle movement for smaller H.T. currents (such as with a detector valve) you have another range (the third) capable of getting in the currents handled by the smaller super-power valves. Actually you must have a meter having a maximum on its scale at least 25 per cent

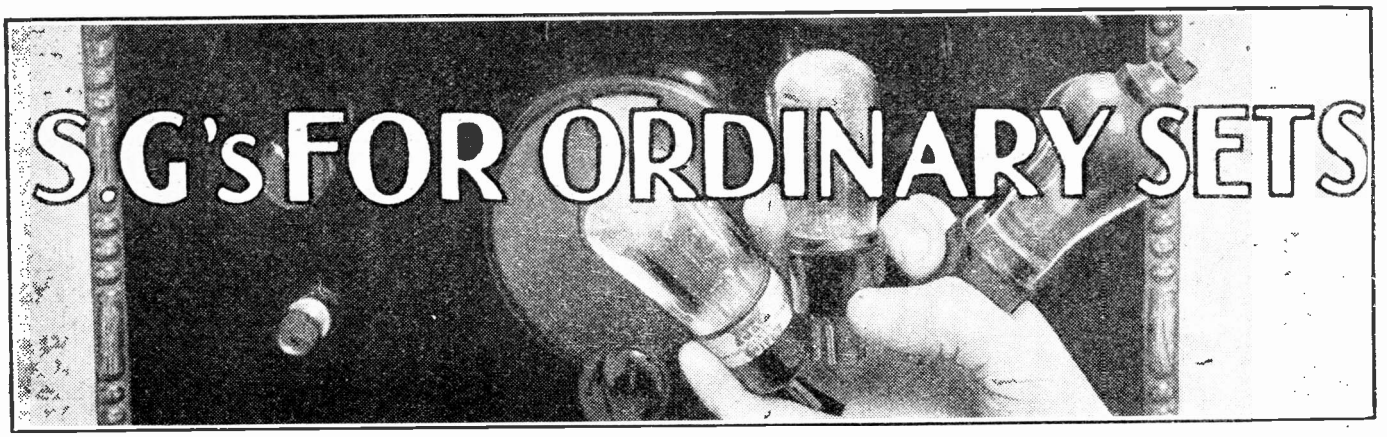



**This drawing illustrates the importance of the relative sizes of the scales of meters. Notice the distances covered by each of the needles to indicate the same one or two milliamperes.**

greater than the greatest H.T. current you ever expect to use.

Don't purchase a meter reading to much greater figures, as the relative needle movements will be so much smaller.

Would you notice a 1 milliamp decrease with Fig. 2B as easily as you would with Fig. 2A? Finally, your object will be to keep the needle of the meter practically stationary when the loudest noises are coming through the loud speaker. But the actual interpretation of milliammeter needle movements has been dealt with quite recently in "P.W."




**In response to numerous requests we are giving full details for the easy conversion of an ordinary set so that it can take one of those wonderful screened-grid valves. The example chosen uses a very popular type of circuit.**

**By G. T. KELSEY.**

HAVE you ever considered the possibility of using an S.G. valve in place of the present valve in the H.F. stage of your receiver, and do you know what alterations are necessary to the circuit in order to make this possible?

Perhaps you are even wondering why it should be necessary to have to make alterations at all when it is desired to change over to a screened-grid valve.

### Preventing Feed-back.

In these circumstances it is reasonable to suppose that a few words of explanation will not be altogether amiss, although it should perhaps be explained that the main object of the present article is to deal with the practical, rather than with the theoretical, side of the question, and that in consequence the "theory" part of the business must be kept short.

When designing the H.F. stage of a set on the ordinary neutralised principle, the coils, wiring, etc., are so arranged that as far as possible no coupling shall take place when the set is working between the grid and anode circuits of the H.F. valve.

The distance separating the coils is based to a large extent upon the degree of amplification given by the valve, since the strength of the "fields" round the coils is very largely governed by this factor. The S.G. type of H.F. valve differs from the ordinary variety in that it has a very much higher amplification factor although, of course, this is not the only essential difference between the two valves.

Consequently, when an S.G. valve is used to replace a valve of the ordinary H.F. type in a set, the coil "fields" increase due to the much greater degree of amplification given by the S.G. valve, and as a result, there is a danger of the set becoming unstable through coupling effects.

### Alterations Essential.

Quite apart from the question of coils, there are, of course, other contributory reasons for the tendency towards instability, such as, for instance, coupling between the wiring. Thus, in point of fact, there are very few sets with ordinary neutralised H.F. stages into which an S.G. valve can be placed, without in some way modifying the existing layout and arrangement.

In attempting to deal with the practical side, one is faced with the difficulty that there are literally dozens of different ways in which to couple the H.F. valve to the detector, although I do not think there is very much doubt as to the arrangement most generally in use.

It is obviously quite impossible in the scope of a single article to give directions which will be applicable to all receivers, and since, to deal with the subject at all thoroughly, it will be necessary to limit the subject to one particular type of set, I propose to deal with those employing the popular split-primary-transformer method.

The H.F. side of a typical set employing the split-primary-transformer scheme is shown in Fig. 1, and although in this particular example a coil of the plug-in "X" type is shown in the grid circuit of the H.F. valve, it is quite feasible that in many sets the grid coil will be one of the six-pin variety or possibly even two separate plug-in coils.

The actual method of aerial coupling is quite immaterial, and the part of the circuit with which we are most concerned is that associated with the anode circuit of the H.F. valve, in other words, the split-primary transformer.

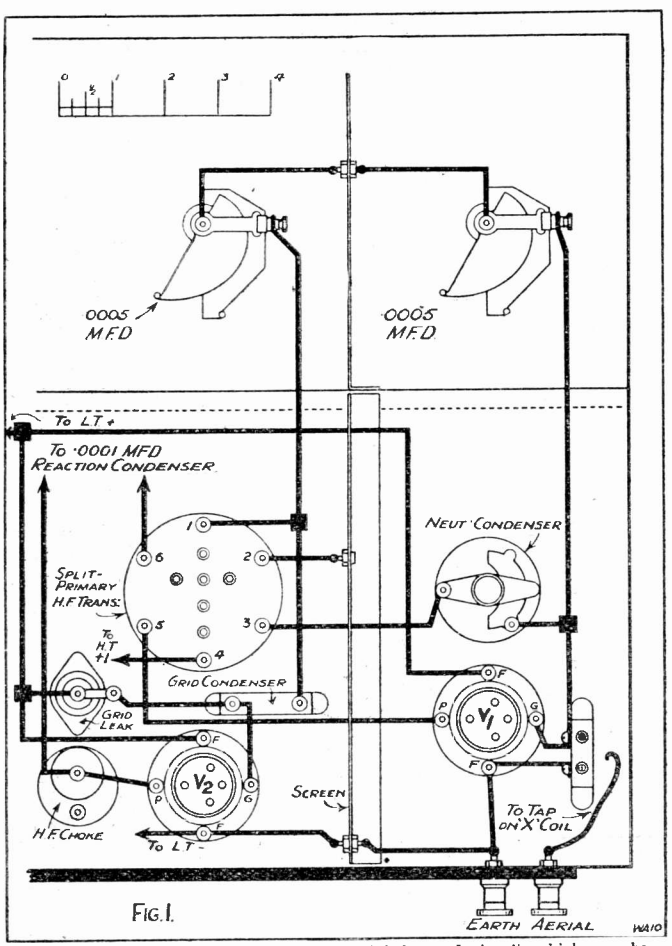



FIG. 1.

The H.F. side of a set employing a straightforward circuit, which can be modified quite easily to accommodate a screened-grid valve.

### The Best Way.

Perhaps the most helpful way in which to deal with the subject of alterations would be by mentioning as a start the components it is necessary to remove. I use the plural, although, as a matter of fact, there is only one which has to be removed entirely, and that is the neutralising condenser.

In order to carry out the alterations you will require in addition to the screened-grid valve one H.F. choke (a good quality choke is strongly to be recommended for use here), one ·001 fixed condenser, two ·25 Mansbridge condensers and two more terminals.

### Not Difficult.

These components are all mounted in position to the right of the vertical screen, and since there is nothing particularly complicated in this part of the work, there is not much

*(Continued on next page.)*

# A VISIT TO THE VARLEY WORKS.

**By A SPECIAL CORRESPONDENT.**

THE following brief account of a recent visit to the Varley Works, at Woolwich, will be of interest to our readers.

After inspecting all the various departments, the modern machines and testing devices, one can quite understand how this firm has reached its present high position in the Radio industry.

The manufactured articles are standardized on a quantity production basis, which enables them to be produced at really competitive prices. Each department has its own special costing system.

The Machine Shop is equipped with the most modern automatic machines, capstan lathes, etc. These enable very accurate machine work and intricate thread-cutting to be carried out.

### Everything Carefully Tested.

The Coil Winding Shop is probably one of the best in the country, and over 300 girls are employed in it. Many types of coils apart from those for wireless are wound in this department.

Incidentally, the machines in this shop are all designed by Varley themselves, and are made in their own machine shop under their own patents. This is the shop where the well-known Bi-duplex Winding is done, in which every coil of wire is separated by pure silk. In addition, there is a complete Impregnating Department and Finishing Shop.

All coils are thoroughly tested before being sent out, even to the extent of being tested for a single short-circuited turn.

Special attention is paid to efficient packing of all products. The Packing Department is quite separate from all others, and each member is trained for his particular job.

A test of each of the parts of a component is made before it is assembled, and a final thorough test is given on completion.

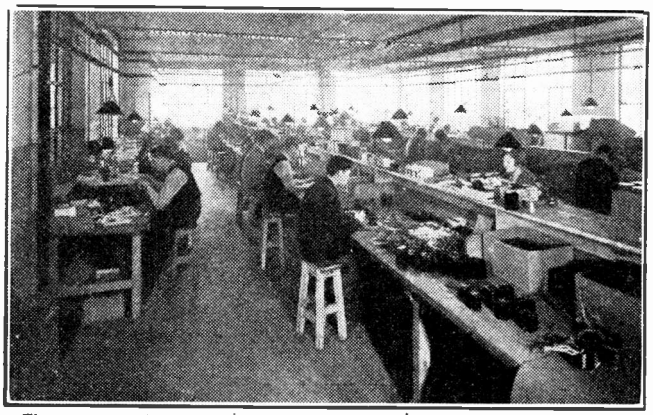
### Building the Sets.

The components themselves are all tested before they go into sets, and the sets are subjected to preliminary tests during construction, afterwards being finally tested before leaving the works.

A test is made on actual broadcasting to see that each set obtains all the stations for which the manufacturers guarantee it.

The Test Department itself is equipped with up-to-date measuring instruments capable of testing all components, sets, coils and other radio equipment. Where necessary, coils, etc., are subjected to a flash test up to 2,000 volts A.C.

Continual additions are being made to the testing department to ensure that it is always up to date.



**The component assembly department where the famous Varley chokes, transformers, etc., reach completion.**

# S.G.'s FOR ORDINARY SETS.

*(Continued from previous page.)*

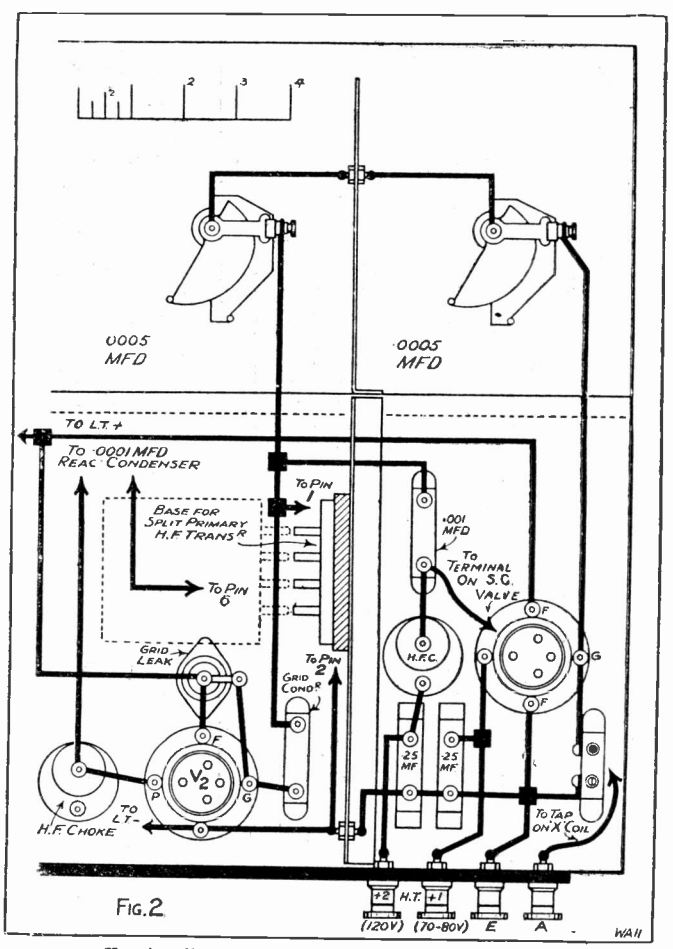



FIG. 2

**Here is a diagram showing how the new connections run.**

point in going over what is already shown quite clearly in the diagram (Fig. 2).

The portion of the set to the left of the vertical screen, however, is not quite so straightforward, although as far as the wiring is concerned this part of the circuit will be even more simple than it was before. The H.F. transformer in its present position is not satisfactory, and if left as it is would in all probability produce instability. If, however, you do not particularly wish to move the six-pin base, it can be left where it is, providing, instead of the present six-pin split-primary transformer, you use a binocular coil of the same type.

I expect, however, that most of you will desire to use up your existing components in preference to purchasing new ones, and it will therefore be necessary for you to mount the six-pin base against the side of the screen. For this purpose the best plan is first to mount against the screen a piece of wood, and it then becomes a simple matter to fix the six-pin base in position.

Full details of the wiring alterations involved are clearly shown in Fig. 2, and perhaps I need only mention that the pins 3, 4 and 5 on the six-pin base are not now used.

### New H.T. Voltages.

When the wiring alterations have been completed, it only remains to put the S.G. valve in the first holder, and to connect to the top of the valve the flex connection, from the ·001 condenser. With regard to the new H.T. plus terminals, the one on the right (marked + 1) should be joined to a position on the existing H.T. battery at about 70 or 80 volts, and the other terminal requires about 120 volts (also from the same H.T. battery). If a separate H.T. plus terminal was used for supplying the H.F. valve in the original set, only one new terminal will, of course, be necessary.

## REMEMBER THAT.

**The long strip of a dry cell represents the negative pole and the short strip the positive.**

* * *

**The actual plate or output connection of an S.G. valve is the terminal on the top of the bulb and that leg of the valve which is joined to the P terminal of the valve holder is joined inside the valve to its screening grid, not to its plate.**

FROM THE TECHNICAL EDITOR'S NOTEBOOK.

# TESTED AND FOUND—?

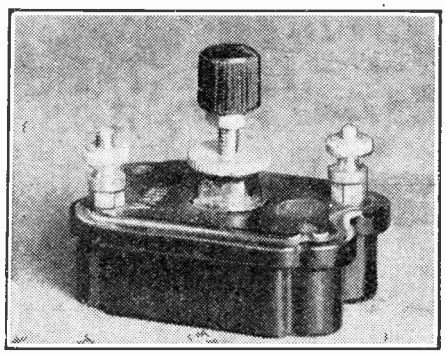
## CONDENSERS FOR OUR REJECTORS.

THE enormous popularity achieved by every one of the several "P.W." "Brookmans" Rejectors that has been described, caused, and still is causing, a very widespread demand for the components peculiar to the designs.

It is a moot point as to whether the Rejectors beat even the "Magic" sets in this regard.

However, the fact remains that those little compression condensers needed for the Rejectors are now to be seen in all radio stores in the land that are not sold out (and there are hundreds periodically finding themselves in this condition).

The reasons are obvious. The Rejectors do the trick as nothing else except the most



The new R.I. Varicap Condenser.

intricate apparatus can, and they are, in fact, exceptionally cheap and remarkably easy to make.

Undoubtedly they are one of "P.W.'s" greatest triumphs. Moreover their arrival coincided with the new broadcasting conditions—conditions that would otherwise have been death to old and well-tried (and well-loved!) sets.

Remembering all this, let us give a hearty welcome to the R.I. Varicap condensers, which have just made their debut and which are now available in any numbers to meet fresh demands made by Rejector enthusiasts.

The Varicap sells at 2s. 6d. and is an excellent job—Radio Instruments have done nothing better and that is saying something.

Particularly do I like the wide range they cover, ·0002 to ·0014 mfd. is fine for such a compact little instrument.

There is, too, a lock screw that runs down and permanently holds a setting just as a good lock screw should.

And the casing is a most pleasing moulding of a high-class character.

Internally, the device, with its wide mica sheets and tough springy brass plates, is absolutely up to scratch—no rough workmanship at any point within sight or hidden to the eye. It is an honest production that a "P.W." Rejector should be pleased to meet!

(*Continued on next page.*)

# TESTED AND FOUND—?

*(Continued from previous page.)*

### THE CHLORIDE CHRONICLE.

This is the journal of the Chloride Electrical Storage Co., Ltd., and it sells for 2d. The cost of printing and publication is borne by the company and the proceeds of sales go to the Chloride Sick Club. I thought the recent number extra specially good.

### FROM LISSEN LTD.

Messrs. Lissen Ltd., recently sent me a selection of their recently published literature. It is an assembly of leaflets and catalogues all very excellently produced, covering the comprehensive range of radio apparatus that Lissens now manufacture.

When one realises that every portion of every one of the components and accessories described is built by Lissen themselves, one begins to realise something of the enormous organisation that this enterprising concern has grown into.

### TRELLEBORG EBONITE.

One meets so much brittle composition material in the cheaper radio components that it is quite a pleasure to examine some first-class ebonite—and this, Trelleborg Genuine Ebonite, certainly is.

Trelleborg Ebonite Works, Ltd., recently sent me a sample panel, glossy black on the one side and mahogany grained on the other.

**Traders and manufacturers are invited to submit radio sets, components, and accessories to the "P.W." Technical Department for test. All tests are carried out with strict impartiality under the personal supervision of the Technical Editor, and readers are asked to note that this weekly feature is intended as a reliable and unbiased guide as to what to buy and what to avoid.**

It has a specific gravity of 1·25 which, in itself, is an excellent indication of its quality, and a resistance test amply confirmed this. It cuts cleanly and drills without cracking and, altogether, is a material of first-class nature.

### EKCO MAINS UNITS.

So great has been the demand for Ekco mains units and sets that E. K. Cole, Ltd., have had to erect an immense new factory. It is built on some ten acres of land and is said to be a most impressive affair.

### A MULLARD LOUD SPEAKER.

What do you think of this?

"A cabinet type instrument possessing all the good technical features of the well-known pure music range of speakers has now been placed on the market by the Mullard Wireless Service Company, Ltd.

"The speaker, which is known as Type 'K,' consists of a balanced-armature, movement driving a 13-in. diameter cone, the whole being mounted in a polished oak cabinet, 19 in. square, with a handsome fretted front. By means of sockets at the back of the instrument either one-third, two-thirds, or the whole of the speech coil can be utilised, so that the impedance of the speaker can be adjusted to suit the output circuit of the receiver.

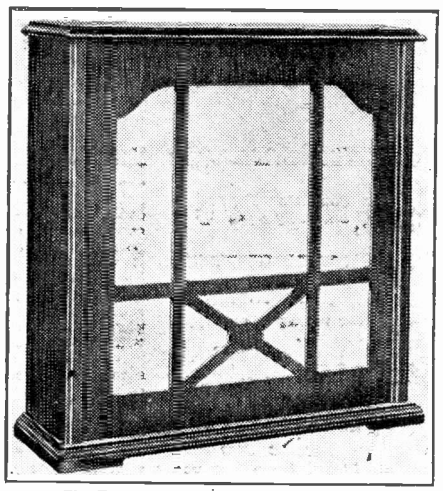
*(Continued on next page.)*

## TESTED AND FOUND—?

*(Continued from previous page.)*

"The front fret has been designed to present the minimum obstruction to the sound waves, and the back of the instrument is also of open construction, so that the natural reproduction from the balanced-armature unit is in no way impaired by the presence of the cabinet. The movement is, of course, protected against dust by silk screens at back and front.

"Sold at the popular price of £6 15s 0d., which includes a 6-ft. flexible lead, the new Mullard Type 'K' speaker is already proving a good selling line."



The Type "K" Mullard Loud Speaker.

It is the Mullard people's own description of their product, and I should say for straightforwardness, lucidity and freedom from padding, it would take some beating. I do not think anyone could describe the instrument better.

It is a fine-looking loud speaker, much larger than the average, although it is far from being clumsy or awkward. Indeed, it appeals to me rather more than anything that I have seen for some time and it gives good results, results that are, in my opinion, slightly better than the other Pure Music loud speaker I reviewed a little while ago, and that is saying something. It has the alertness of the moving-coil variety with an excellent high note response. It works comparatively as well with a small two-valver as with a five-valve outfit.

### IGRANIC Q.M.B. SWITCH.

A few weeks ago I dealt with the Igranic Q.M.B. Switch but did not make it clear that there are two models available.

The one is the L.T. type, and this retails at 2s. 6d. and is excellent value for money.

The other can deal with voltages up to 250 or carry currents up to 5 amperes. This type retails at 3s. 6d. and also is a fine proposition.

### THE VALUE OF THE PENTODE.

I have received the following interesting notes from the Mullard people.

Owing to the more general use of "super" power valves in recent years, which necessitates, of course, the acceptance of the limitations of the three-electrode valve, a large grid bias has come to be associated, in the minds of the large majority of listeners, with a good power valve.

But a large grid bias simply means that the amplification factor of the valve is so low that a large signal voltage swing must be applied to the grid in order to obtain the maximum output of audio-frequency power, and that, in order to obtain this larger signal voltage, a very considerable degree of low-frequency amplification is necessary preceding the power stage.

The best power valve is the valve which will give the desired power output for the smallest grid voltage swing, and the qualities in a valve determining its performance in this direction are its amplification factor and mutual conductance, both of which should be high, combined of course, with adequate emission.

This is one reason for the growing popularity of the pentode type of amplifying valve. The amplification factors of these valves are high, and the mutual conductances highly satisfactory. For example, the figures for the Mullard P.M.24 4-volts "Pentone" are 62 and 2·3 respectively, as compared with 4·2 and 2·1 for the super-power valve P.M.254 of similar output.

This means that with a given input signal strength, and in order to obtain the same output, a receiver or amplifier fitted with a pentode output valve need supply far less low-frequency voltage amplification than a set using a triode in the output stage. In fact, in many domestic receivers, if a pentode is employed, no intermediate low-frequency stage between the detector and pentode is required. Thus a substantial saving is effected in the initial cost of the equipment, and in addition the risk of introducing distortion is greatly reduced.

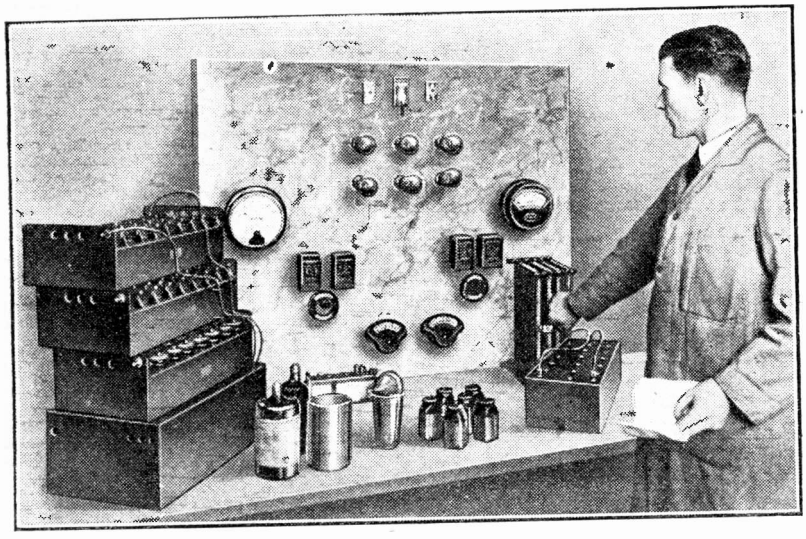
But this does not complete the tale of the advantages to be gained from the use of the pentode. If correctly applied and operated, the five-electrode valve may result in a very considerable improvement in the quality of reproduction.

To understand this, it should be realised that the output stage of a receiver, that is to say, the power valve and the speaker, must be considered as a combined unit, the performance of which depends upon the design and selection of both components.

Now the earlier types of speaker—horn-type instruments and certain forms of cone speaker—tended to over-accentuate the higher audio-frequencies—i.e. the treble notes, with the result that reproduction was apt to be high-pitched. More recent designs of speaker give a more even response to the different frequencies within the audio-frequency band, and some even err on the other side and give over-accentuated bass reproduction, a fault which is aggravated by the fact that the output of a three-electrode power valve at the higher frequencies falls off very severely.

As a result, the reproduction in modern radio equipment is usually characterised by an over-preponderance of bass, which is not only pronounced, but has become fashionable and even identified with "good quality." Now, deficiency in the higher frequencies is fatal to fidelity of reproduction.

# COMPARATIVE TESTS REVEAL REMARKABLE FACTS



## REMARKABLE TESTIMONY

These testimonials are unsolicited and the originals can be inspected at our offices.

3/10/28
**VASTLY SUPERIOR TO DRY BATTERIES** *C. S. F. (Brighton)*

19/2/29
**BEST H.T. I HAVE EVER HAD** *H. B. (S.W.8)*

13/7/29
**SURPRISINGLY TROUBLE FREE** *C. H. T. (Caterham)*

10/1/29
**PREVIOUSLY SPENT POUNDS ON DRY BATTERIES** *F. S. D. (Wood Green)*

Why waste money on costly and obsolete sources of H.T. supply, when you will be faced with periodical renewals at further cost? In addition to giving you longer initial service, the "Standard" H.T. can be re-charged simply at home, merely by replacing the used-up Cartridges with Refills.

# The STANDARD Battery 57% CHEAPER in operation THAN DRY BATTERIES

## AMAZING OUT-PUT. 21,000 M.A. RESULT OF 69 WEEKS' TEST

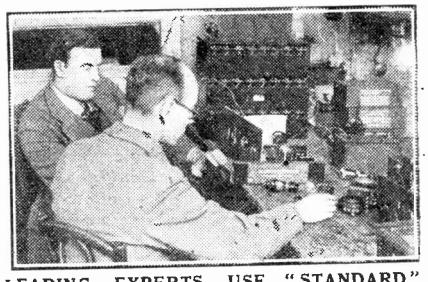
Comparative tests carried out on a 96 cell No. 3 Standard Battery, under average working conditions, have revealed conclusively that it is overwhelmingly superior both for economy and results than the average dry battery.

30 HOURS' USE PER WEEK FOR 16 MONTHS.

The battery was in service from July, 1928, to 1st December, 1929, a period of 69 weeks, on an average of 30 hours per week on a set taking 10 M.A. The output of the battery was 300 M.A. or, on this basis, a total output of 21,000 M.A. hours.

PROVED 57 % CHEAPER TO RUN.

The test shows that, apart from maintaining a steady and constant pressure of current, the battery was remarkably economical. Comparing an average size dry H.T battery, costing approximately 12/- per 100 volts, the maximum economical output is 5 M.A., and the average life cannot be considered to exceed 5 months on the weekly running of 30 hours. Taking 20 weeks as a fair life, the cost per 100 M.A. hours equals 7·5 pence. Then take the cost of a set of refills and chemical, of the Standard battery, plus one-third of the initial cost, the cost of running equals 3·2 pence per 100 M.A. hours—57% cheaper than the dry battery.



LEADING EXPERTS USE "STANDARD" FOR LABORATORY WORK.

The recognition of the Standard Battery by such well-known experts as Capt. Eckersley and Mr. G. P. Kendall, B.Sc., shewn experimenting with the aid of the Standard Battery in the "Modern Wireless" Research Laboratory, is indeed an indication of its great efficiency and economy.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*Please send me your free book fully describing and illustrating how the Standard Battery improves reception and saves money.*

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*Complete batteries assembled. Cash or on our famous "No Deposit, No Refs," terms. Obtainable from all good dealers, Currys or Halford's.*

**H.2.** 10,000 M.A. capacity. 48 No. 3 cells, 72 volts, in 2 trays with lid. Cash £2. 3 6, or 5/- down and 5 monthly payments of 8/2.

**5/- DOWN**

**H.4.** Over 10,000 M.A. capacity. 72 cells, 108 volts, in 3 trays with lid. Cash £3. 4. 0 or 10/- down and 5 monthly payments of 11/8.

**10/- DOWN**

**J.6.** Over 20,000 M.A. capacity. 96 No. 4 cells. 144 volts in 3 trays, with lid. Cash £3. 10. 3 or £1 down and 5 monthly payments of 19/2.

**£1 DOWN**

M.B.

# RADIOTORIAL

All Editorial communications to be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

*The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts or photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.*

*The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.*

## QUESTIONS AND ANSWERS.

### DO YOU GET ANGRY WITH YOUR SET?

"Troubled Wife."—"My husband is what would be termed an amateur wireless enthusiast. He has a two-valve set and on the whole gets very good results.

"We have a home with every comfort, and could be very happy, but at times it is made a veritable hell if anything goes wrong with the accumulator, or with the eliminator, or in fact with anything connected with the wireless. The most dreadful accusations are made.

"No matter how careful I am the wind is raised every time anything goes wrong, and I should like to know if there is any other person who has the same thing to contend with, or is he an exception? If so, what is the best way of getting rid of it?"

We are very sorry to hear that wireless is the cause of any unpleasantness, because there is really no need for this at all. It is, alas, perfectly true that other cases have occurred, and in the great majority of those we have investigated the trouble has all been due to faulty maintenance.

The set itself may be all right, but in order to give results it must have a good "broadcasting" input from the aerial, and a good energy input from the accumulator, eliminator, etc. You can always rely on the B.B.C. for putting out a good standard of quality and strength, so if your aerial is O.K. and is kept in good condition by a monthly inspection and overhaul, you can be reasonably sure that the actual broadcasting is entering the set correctly.

Next you want proper L.T. and H.T. voltages and current, and for this purpose a voltmeter is invaluable, to check the power supply. One of the two-scale kind is perfectly satisfactory, as one scale will enable a check to be kept on H.T. voltages, and the other scale enables you to check the low tension.

If these two power supplies are kept up to scratch the probability is that most of your troubles will disappear, as faulty maintenance (run-down batteries, etc.) is the chief cause of poor reception.

(After you have had your valves in use for about a year or so, there is a possibility of one of them "konking out," or "losing emission," as it is called, and this is generally indicated by a sudden falling off in strength and quality, even though the battery voltages are all O.K. A new valve is the only cure in such a case, but as we have pointed out, this should only happen say once a year at the most, and you can easily tell when this trouble arises, if you are able to borrow a valve similar to the one you are using, and substitute it, as the set will instantly be restored to life by this means.)

We feel pretty sure that in your case the bad results are due to voltage drop which should be shown up by the voltmeter, so if possible we should certainly obtain one of these invaluable instruments.

If we may venture to add another word it would be to say that irritability or impatience with a set will generally vanish when more knowledge of its working is gained. Can you not get him interested in "Pentode's" articles dealing with the working of wireless currents, so that he understands what a delicate thing a set is, and how easily some unsuspected cause may throw it out of operation unless a watch is kept on it?

It is not generally carelessness, or other people, that put it out of action, and fortunately, when all the voltages, etc., are maintained properly, it will give such regular and reliable service that to have a little fault come on it, to look for this and put it right, will be an enjoyable rather than an annoying experience!

### TRANSFORMER CONNECTIONS.

J. L. B. (Yorks).—"I have just completed the construction of the 'P.W.' 'Holiday' Two, and I think it is a wonderful little set. I have constructed it for home use, still having the

(*Continued on page* 1098.)

# RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 1096.)

batteries, etc., inside the cabinet as the original. The terminals are on a strip at the back, thus giving the set a better appearance.

"When I first wired the set I got no results, but after checking every component and wiring, I found that my L.F. transformer was connected the wrong way. You will remember that the connections on the diagram are marked G, Plate, + B, —C.

"My transformer is marked IS, OS, etc. To anyone not knowing that IS is connected to G.B.—, OS to grid of valve, IP to plate, and OP to H.T.+, I think that this is liable to cause trouble, and suggest therefore that the markings should be made standard."

As a matter of fact, the markings IS, OS, etc., are rather old-fashioned ones that appear to be rapidly going out. Nearly all the British manufacturers now mark the terminals according to the points where they can be connected, i.e. G for grid, G B for G.B.—, P (or A) for Plate (or Anode), and H.T.+ for H.T.+

## "P.W." TECHNICAL QUERY DEPARTMENT

***Is Your Set "Going Good"?***

Perhaps some mysterious noise has appeared, and is spoiling your radio reception?—Or one of the batteries seems to run down much faster than formerly?—Or you want a Blue Print?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers an *unrivalled* service.

Full details, including scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do. On receipt of this an Application Form will be sent to you free and post free immediately. This application will place you under no obligation whatever, but having the form you will know exactly what information we require to have before us in order to solve your problems.

**LONDON READERS PLEASE NOTE:** Inquiries should **NOT** be made in person at Fleetway House or Tallis House.

### MAKING A THREE-VALVER SELECTIVE.

A. F. F. (Enfield Highway).—"Before I ask my question, I should like to say 'Thank-You-Three-Bags-Full' for the circuit and wiring diagram you sent me last year. Right from the first it was a winner, and the variety of programmes I could get is about as amazing to my friends as the purity and strength with which I fill the room.

"Being lazy, I have not written to thank you for it, though I have often thought of doing so, but all my friends have heard about it, you can bet!

"As you will gather, I would be very loath to alter the circuit much, but I should like more selectivity now the Regional scheme is going. As there is plenty of room in the receiver, what I should like to do is to put another circuit in front of the detector, either with or without an H.F. valve; preferably without.

"I am still using plug-in tuning coils, because I have found them absolutely satisfactory, and there is plenty of room on the panel for another tuning condenser and on the baseboard for another valve, unless it wants very elaborate screening. My idea is to strip everything from in front of the detector, and re-wire it, so as to make it much more selective than the centre-tapped aerial coil. I do not really want an H.F. valve, as there are plenty of stations to satisfy anybody on the present arrangements.

(*Continued on page* H100.)

Your panel should be PAXOLIN. The appearance and performance of your set will then give you the satisfaction you deserve.

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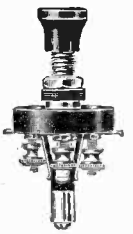

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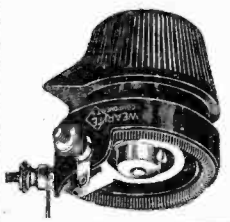

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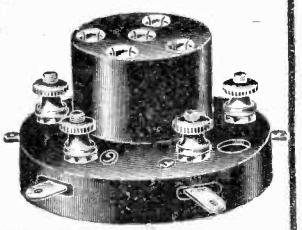

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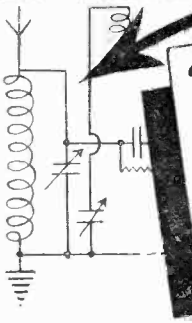

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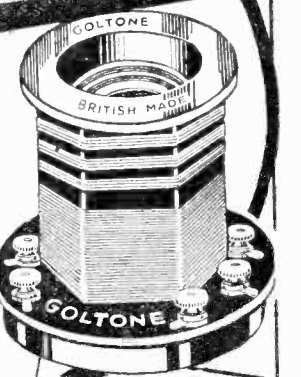


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# The Men who fail and why!

## By J. A. R. CAIRNS

For this week's ANSWERS London's most experienced and human magistrate has written the most helpful article of the year.

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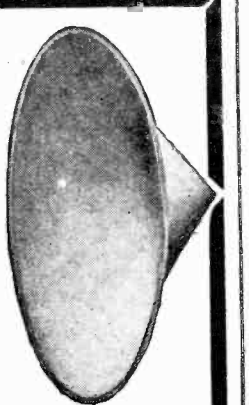

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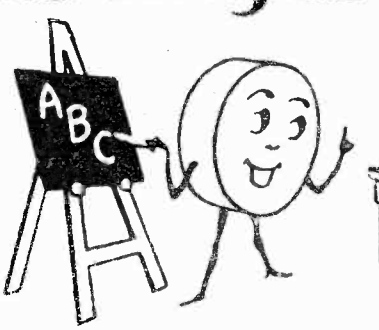


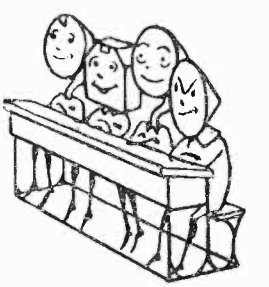

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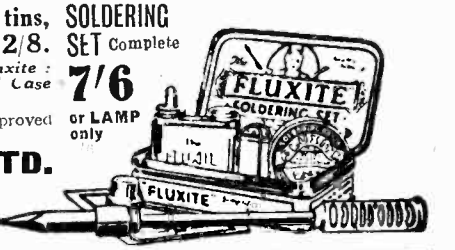



**- IT SIMPLIFIES ALL SOLDERING**

## RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 1098.)

"Having proved what 'P.W.' Query Department has done in the past, I put myself entirely in your hands, hoping that you will use as many of my own components as possible, of which I include a list. (I am also returning the theoretical diagram you sent me which shows the circuit is a det-2 L.F. and gives the date if you want to refer to other diagram.")

We do not think there is any need in your case for an extra valve, as you should be able to get all the selectivity required by means of one extra tuning circuit. You will need your present aerial coil-holder and aerial tuning condenser left in position, and, in addition, you will require another ·0005-mfd. variable condenser, another tuning coil, and two neutralising condensers, all of which are included in your list of parts on hand.

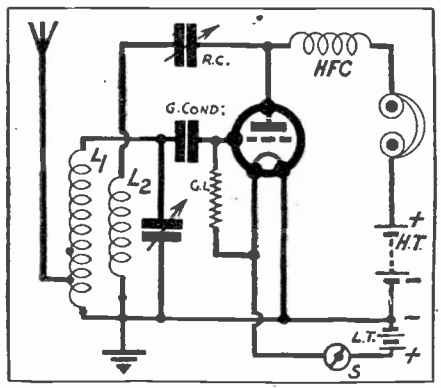
Arrange the new tuning condenser well away from the aerial condenser, and place the new coil-holder behind it, so that the two circuits are not magnetically coupled. Put a new aerial terminal near to this new tuned circuit, and mount the two neutralising condensers between the old aerial coil-holder and the new one.

Now wire up as follows: From the old earth terminal of the receiver (which will still remain the earth terminal) run a wire to one side of the new

(*Continued on page* 1101.)

## POPULAR "WIRELETS"

**Here is the answer to No. 1**




## DID YOU GET IT RIGHT?

(*Wirelet No. 2 appears next week.*)

# RADIOTORIAL QUESTIONS AND ANSWERS

*(Continued from previous page.)*

coil holder and to the moving vanes of the new condenser. The remaining side of the new variable condenser is joined to the new aerial terminal and also to the vacant side of the new coil holder and to the first neutralising condenser.

The other side of the neutralising condenser is joined to the second neutralising condenser, and finally the remaining terminal on the second neutralising condenser is taken to that side of the old aerial coil and aerial tuning condenser which is connected to the grid condenser.

This completes the new wiring, and you can vary the selectivity of the arrangement and the sharpness of tuning by adjusting the size of the neutralising condenser. If the arrangement seems too sharp, cut out one of these neutralising condensers by means of a shorting link or plug, and try the effect of using only one of them. But situated as you are, we expect that two will be necessary.

By means of a little juggling with coils, you should be able to get the two tuning dials to read alike, so that readjustment for any given station will be quite easy, and you will still have a big bag of programmes which now will be easily separable from one another

## WHAT DO *YOU* THINK ABOUT THIS?

**Here is a problem that puzzled a Brighton reader of "P.W."**

**The set was a home-made 3-valver (Det. and 2 L.F., 1 stage Resistance, 1 Transformer), and had been in use for 18 months, with no trouble.**

**Quality had always been good until one day it "went off," the set got very weak, and reaction failed to act.**

**Checked all plate voltages—O.K.**

**Checked all fil. voltages—O.K.**

**Grid bias, earth and aerial, loud speaker, condensers, coils, and all leads, etc., in perfect order. All joints, etc., inside set tested and found O.K.**

**WHERE WAS THE FAULT?**

N.B.—There is no prize for answering this, but from time to time we shall give a radio problem (followed the next week by the answer) in the hope that readers will find them both interesting and instructive.

(Look out for the solution to above next week.)

***The fault in the Birmingham reader's outfit, that was described last week, was found to be in the loud speaker. It had merely gone out of adjustment and our reader tested everything except that!***

## TECHNICAL NOTES.

(*Continued from page* 1076.)

telegraphone, and very great improvements were made in it, the principal experimenter in this direction being a German scientist Dr. Stille.

This inventor has produced a totally new type of recording and reproducing machine for the magnetic wire or tape, and has brought the telegraphone system to a state in which it can be, and indeed has been, used for talking pictures.

The wire passes through the machine from one spool to another, in somewhat the same way as the film in a cinematograph projector, the actual speed of the wire being about 6 ft. per second. During its progress from the one spool to the other it passes between the poles of an electromagnet; the speech currents to be recorded are fed into the windings of this electromagnet.

In this way, as you will see at once, the wire is magnetised at each point to an intensity depending upon the strength of the speech currents in the magnet windings, at the moment when that particular part of the wire was in transit between the poles.

It is easy to see that by passing the wire through again in the same way currents will be induced in the windings of the electromagnet (exactly as in an electrical "pick-up"), and these currents are led away, amplified in the usual manner, and reproduced through a loud speaker.

### Using the Record Again.

The same wire may be used repeatedly and the magnetic "impression" may be removed by running the wire past a suitable magnetic arrangement which "washes out" the magnetic impressions already upon it.

This is a feature which makes the arrangement very suitable for the talking-picture studio, since the record obtained is instantly ready for reproduction. The director, therefore, can tell at once whether the recording conditions are to his liking.

The reproduction from the wire or tape is claimed to be superior to that from other more conventional types of record, and a particular claim is made with regard to the recording and reproduction of very high and very low frequencies which, of course, have so important an effect upon the quality of the reproduced sound.

If the wire or tape should happen to be broken, or if it is desired to piece together different recorded selections, joints can easily be made by a simple soldering process.

### Permanent Magnetism.

You might think that when the wire was wound upon a spool with the turns touching one another, the magnetisation would be destroyed, but apparently this is not the case. A still more simple feature is that the wire or tape, after being magnetically "recorded," can actually be heated to a high temperature without obliterating the magnetic record.

Naturally this is not a matter of any great practical importance—I mean the heating—as it pre-supposes a condition not likely to arise in practice; at the same time it indicates how tenaciously the magnetic effect is retained.

(*Continued on next page.*)

# TECHNICAL NOTES.

*(Continued from previous page.)*

### Improving Selectivity.

In connection with the improvement of the selectivity of a set, a matter to which I have referred once or twice lately, probably you know that with the grid-leak method of rectification there is usually a tendency for the tuning to be flatter, that is, to lack selectivity. In the usual way the detector is connected to the top of the grid coil, and when this is the case the voltages arising in the detector circuit are to some extent reduced. This is due, of course, to the damping which is in this way introduced into the circuit.

If, however, the connection to the detector is shifted from the end of the grid coil to some other point on that coil, it will probably be possible, after a certain amount of trial, to find a position where, without much interference with the signal strength, a much improved selectivity is obtained.

The improvement obtainable in this way will naturally depend upon the capabilities of the set when it is working under the most efficient conditions; if the set is inherently inefficient (owing to bad design, bad components or what not) the improvement obtainable either in the above-mentioned way or any other way may not be significant.

For instance, in the present case, if the grid coil is not functioning properly, no doubt you will get very little, if any, improvement in selectivity by the little dodge which I have mentioned. But under certain conditions this little alteration of the circuit may prove worth while.

### Leaks and Condensers.

Talking about grid leaks and condensers, I should add that it is not always possible to say offhand what will be the best value for the resistance of a grid leak and the capacity of the grid condenser in any particular case.

I know that certain standard or average values are commonly recommended, but it is clear that the values must depend upon circumstances and, therefore, that a little experimenting will be necessary to determine the best possible values.

For instance, with the conventional 2-megohms grid-leak and ·0003 mfd. for the condenser the quality of the reproduction may not be so good as when the capacity of the condenser is somewhat reduced.

Again, the value of the grid leak depends upon the strength of signals which it is intended to handle, and for strong signals you should certainly use a lower value of grid-leak. It is a well-known fact that if strong signals are being handled with high value of grid leak there is a tendency for the detector to become badly choked.

### Effect of Signal Strength.

Another reason why it is impossible to make any hard-and-fast rule with regard to grid-leak and condenser values is because, even for a given circuit and given components, there are slight variations in the characteristics of the components, particularly the valves.

Even in these days of scientific valve manufacture it is impossible to turn out valves of absolutely constant characteristics, and slight variations in characteristics may necessitate corresponding adjustments in

*(Continued on next page)*

# TECHNICAL NOTES.

*(Continued from previous page.)*

the circuit such as, in the case we are considering, a somewhat different value of grid leak and condenser.

### Anode-Bend Rectification.

Following the above remarks on grid-leak rectification, I should like to say something about anode-bend detection and the question of overloading.

One of the simplest ways of noting whether the anode-bend detector is being overloaded is to introduce into the output circuit a suitable milliammeter; this meter may be one reading up to, say, 5 milliamps, although, of course, the current actually registered in the case in question will be much less than this maximum amount.

It is important to choose the grid bias so that the current passing through the detector anode circuit when no signals are being received is as small as possible. Then when signals are tuned in, the current will increase very considerably, and this increase depends naturally upon the strength of the transmission which is being received.

### Watch the Meter.

Whilst you have the station tuned in, you should note very carefully not only the current indicated on the milliammeter but also the *behaviour* of the needle. As you tune in nearer and nearer to resonance you will find the current increase, but you may reach a point where the needle of the milliammeter begins to show unsteadiness and, in particular, where it gives little kicks as different sounds come through.

If this state of affairs is reached it indicates definitely that the anode-bend detector is being overloaded and, therefore, that the rectified signals are losing their quality and distortion is being introduced.



**PLEASE MENTION "POPULAR WIRELESS" WHEN REPLYING TO ADVERTISEMENTS.**

# Certainly-experiment with your set

## BUT NOT WITH *the* COMPONENTS

*Always use the best—*

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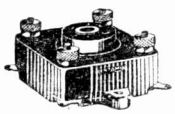

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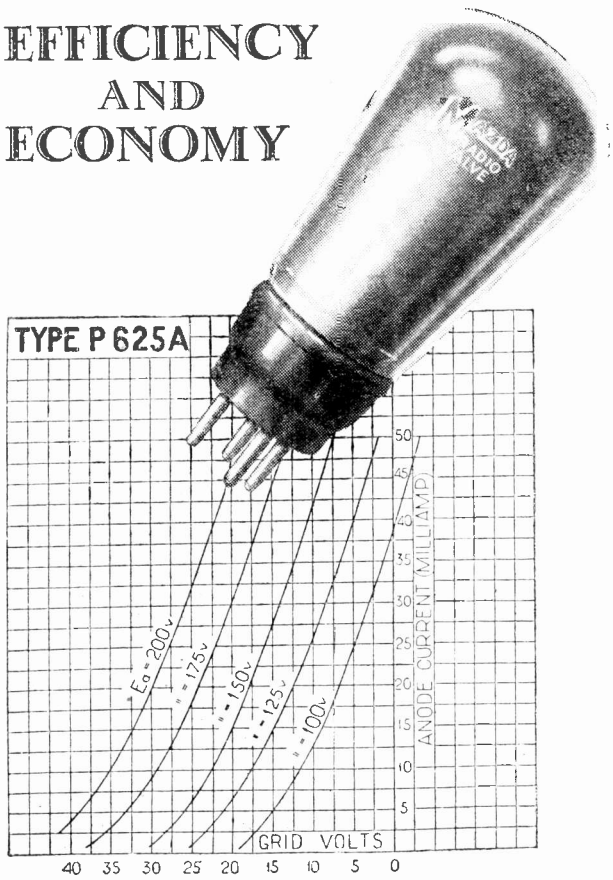


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Type P625A is a super-power valve, and is capable of giving a high power output without distortion. It has been designed for operating cone and moving-coil type loud speakers.

The volume obtained with this valve when used in the final L.F. stage is sufficient for most purposes, whilst the quality of reproduction over the whole of the musical range is bound to please all lovers of good music.

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