

# The Wireless 6<sup>d</sup> Constructor

RADIO CONSULTANT-IN-CHIEF CAPT. P. P. PECKERSLEY M.I.E.E.

Vol. XII.

AUGUST, 1931.

No. 58.



Two Outstanding Sets

*The A.C. "ACE"*

AND THE

*"SELECTIVITY" THREE*

## THE "ACE"

gives you

Long-Range Loud-Speaker Results

and

Does Not Need a Single Battery!

EFFICIENT BAND-PASSING,  
TWO POWERFUL L.F. STAGES,

and reproduction of  
RADIO OR RECORDS

are features of the

"SELECTIVITY" THREE



# Mazda Achievements



Mazda engineers introduce the first indirectly heated valve—1926. Made the all-mains set a commercial possibility.



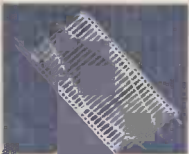
Mazda engineers invent method of applying insulating coating direct to heater. Now universally adopted by valve manufacturers.



Mazda engineers introduce first indirectly heated S.G. valve—1928. And the first indirectly heated pentode—1930.



Mazda announce the new Unitary Structure principle and so ensure absolute uniformity of characteristics.



Mazda introduce anti-microphonic filament supporting hooks and produce the first really non-microphonic battery valve.



Mazda market the first D.C. main valves already standardised by leading set makers.



Where Mazda Valves are made—Brimsdown, Middlesex.

IN all those epoch-making developments which have attended the evolution of the modern radio valve, Mazda has led the way. From the time when the first indirectly heated valves made the commercial all-mains receiver a practical possibility, Mazda engineers have been in the van of achievement.

## MAZDA RESULTS

The reason for the amazing success of Mazda valves need not be sought. They are used by the leading set manufacturers and are generally acknowledged by public, trade and press to be the finest range of valves the radio world has known. Remember that when you equip your set with Mazda valves you get Mazda experience—Mazda quality—Mazda performance.



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# MAZDA

THE  
BRITISH  
VALVES

All-mains, battery and  
rectifier types from  
all good radio  
dealers.

# CONTENTS

	Page		Page
The Editor's Chat ...	163	A Practical Man's Corner ..	189
"On the Grid" ..	164	The D.C. Mains Muddle ..	191
The Month on Short Waves ..	164	With Pick-up and Speaker ..	193
Mind Those Mains ..	165	Queer Queries ..	194
The A.C. "Ace" ..	167	Pick-Up Hints and Tips ..	196
Round the Dials ..	172	In Lighter Vein ..	198
Points for Purchasers ..	172	A 200 K.W. Valve ..	202
Savoy Hill News ..	173	A Useful Wire-Holder ..	203
As We Find Them ..	175	Our News Bulletin ..	204
The "Extenser" Meter ..	177	Your Radio-Gram Records ..	207
The "Selectivity" Three ..	181	Using a Milliammeter as a Voltmeter ..	209
Inside Berlin's Broadcasting House ..	186	Converting Your Set for the Mains ..	210
German Radio's New Home ..	187	Workshop Wrinkles ..	212

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

Chief Radio Consultant:  
**Capt. P. P. ECKERSLEY, M.I.E.E.**



## IGRANIC Components Satisfy



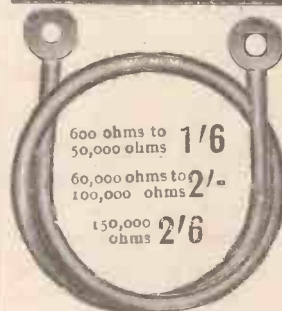
When you embody Igranic Components in your set you are assured of extreme satisfaction. They are specified by experts because of their known quality and efficiency.

**IGRANIC MIDGET CHOKE**

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Specified for the  
**A.C. "ACE"**

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Specified for A.C. "Ace" and hosts of other modern circuits.

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Specified for the "Selectivity" Three.

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# Still lower inter-electrode capacity —still greater effective amplification

**Cossor Metallised Valves are available in the following types at standard list prices:—**

**BATTERY OPERATED:**

215 S.G.            220 S.G.  
210 H.L.           210 DET.

**A.C. MAINS VALVES**

MSG - HA            MSG - LA  
41 MSG              41 MH  
41 MHL              MS/PEN-A

**T**HE latest Cossor development—Metallised Valves—is a matter of the utmost importance to every user of a long-range Receiver,

The process of metallising, i.e., the depositing of a metal coating on the exterior of the glass bulb, forms an efficient screen and, in addition to reducing still further the very low inter-electrode capacity of the Cossor Screened Grid Valve permits even greater effective amplification.

At the same time selectivity is considerably improved due to the elimination of direct pick-up and of couplings between the valve and near-by components. This feature is of marked importance to users of super-heterodynes as it ensures freedom from stray couplings that frequently give rise to instability.

Cossor Metallised A.C. Mains Valves, in addition to the advantages outlined above, possess the further important



quality of reducing the tendency towards mains hum.

Cossor Metallised Valves in both Battery operated and A.C. Mains Types are obtainable from any Wireless Shop.

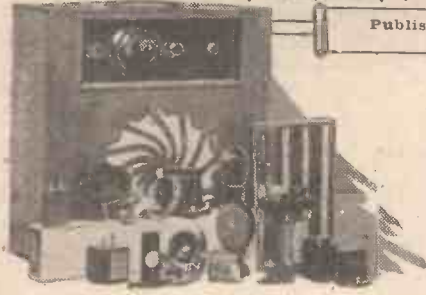
To Messrs A. C. Cossor Ltd., Highbury Grove, London, N.5.  
Please send me, free of charge, Leaflet L.51, giving interesting technical information on Cossor Metallised Valves.  
Name.....  
Address.....  
W.C. 8/31.

# COSSOR METALLISED VALVES

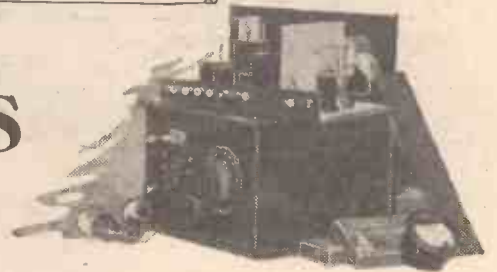
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# The WIRELESS CONSTRUCTOR

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## THE EDITOR'S CHAT



Some Remarks on Radio's Progress, and on the Recent Return of Sir John Reith from America.

**T**IMES change. The novelty of to-day is out of date to-morrow. Yes, and a cat has nine lives, and so have I a dozen more platitudes of this kind with which I could begin this article. But the fact of the matter is that one has to resort to some sort of a cliché, because how else can one say, or how else can one describe, the rapid changes and the rapid progress in radio technique?

### The Valve's Advance

And so I must begin this article with a platitude, or at least with the remark: "How radio strides ahead!" For the simple reason that every reader will agree with me that in this particular hobby we are all interested in nothing seems to stand still.

A good example of this is the all-mains receiver which is described fully in this issue. To-day all-mains receivers are becoming more and more common; and yet not so very long ago they were distinct novelties. In fact, it would be no exaggeration to say that the A.C. valve was regarded as an experimental curiosity and nothing else.

Cast your mind back when you read all about this all-mains receiver in this issue of the "Wireless Constructor" and you will realise how the A.C. valve has developed so rapidly that to-day an all-mains A.C. receiver is an integral part of up-to-date radio technique. And take selectivity. That we have always been after—not only selectivity, but super-selectivity. Especially so in these days.

### Some Splendid Sets

No doubt many of my readers can remember when quite an ordinary selective receiver was all that was

wanted—two or three years ago; but these days, with more and more stations cropping up, the ether congestion problem becoming more and more acute, ordinary selectivity will not suffice and we must inevitably look to super-selectivity to get us out of our troubles.

So much has been done lately towards the solution of this big problem that it is within the means of every amateur to obtain the necessary amount of super-selectivity in his set without too much trouble.

I have referred to the A.C. valve and to super-selectivity for the simple reason that these two items, if I may call them such, are given special attention in this issue, and, in fact, we have described fully two sets

### A FIVE-MILE "VOICE"!



*This American radio "truck," which is making a 10,000-mile publicity tour on behalf of a theatre company, has loud speakers sufficiently powerful to be heard five miles away.*

which I venture to say are the last word in these two examples of modern radio technique.

The "Simplicity" Three I recommend to your notice especially. It is a wave-change set with the latest band-pass scheme devised, and it separates stations with remarkable ease.

This is a receiver you can build with

the minimum of trouble and very little expenditure and it not only offers you adequate selectivity, but quality as near perfection as it is possible to obtain.

Finally, just a word about the A.C. "Ace," a two-valve all-mains receiver which we have made rather a pet of in the laboratory for some months past. No batteries are employed, and besides being highly selective it has a punch that Kid Berg himself might envy.

### The D.G.'s Return

The Director-General of the B.B.C., Sir John Reith, is back again after his five weeks' tour in America, and I had the pleasure of a talk with him the other day at Southampton on his return. One thing seems pretty obvious, and that is that we may look forward to a fairly good increase in American programmes.

"One of the fundamental principles which both sides are trying to carry out in connection with the interchange of programmes," he said, "is to select those items which that country does better than the other."

### What About Jazz?

Sir John instanced, from our point of view, the Ceremony of the Keys from the Tower of London, which to American listeners is something rather unique. It was certainly surprising, however, to hear Sir John admit that in his opinion the jazz bands on the other side of the Atlantic were one up on ours, and he thought that a judicious selection of relays of American jazz bands might be appreciated in this country.

Somebody present suggested that on a Sunday afternoon they would be, but Sir John did not reply except by giving a rather grim smile!



# “ON THE GRID”

It's one big shame, as I should imagine the Yank would put it, that some makers of transformers should imagine that the user knows as much about them as they do. The transformers I have in mind are those of the power type, not intervalve transformers.

A four-volt winding for the rectifier valve, and a four-volt winding for heaters as well, are by no means uncommon. But the transformers that definitely differentiate between them are in the minority.

True, one can find out by experiment, but, I ask you, should that be necessary? And now a friend has come to me with a mains transformer that has six terminals and not one has so much as a scratch on it!

An instance of just the opposite sort of thing, which illustrates how a little thought goes a long way, is to be

found on many L.T. accumulators. It applies to the indication of which terminal is which.

Little plus and minus signs stuck on the case are likely to come unstuck and vanish. So one insulated terminal is made red and the other black.

### Real Ingenuity

This in itself, you will see, is not much good, because the terminals could easily be reversed. But it is just here where the ingenuity comes in, for the terminal screws are of different diameters and the terminals are not interchangeable.

Why not a little more application of these "obvious" ideas?

When the new scheme for electrifying the whole country came along many self-appointed prophets predicted that in a short time there would be nothing but A.C. mains

about. Evidently the valve manufacturers took all this with a big grain of salt, for they are now busy producing D.C. indirectly-heated valves.

These should enable D.C. all-mains sets to come into their own and give results equal to the A.C. receivers. At the moment things are a little bit up in the air, for there is no standardised current or voltage for these valves.

This, of course, will eventually be adjusted by collaboration, but in the meantime no one is going to attempt to market a resistance. They do not know whether to drop the voltage to 4, 6, or what volts.

Yes, it does seem a waste of good juice! In fact, the question as to why the valves cannot be rated at the voltage of the mains is always cropping up. Surely, argues the enquirer, the resistance is a wasted component?

On the face of things that is all very sound, but (yes, there's generally a "but" in such things) there would be a steady potential of 100 or so volts across the ends of the heater. Also, the heater would be carrying a goodly ripple voltage.

Neither of these would be conducive to a silent, stable valve. Actually, I believe, high-voltage mains valves have been well-tried out in America, and once marketed, but to no good purpose.

A. S. C.

I FEEL rather like starting my notes this month with an "Oh, to be in Australia, now that winter's there!" For, generally speaking, the conditions in this country during the last month, or more correctly during the last week or so of the month, have not been anything to write home about.

### An Atmospheric Hint

I've been trying lots of stunts in an effort to reduce the present thunderstorm background, and, so far, the best scheme I've struck is to connect a .01 condenser straight across the output terminals. I'm afraid it's not much good for telephony, but for C.W. reception it does seem to help no end to clear up the background, even if it does reduce signal strength.

It is my firm belief that the only way to get decent telephony signals when X's are particularly troublesome is to limit your L.F. amplifying stages to one. I've found that a second L.F. stage, even if it does bring signals up, is not worth while, because it

\*\*\*\*\*  
 \* THE MONTH ON \*  
 \* SHORT WAVES \*  
 \*\*\*\*\*

seems to bring up static out of all proportion.

Reception of DX telephony during the last month has not been particularly startling. But there are one or two out-of-the-rut transmissions to which my attention has been called, but which, up to the time of writing, I have not succeeded in logging. The first is a "V E" (Canadian), on 48.8 metres. The full call-sign is V E 9 O L, and the station is to be heard on most nights, or rather mornings, from 00.30 to 02.30 G.M.T.

Reception of signals from the Graf Zeppelin on about 35 metres has also been reported, and if any of you have heard either of these transmissions—particularly, in connection with the schedules for the forthcoming Polar flight—I should appreciate details. Incidentally, I'm always glad to hear

of anything in what we might call the out-of-the-ordinary class so that I can pass the word on.

"N. M.," of Grantham, and several others have asked me if I can give the latest details of the active short-wavers in the United States. Here is the latest list available:

### Active Americans

W 2 X A D and W 2 X A F (the Schenectady "Brookmans" efforts!), on 19.56 and 31.48 metres respectively; W 9 X A A, Chicago, on 16.57, 25.34 and 49.34 metres; W 3 X A U, Philadelphia, on 31.3 and 49.5 metres; W 8 X K, Pittsburgh East, on 19.72, 25.25, and 48.86 metres; W 1 X A Z, Springfield, Mass, on 31.35 metres; W 3 X A L, Boundbrook, N.J., on 49.18 metres; W 8 X A L, Cincinnati, Ohio, on 49.5 metres; W 2 X E, Richmond Hill, N.Y., on 49.02 metres; W 2 X B H, Brooklyn, N.Y., on 51.52 metres; W 9 X F, Chicago, Ill., on 49.83 metres; and W 2 X V, Long Island City, N.Y., on 34.68 and 62.5 metres.

G. T. K.

**BY  
VICTOR  
KING**

**MIND  
THOSE  
MAINS**



**S**UPPOSING a mad horse marked you down as the one object in the whole of his equine world that he hated above all others, and supposing you were sitting on a camp-stool with your back to him and quite unaware of his presence within a few feet of you. He looks at your unconscious back calculatingly, and spends a few moments working out exactly how he can best use his giant strength against you.

**Where Danger Lurks**

At last he has everything measured up. He gathers himself together and, using every ounce of his muscular power, he suddenly pounds down upon you!

I leave the result to your imagination, and when you have arrived at some kind of conclusion, apply it as a simile to your ordinary electric supply mains. They look very innocent and very harmless, bits of cable terminating in flimsy lamp-holders and small plug-points.

But one mad horse, amok, would have to back into second place for savagery against a 250-volt A.C. electric main getting out of hand.

I don't mean only in regard to the direct shocks it can give—and these are frequently fatal!—I am bunching together conflagration and shock.

**A Typical Instance**

No radio constructor should attempt to experiment with mains gear unless he has the above in mind all the time. Treated with respect and handled with knowledge, electricity can be the most perfect servant of man; but, though you cannot see it, smell or hear it, you can feel it and it can do terrible damage.

*Owing to our ever-extending electricity supplies the use of the mains for radio is becoming more and more popular, and thus the words of warning here advanced by our famous contributor are particularly timely. Mains gear is perfectly safe to use if you are careful in its installation and operation, but it can be very dangerous if you ignore certain elementary precautions.*

I am driven to these words by the receipt of numerous letters from constructors asking for details as to how they can modify their sets for all-mains working, etc. This is the kind of query I have in mind:

"Can I use A.C. valves with my so-and-so battery set, and also take H.T. and grid bias from the mains? If so, will you please tell me how I

**PERFECT SAFETY**



*A safety device incorporated in a "Wireless Constructor" mains unit design. You cannot open the lid without first of all withdrawing the plug which connects the unit to the mains.*

should go about the job? Full details with a diagram will greatly oblige."

And this is how I generally reply to such a query:

"I know you will at first feel disappointed, but I fear that I

cannot see my way to give you the information you require; and this is my reason for refusing. No constructor should attempt drastic alterations to his set involving the extensive application of the mains supply unless he has a fair knowledge of electricity and radio. I judge that you are not possessed of this knowledge, or you would not have to ask for advice on the subject. It is reasonable to say that no one who has to obtain the assistance of someone else before he can carry out such alterations can safely meddle with mains apparatus."

**Converting to Mains Valves**

You no doubt see the point, but actually there is still more to be said against such practices. A mains set needs to be specially designed, various precautions being taken in the layout and the disposition of the components directly concerned with the mains power.

It is unlikely that just any battery set will make a good foundation for mains apparatus.

Further, it is quite a gamble whether or not good results would be given even if the alterations were safely made. You see, the higher H.T.'s given, added to the vastly better characteristics of the mains valves, will mean a greatly increased amplification per stage.

**The Stability Problem**

Unless the battery set bristles with de-coupling and scientifically arranged screening it is unlikely to "sit down" under this.

It is one of the greatest problems in the designing of a mains set to achieve perfect stability.

It is an entirely different matter

## Mind Those Mains—continued

when the constructor builds up a mains unit or set from expertly and carefully prepared specifications. The only danger, then, is in experimenting with the interior of the set while the mains current is switched on.

### A Frank Admission

Battery set users get so used to making minor adjustments to the "innards" of their sets while these are actually working that they are often tempted to do the same sort of thing with mains sets. It is a very great mistake.

When you go over to the mains you are facing an entirely different proposition. Don't feel ashamed if you develop a wholehearted respect for the "juice" you are tapping off from a power-point or light-socket.

I don't at all mind admitting that I am *frightened* of it myself, and I always take the connecting socket right out before I lift the set's lid. I

("familiarity breeding contempt"), and that, maybe, has a lot to do with this particular "complex" of mine.

There are those who will no doubt accuse me of "crabbing" the use of mains by this article. But if my words happen to meet the eye of only one man who, with no real idea of the fundamental laws of electricity, was intending experimentally to rearrange an old set for mains working, I feel they will have served some vitally useful service.

### When the Grid Gets Going

The new "Grid" scheme, whereby hundreds of thousands more people will be served with electrical power at cheap rates, has given an immense fillip to mains radio, and every post these days brings me letters from readers on the subject.

Naturally, anything that tends to stimulate interest in any branch of

irons, kettles, fires, soldering irons, fans, geysers, hair driers, refrigerator, and medical devices in commission, besides two all-electric radio outfits.

But I see that leads do not fray and plug-points aren't left unprotected!

### Past the Power Point

Also, I never replace a fuse for one of a higher current rating. I've known radio enthusiasts to do that!

By the way, it is a very great mistake to think that because you can identify positive and negatives, and can make a pretty good soldered joint, you are qualified to tinker with the house-wiring.

And even if you have accumulated as much electrical learning as the average electrician's mate, you must not put your pliers or screwdrivers on anything beyond the power point. That is against the law.

### A Pat on the Back

I have always wondered why the law forbids one to touch the wiring and yet leaves one free to tack pretty nearly anything one likes on to the power and light points; because, after all, everything joined to such becomes in effect a live extension of the electrical system.

But there is no control on the things sold for use with the mains. At least, if there is it is completely ineffective, for a goodly proportion of the electrical gear retailed is criminally flimsy stuff.

I am referring to domestic appliances now, and not radio sets and units. It is here that a big pat on the back for the radio industry in general is deserved. Some years ago the Institution of Electrical Engineers framed up a comprehensive list of recommendations for the design and construction of radio mains devices.

### Radio Trade's Good Example

They are very drastic and call for an extremely high standard of manufacture and quality of materials.

Nevertheless, I cannot call to mind a single firm making mains gear that is not carrying out these recommendations. And in the majority of cases the recommendations are being obeyed to the letter.

They could not be a stronger power for the good if they were laws of the land carrying with them the severest penalties known.

## PROTECTING YOUR EARDRUMS!



Here is a control engineer at work at the North Regional Station, Moorside Edge, Yorks. His job is to watch out against "blasting," over-modulating, and any accidental ear-drum shattering sounds from the studio.

developed this fear of electricity during my five years of service, before the Great War, at a power station; the same station that supplies many thousands of WIRELESS CONSTRUCTOR readers with their "juice."

### The Reason Why

I happened to witness a fatality that was entirely due to carelessness

radio is greatly welcomed by we set designers, and I assure you we heartily welcome this new phase. And if I strike a note of warning, please do not think that I am in any way reactionary.

Although, as I said above, I have a wholehearted fear of the mains, I use them with great liberality in my own home. There are electric cleaners,



# The A.C. "ACE"

An all-mains set that is capable of an excellent performance. Its selectivity is well above the average and the A.C. valves give astonishing magnification. You get fine loud-speaker results from stations hardly audible on a battery outfit with the same number of stages. And the construction is quite easy and the running costs absolutely negligible.

It is rather a surprising thing that, despite all the advantages of an all-mains-operated receiver, there are still a great many people having A.C. who refuse to work the radio from the mains on account of the fact that something might "blow up"!

As a matter of fact, there is no more danger attached to the working of a wireless set from the mains than there is from using an electric iron, or anything else electrical. On the contrary, an all-electric outfit is as safe as houses, and what to most of us is equally as important, it's a thoroughly economical proposition.

## All Power "On Tap"

Take the case of the "A.C. Ace." Here is an efficient two-valve receiver which is entirely mains-operated. H.T., L.T. and grid bias are all obtained on tap, so to speak, from the mains. You have absolutely trouble-free radio at any time of the night or day that you happen to want it.

And what have you got to pay

By  
G. T.  
KELSEY



for all these privileges? Believe it or not, beyond the initial outlay for the set, which taking into consideration the cost of batteries, etc., is not likely to work out at very much more than the cost of a battery set, it is very doubtful indeed whether the actual running costs would be noticeable at all!

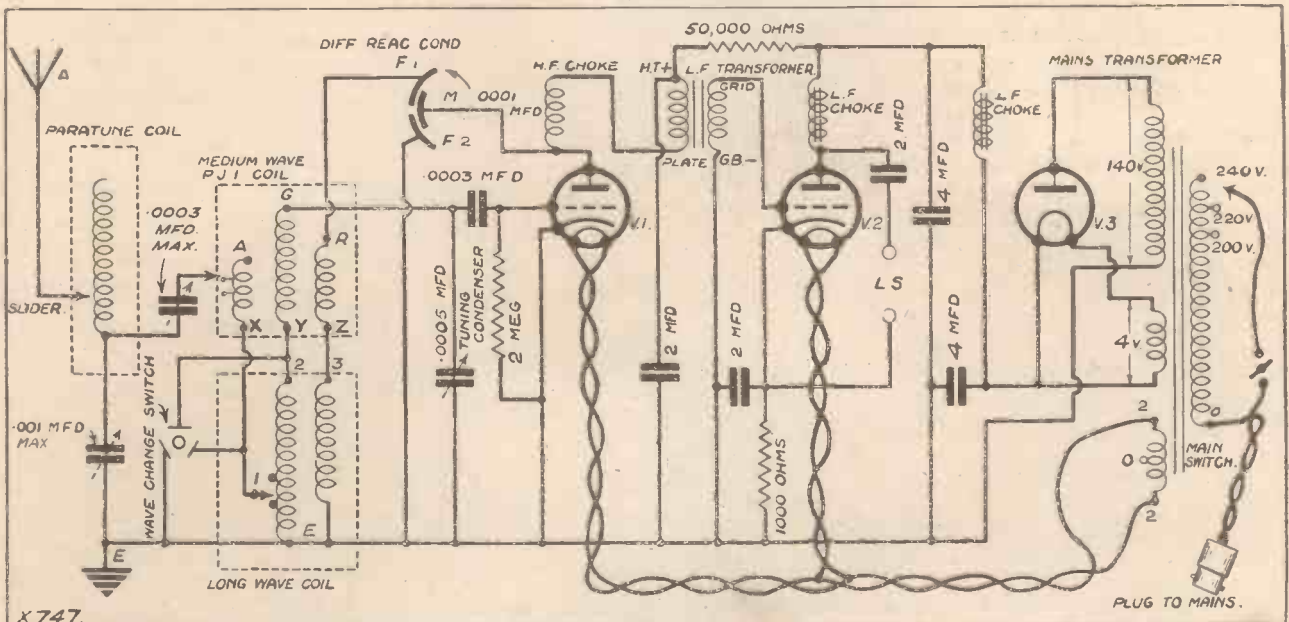
I have been running a much more elaborate all-electric outfit for something more than two years, and even with that outfit comparison of a quarter's account with one of a corresponding quarter before the set was "electrified" fails to show any increase that could reasonably be

attributed to the radio. (No, it wouldn't be policy to tell you the name of my supply company, for we are already over-populated!)

## Absolutely Safe

But it is a fact that the actual running costs of a mains-driven set, or, rather, of an A.C. mains-driven set (D.C. is a different proposition), are pretty well negligible. And as for safety, it is well-nigh impossible to get a shock of any kind from the A.C. "Ace" unless you deliberately ask for it by tinkering with the set's "innards" with the mains switched on.

## DON'T JUDGE THIS SET BY ITS SIZE



The results given by virtue of this special circuit and a new method of using new coils are out of all proportion to the size of the receiver and the number of valves and components used.

## The A.C. "Ace"—continued

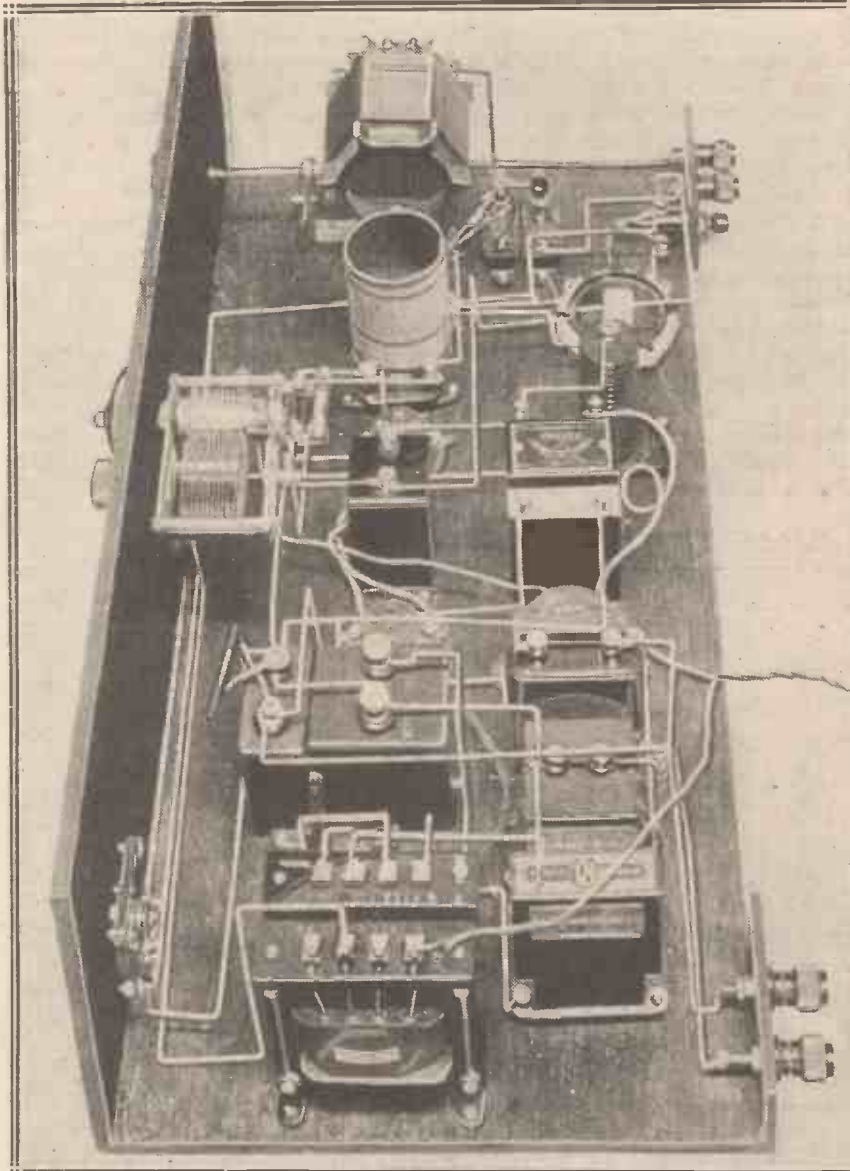
Now a word as to general circuit efficiency. First and foremost, the A.C. "Ace" employs the Paratune scheme of aerial coupling, and in consequence it is very selective. Added to this is the fact that although it is only a two-valver in so far as numbers of valves are concerned, the modern A.C. valve is considerably more efficient than the ordinary battery-driven type, with the result that the A.C. "Ace" is not so very far short of a three-valver using ordinary valves!

It is, of course, a wave-change set, and you have the option of building it

### YOUR SHOPPING LIST

- 1 Ebonite panel, 21 in. × 7 in. ×  $\frac{3}{8}$  or  $\frac{1}{2}$  in. (Permcot, or Parex, Lissen, Beol, Peto-Scott, Goltone, Wearite, etc.).
- 1 Cabinet for above panel, with baseboard 10 in. deep (Kay, or Camco, Lock, Pickett, Osborn, Gilbert, Langmore, etc.).
- 1 .0005-mfd. variable condenser (Lotus, or J.B., Polar, Lissen, Cydon, Ormond, Burton, Formo, Dubilier, Ready Radio, Igranic, etc.).
- 1 Vernier dial, if condenser is not of slow-motion type (Formo, or Brownie, Lotus, Igranic, Ormond, Ready Radio, J.B., Lissen, etc.).
- 1 2-point push-pull wave-change switch (Red Diamond, Magnum, Ormond, Wearite, Keystone, Bulgin, W.B., Ready Radio, etc.).
- 1 .0001-mfd.—or larger up to .00015-mfd.—differential reaction condenser (Ready Radio, or Polar, Ormond, Igranic, Lotus, Parex, Burton, Formo, Telsen, Wavemaster, Magnum, Wearite, Dubilier, J.B., etc.).
- 1 Mains on-off switch (Bulgin "toggle," or Igranic, etc.).
- 1 "Paratune" coil unit (Wearite, or Ready Radio, etc.).
- 1 50,000-ohm Spaghetti-type resistance (Bulgin, or Magnum, Leweos, Lissen, Graham Farish, Ready Radio, Sovereign, Keystone, Varley, Tunewell, etc.).
- 1 1,000-ohm Spaghetti-type resistance (Magnum, or see above).
- 1 2-meg. grid leak and holder (Dubilier, or Telsen, Ferranti, Lissen, Ediswan, Mullard, Igranic, Graham Farish, Watmel, etc.).
- 1 4-pin valve holder (Clix, or Telsen, Bulgin, W.B., Benjamin, Igranic, Junit, Formo, Lotus, Wearite, Lissen, Dario, Magnum, etc.).
- 2 5-pin valve holders (Clix, or see above).
- 1 .0003-mfd. fixed condenser (Ferranti, or Ready Radio, Formo, Lissen, Telsen, Mullard, Graham Farish, Dubilier, Igranic, T.C.C., Watmel, Ediswan, etc.).
- 3 2-mfd. fixed condensers (Ferranti, Formo and T.C.C. in set, or Igranic, Dubilier, Lissen, Hydra, Mullard, Franklin, Helsby, etc.).
- 2 4-mfd. fixed condensers (T.C.C. and Dubilier in set, or see above).
- 1 .001-mfd. max. compression-type condenser (Formo, or Leweos, R.I., Lissen, Polar, Sovereign, etc.).
- 1 .0003-mfd. max. compression-type condenser (Sovereign, or see above).
- 1 L.F. transformer (Varley, or Telsen, Ferranti, Igranic, Lotus, Leweos, R.I., Mullard, Lissen, etc.).
- 1 L.F. output choke (Igranic, or Atlas, Magnum, Ferranti, Bulgin, Varley, Wearite, Lissen, R.I., Telsen, etc.).
- 1 L.F. smoothing choke (R.I., or Igranic, Varley, Atlas, Bulgin, Wearite, etc.).
- 1 Mains transformer for half-wave rectifying valve, with 4-volt winding for A.C. valves (Wearite, or R.I., etc.).
- 2 Ebonite strips, each 3 in. × 2 in.
- 4 Engraved type terminals (Belling & Lee, or Eelex, Igranic, Clix, etc.).
- 1 "P.J.1" coil unit (R.I., Wearite, Ready Radio, A.E.D., Melbourne, etc.).
- 1 Coil quoit (Keystone, A.E.D., Wearite, Ready Radio, etc.).
- 1 H.F. choke (Leweos, Keystone, Telsen, R.I., Ready Radio, Parex, Varley, Dubilier, Lissen, Lotus, Wearite, Magnum, Watmel, Sovereign).
- 1 Plug adaptor for electric-light holder.
- 1 oz. No. 30 D.S.C. wire.
- Glazite or Lacoline for wiring.
- Flex, screws, wander plugs, etc.

### COMPLETELY TROUBLE-FREE IN USE



You can forget the technical aspects of this set once it is in commission. There are no batteries at all and its reliability factor is almost infinitely high!

## The A.C. "Ace"—continued

on the old principle with an ordinary wave-change switch, or else of having automatic wave-changing by using an Extenser.

Thus if you are on A.C. mains and are in need of a jolly good, trouble-free radio outfit—particularly if you haven't yet tackled an all-mains outfit—you would be well advised to have a go at the A.C. "Ace."

### Easy to Construct

It's not a difficult set to build and when completed you can forget about it. The A.C. "Ace" will hold out as long as the power station!

The choice of components for this all-from-the-mains two-valver is a matter in which a certain amount of care will need to be exercised, more so, perhaps, than in the selection of parts for a set of the ordinary type.

But a complete list of the components used in the original model, together with our recommended alternatives, is given elsewhere in the article.

You will probably find it more convenient to commence the constructional part of the business by

first winding the special coils. The medium-wave coil, which is known as the P.J.1, is now obtainable commercially in several different makes. But it's not a difficult coil to make.

The former on which the coil is wound is 2 in. in diameter and 3 in.

$\frac{1}{8}$  in. in this time, and then continue with a further 34 turns, which are for reaction. All these windings should be carried out in the same direction.

With regard to connections, the start of the aerial winding should be marked A (this is one of the taps to which the clip is connected), and the end X; the start of the second winding (the 64 turns) should be marked G, and the end Y, and the start of the third winding should be marked Z, and the end R.

Some commercial coils have coloured flex connections instead of lettering as follows: A, red; X, blue; G, white; Y, black; Z, green; R, yellow.

### The Long-Wave Coil

For the long-wave coil you will require what is known as a "Coil Quoit," and it can be obtained from any of the people mentioned in the component list. The windings for this coil (which are also carried out with No. 30 D.S.C. wire) consist of 60 turns for reaction and 150 turns for the grid winding, with tappings on the latter at 30 and 60 turns.

### YOU WILL WANT THESE

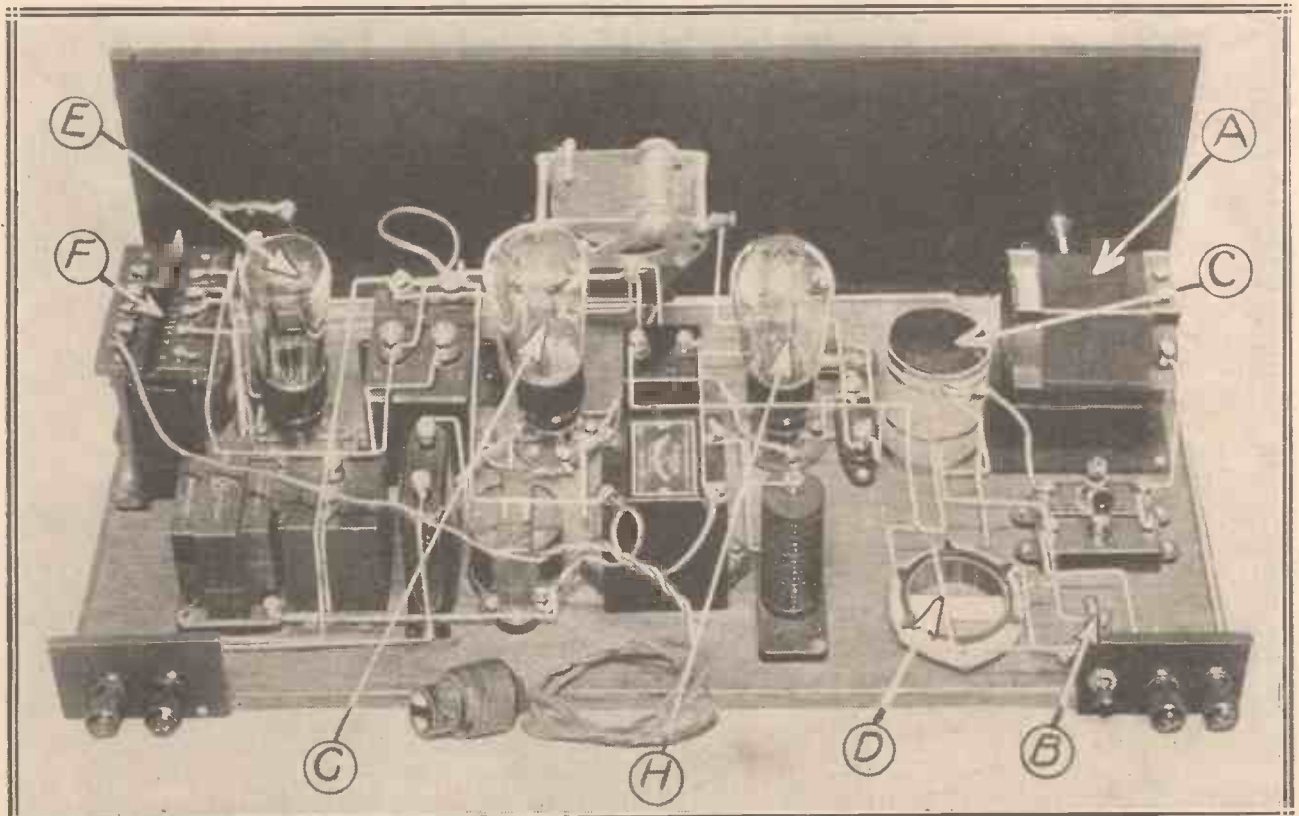
Receiving Valves. 1 H.L. or similar type and 1 output valve (both of 4-volt A.C. type) (Mazda, Cossor, Osram, Mullard, Eta, Marconi, Lissen, Six-Sixty.)

Half-Wave Rectifying Valve. (Mullard D.U.1, Cosmos S.P.41/U, Cossor 44 S.U., Mazda U.30/250.)

Loud Speaker. (Amplion, Blue Spot, B.T.-H., Celestion, Donotone, Mullard, Ormond, Undy, etc.)

long, and the windings (three in all) are carried out with No. 30 D.S.C. Start at one end and wind on 9 turns, making taps at the fourth and sixth turns. Leave a space of  $\frac{3}{8}$  in. and then put on a further winding of 64 turns. Leave a space of only

### FEATURES OF THE A.C. "ACE" THAT ARE WORTH NOTING



(A) is the Paratune coil; (B), wave-change switch; (C), medium-wave coil, P.J.1; (D), long-wave coil wound on a coil quoit; (E), rectifying valve; (F), mains transformer; (G) and (H), the two A.C. valves.

# The A.C. "Ace"—continued

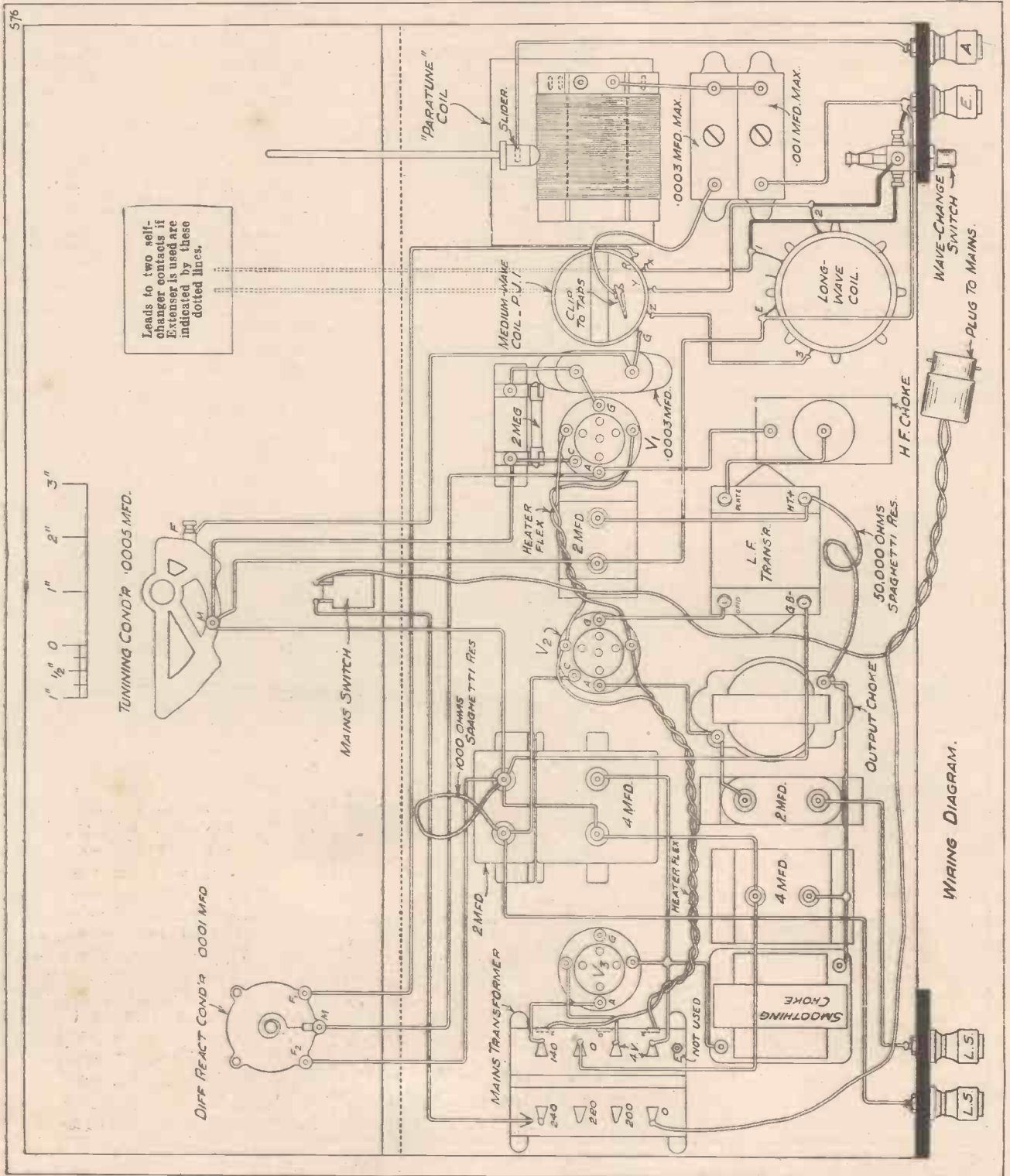
Join the end of the 60-turn winding to the start of the 150-turn winding, and mark this common connection E.

The start of the 60-turn winding should be marked 3, and the end of the larger winding 2.

Wind the 50 turns—hank fashion—on the special former first of all, and when this is done wrap a strip of paper or Empire cloth round the winding and proceed with the second coil, which should be in the same

direction on top of the first winding.

When you have finished the coils the next job is to mark out and drill the panel. The fixing of the various components is straightforward enough if you refer to the back-of-panel diagram.



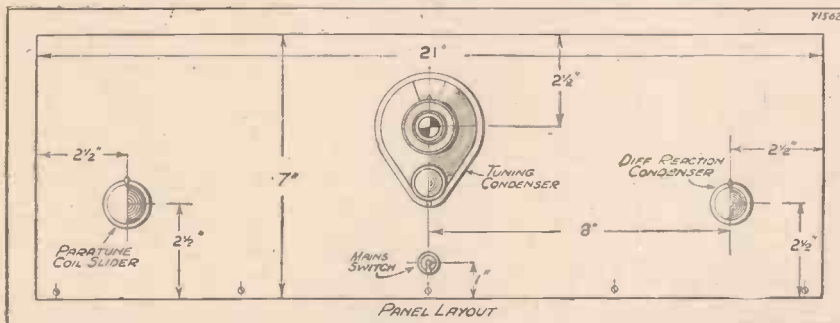
**THE A.C. "ACE"—continued**

By the way, if you use an Extenser, and I expect most of you will, then, of course, the wave-change switch on the right-hand side of the terminal strip at the back will not be wanted. Instead you will simply connect up your Extenser in the manner shown in the wiring diagram, omitting altogether the ordinary tuning condenser and wave-change switch. The three leads to the wave-change switch which are shown as full black lines are not needed in this case.

**Preparing the Test**

Now as to giving the set a try-out. First of all consult the operating panel and the recommended accessories list given elsewhere in the article

**ONE OF ITS GREATEST ADVANTAGES**



The controls are very few in number, and consequently you will find that operation is simplicity itself. The main tuning control is the condenser in the centre of the panel, the adjustment of the Paratune coil not being critical.

for details of the valves required. Then when you have placed the valves in their respective positions (see that you put the rectifying valve in the right holder!), connect the flexible lead from the .0003-mfd. condenser (the one nearest the Paratune coil) to a tapping on the aerial winding of the P.J.1 coil.

You will remember that two tapings were made on the grid winding of the long-wave coil, but there is really no need for a flexible lead to these taps, because once you have determined the one that gives the best results in your particular locality you can solder it up and forget about it. So for the preliminary tests you can just twist first one tapping and then the other round the wire to which the one giving best results will ultimately be soldered.

**Warming Up**

When you are quite certain that you have done everything, and when

**THE "WIRELESS CONSTRUCTOR" A.C. "ACE"**

Circuit: All-from-mains. (A.C.) Det., L.F.

**VALVES.**

- 1st: Indirectly-heated type H.L., A.C. valve for detector.
- 2nd: A.C. type output valve (a super-power valve is unnecessary).

**RECTIFIER.**

Any 4-volt half-wave rectifying type (U.30/250, D.U.1, 44S.U., etc.).

**ADJUSTMENTS.**

- MAINS VOLTAGE:** Join wire from mains switch (on panel) to tap on mains transformer corresponding with voltage of local supply.
- SELECTIVITY:** For altering selectivity on medium-wave band, adjust position of tapping clip on solenoid coil.
- LOCAL STATION "BREAK-THROUGH" ON LONG WAVES:** Adjust capacities of compression condensers until trouble disappears. (Do not reduce one nearer back of set too much.)

**CONTROLS ON PANEL.**

- LEFT-HAND KNOB:** Paratune coil control (see operating details below).
  - LARGE CENTRAL KNOB:** Main tuning condenser or Extenser control.
  - SMALL CENTRAL KNOB:** Main on-off switch (This switch breaks the mains).
  - RIGHT-HAND KNOB:** Reaction control.
- NOTE.**—If set is made up without Extenser tuning, wave-change switch is on terminal strip at back.

**OPERATION.**

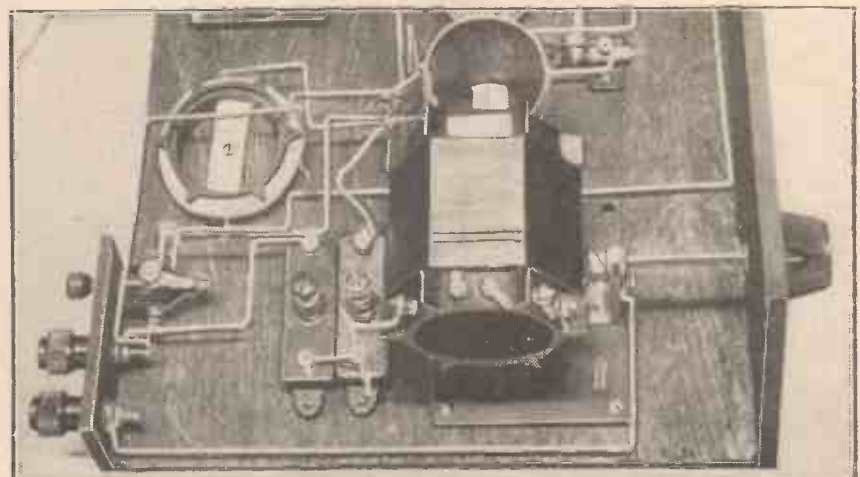
- WITH EXTENSER TUNING:** Carry out main tuning with large central dial. Paratune coil control should be adjusted for loudest results on every station received on medium broadcast band (0-100 degrees). Use reaction control (right-hand knob) when receiving distant stations on both bands. On long waves (100-200 degrees) Paratune coil should be left adjusted at extreme left or right (whichever gives best results). Beyond this preliminary setting, Paratune control should NOT be used on long waves.
- WITH ORDINARY TUNING:** Proceed as above, but bring switch at back of set into operation when changing from medium broadcast band to long waves. Push switch in for long waves; pull switch out for medium waves.

loud speaker, put the mains plug into the nearest available socket, and switch on.

It may take half a minute or so for the valves to warm up, but as soon as the set begins to "become lively" then just proceed to operate the set exactly in accordance with the instructions given in the operating panel, and it won't be long before you hear signals.

As a final remark may I just give you a gentle reminder regarding the safety question. Make it a fixed rule never to make any adjustments to the inside of the set until you have first put the mains switch in the off position. And if you bear that closely in mind, you'll find the A.C. "Ace" as harmless as a kitten!

**GIVES PERFECT STATION-SEPARATION**



The Paratune coil, which is in the foreground of this photo, enables you to achieve a high degree of selectivity without loss of power.



# ROUND the DIALS

*Practical notes on what stations to look for and how to get the foreigners that are coming over well.*

DESPITE occasional nasty little bouts of X's, the conditions for reception have remained remarkably good, and this summer must be creating something of a record for easily-tuned-in foreign programmes. Not only has daylight reception been much better than usual, but real DX reception has been possible nightly, and quite early in the evenings, as compared with other years.

After about 9 p.m. the foreigners seem almost anxious to pay calls on my own aerial, and the regular old friends like Rome, Toulouse, the usual Germans, and Hilversum, have been supplemented by lusty transmissions from the new Swiss stations at Sottens and Beromunster. On 403 and 459 metres respectively these two have become quite regular callers.

### A Good Station

The surprise of the month has been afforded by Fécamp, on about 250 metres, his strength and regularity being quite amazingly good. As this station is not as well known as it deserves to be, the following particulars may be of interest.

Fécamp rarely gives the name of the town in its announcements, but generally calls "Radio Normandie." Thus it sounds quite different from what might be expected by those trying to log the station for the first time, the announcement sounding like "Allo, Allo. Ici Raddio Naw-mawndy."

Once this is realised the station is easily recognised, for it announces with commendable frequency, but unfortunately it does not stick closely to its allotted wave-length.

On the long waves there have been two interesting features, the increased power of Konigswusterhausen and tests by Radio Paris. The latter appears to be trying out the increased power of which we have heard so much, while the famous long-wave Berliner has now developed his full power of 75 kilowatts on 1,635 metres

\*\*\*\*\*  
 \* **POINTS FOR** \*  
 \* **PURCHASERS** \*  
 \* *Interesting details from manufac-* \*  
 \* *turers about recent trade activities.* \*  
 \*\*\*\*\*

MR. A. BRODERSEN, sole distributor of the N. & K. Inductor loud speaker, announces that certificates of guarantee which were not issued when the speaker was bought cannot be supplied by him. The wholesale houses are furnished with certificates for every new model N. & K. loud speaker, to hand on to the retailer for issue to the purchaser, and every customer should *insist* on having the certificate at the time of purchase.

### Polar Prices

Readers will be glad to know that the list price of all Polar Pre-set condensers has been reduced, and two new capacities have been introduced, viz., .0002 and .0005 mfd. The following are the new figures. Capacities of .0001, .0002, .0003, .0005 and .001, price 1s. 6d. The .002 model is now sold at 2s.

### Good Business

A bit of good work by the Exide service came to light in connection with the Amateur Golf Championship, played at Westward Ho some

weeks ago. To get the result over to America quickly the Western Union Telegraph Co. needed at very short notice a set of 120-volters, and in response to an S.O.S. to Clifton Junction the batteries were on the course, and working, within only a few hours. Good business!

### For the Coil Constructor

The British Ebonite Co. have forwarded us a leaflet regarding the "Becol" formers and panels, from which we see that the firm is now listing  $\frac{3}{16}$  in. thick "Becol" panels in standard sizes, in addition to their  $\frac{1}{4}$ -in. lines.

The full range of Becol coil formers is also detailed, with exact diameters, internal and external, and WIRELESS CONSTRUCTOR readers who "roll their own," and like to use high-quality electrically tested goods, are invited to apply for the list.

The address is Nightingale Road, Hanwell, London, W.7.

### New Westinghouse Lines

Radio sets manufactured by the Westinghouse Co.—whose products are a household word in the electrical industry—are now available.

They will be distributed by the Rothermel Corporation and available through dealers, the first model being a magnificent 9-valve super set mounted in an unconventional but handsome clock-style cabinet, with an electric clock that operates from the mains and never needs winding.

Alternatively an eight-day spring clock can be supplied where the mains frequency is not constant. The moving-coil loud speaker, housed in the tall "cabinet," which provides a long air-column, is of special design, and the operating controls are inconspicuously placed at the side of the cabinet.

Particulars of this very striking design can be obtained from the Rothermel Corporation, Ltd., 24-26, Maddox Street, London, W.1.

### Ealex Reductions

If you are thinking of overhauling your buried earth system you will be interested to know that the Ealex Earth Bowl is now reduced in price. This bowl, which has moisture-retaining properties that are well known, is now reduced from 5s. 6d. to 3s. 6d.

\*\*\*\*\*  
**NEXT MONTH**  
 Look out for the September  
 "Wireless Constructor"  
 ON SALE AUG. 15th. Price 6d.  
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# SAVOY HILL NEWS

*Dr. Boult's Task—The Governors Active—Talks Split Up—Listeners to See the Military Band—The Professional v. Amateur  
Bother—The Angry Highlands—Broadcasting House—B.B.C. Finance.*

## Dr. Boult's Task

I WAS hearing the other day an "inside" account of some of the troubles that Dr. Adrian Boult, Music Director of the B.B.C., has been encountering and surmounting. The task of evolving the world's greatest orchestra requires not only first-class musicianship, but also a statesmanlike quality and well-nigh unlimited patience, and from what I can gather it seems that Dr. Boult embodies as nearly the ideal combination of these qualities as one is likely to find.

## Work and Pay

For one so intensely sympathetic as Dr. Boult the task of thinning out must be extremely painful; yet it has to be tackled, and regularly, for the next two years or so if the desired result is to be attained. My information is that for the most part the B.B.C. is wisely accepting and implementing Dr. Boult's conception of musical policy.

I have just a little anxiety that Savoy Hill may make a mistake in failing to appreciate the value of Dr. Boult in terms of money. The Music Directorship of the B.B.C. is now the most important and responsible musical post in the world; it is a job the rewards of which cannot, of course, be competitively commercial, but which should be of the order of £5,000 a year.

That the present Music Director may not care about his B.B.C. pay is immaterial. It is up to the B.B.C. to make it well paid.

## The Governors Active

The B.B.C. Governors spread themselves during the absence of Sir John Reith in America; this prospect I anticipated in my early observations

on the visit of the chief of the B.B.C. But it is a tribute to the solidity of the structure of the organisation of British broadcasting that the intrusion of the legislative element into the executive machine in the absence of the Chief Executive was accommodated with the minimum of friction and without observable decline of service.

Indeed, the contrary effect was noted in several directions. There is now, I believe, an excellent chance of more wholehearted and complete co-operation between those really dynamic forces, Mrs. Philip Snowden and Sir John Reith, under the states-

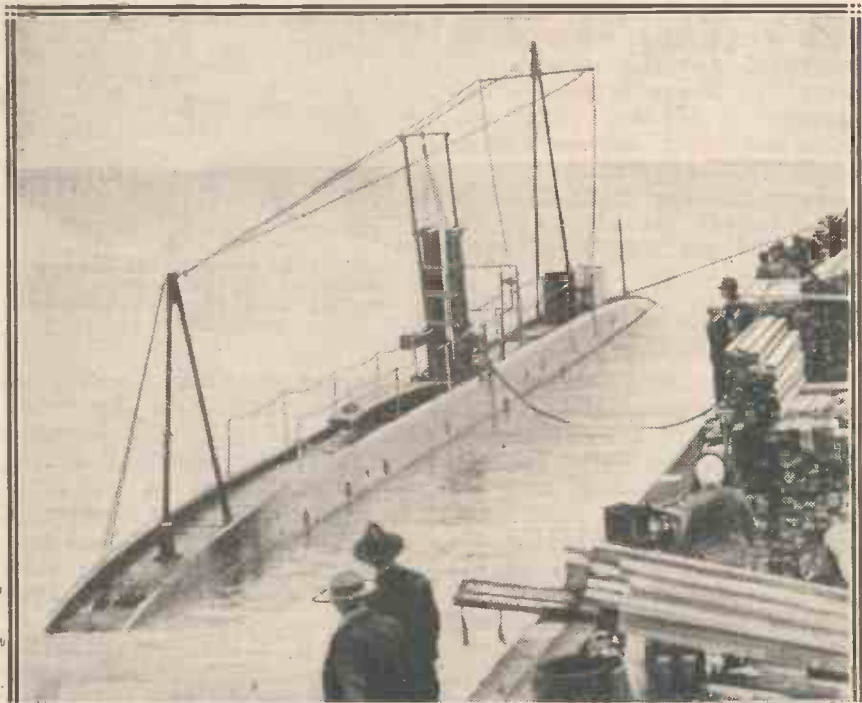
manlike and experienced guidance of Mr. Whitley.

Some friction there is bound to be until the functions of the Governors are more precisely defined. There is still doubt of the intentions of those who framed the Royal Charter. Were the Governors merely to keep a watchful eye on things in the public interest, or were they to work just like senior members of the staff?

## Talks Split Up

The separation of General Talks, Adult Education Talks and School Talks is now complete. One favourable result has been to make it

## RADIO ON SIR HUBERT WILKINS' SUBMARINE



*Radio is going to play an important part in the "Wilkins'" Expedition to the North Pole, and this photograph shows their submarine "Nautilus" undergoing tests alongside the quay. Note the wireless aerial, supported by collapsible masts.*

## Savoy Hill News—continued

possible for the Director of Programmes in settling differences and giving rulings considerably to curtail the duller and less desirable talk schemes.

On the other hand, an alarming aspect is that Mr. Siepmann, the Adult Education officer, now that he has got his head on his own territory, is producing schemes of talks for years ahead.

I do not mean that there is anything alarming in the schemes. No doubt they are ideal for their purpose. But I do suggest that this long-distance planning imposes a severe handicap of rigidity on programmes, and goes a good way to nullifying the greater flexibility which Miss Matheson has gained for her general talks.

### Listeners to See the Military Band

After a good deal of discussion at Savoy Hill it is now practically decided to introduce the Wireless Military Band in a series of public concerts beginning next winter.

Mr. Walton O'Donnell has produced a very fine military band, perhaps the finest in the world, and its microphone performances are one of the most esteemed of B.B.C. features. But the musical authorities at Savoy Hill came rightly to the conclusion that this band would never take its correct place in the appreciation of the critics and music lovers if its activities were to remain confined to studios.

Hence the new move, which if successful will add gladly to the interest of the next broadcasting season.

### The Professional v. Amateur Bother

I gave you the exclusive advance news of this some months ago. The announcement of a definite preference for musicians who depend for their livelihood on that kind of work was violently attacked by some newspapers. But in its own interests the B.B.C. is bound to do everything it can to create and support a strong corps of professional musicians and artistes.

By and large the professional gives a better performance; indeed, the day of the amateur at the microphone has been outlived. Not that the B.B.C. should discourage original talent and

genius wherever it is to be found. This is a further point of policy that has not yet been ventilated.

The B.B.C. is now determined to make it clear that musicians and artistes cannot expect to be "brought out" by the B.B.C. alone.

### The Angry Highlands

Of the various outlying areas not adequately covered now, and unlikely to be much better off under the Regional Scheme, the North of Scotland is the most vocal and powerful. Many municipal authorities in the Inverness-Fort William district have passed strong remonstrances to the B.B.C., the Prime Minister and the Postmaster-General, asking that something should be done to make it possible for Highland listeners to receive the Scottish programmes.

### THE FRENCH LESSON



Here is M. Stephan, the popular Frenchman who set such a high standard with his language-talks from London.

They are at present dependent on Daventry. In the old days, when Aberdeen had a good exclusive wave, there was a Scottish service of sorts for the North. But now that Aberdeen has been reduced to the status of repeating the British National programme on the common wave, what there was of a Scottish service for the North has disappeared.

I believe the B.B.C. is taking the line that nothing should be done until it is clear exactly what will be the effective radius of the new Scottish Regional transmitter under construction at Falkirk now.

At the same time, engineers at Savoy Hill are not at all hopeful of a solution in this direction.

It may be necessary ultimately to put a relay station at Inverness, even if it has only a three or four miles range. Incidentally, I was interested to hear the other day that work on the Falkirk transmitters promises to be much more rapid than work on the other Regional jobs already tackled.

There should be regular service transmissions in Scotland about this time next year.

### Broadcasting House

I went round the new building in Langham Place the other day. It is rapidly nearing completion.

Some furniture is appearing and several studios are beginning to look like what they are meant to be. But there is already a critical accommodation problem.

Many of the staff at Savoy Hill will be relatively worse off in the new building. First of all there are the unfortunates who will be in the three or four floors underground. Then there are those who will have to work in the central tower, removed from daylight.

These and definite lack of room are among the problems the administration of the B.B.C. is now wrestling with. I should not be at all surprised to see a considerable number of the staff of the B.B.C. stay in one of the various separate buildings which are now in occupation in addition to Savoy Hill.

### B.B.C. Finance

The "Supplemental Agreement" between the Postmaster-General and the B.B.C. revising the division of the licence money was something of a joke, and not a pleasant one either for the broadcasters.

The B.B.C. needs a substantial part of the Treasury part of licence revenue and has been trying for months to get it. The result is that the Opera subsidy is to be handed over, if Parliament agrees, and a matter of £35,000 a year added to the B.B.C. allowance from the Post Office deduction, which is now reduced from 12½ per cent to 10 per cent.

This is simply ridiculous, and I suspect that there is private pressure at work to get the B.B.C. to devote this addition to Empire broadcasting.



# AS WE FIND THEM



**U**NDER present-day conditions, a sensitive receiver is of little practical value unless it has a degree of selectivity sufficient to ensure adequate separation of the various stations which it will bring in.

There are several methods of obtaining or increasing the selectivity of any given circuit. Perhaps the most

is arranged for one-hole fixing on the panel, having an additional supporting bracket which may be screwed to the baseboard.

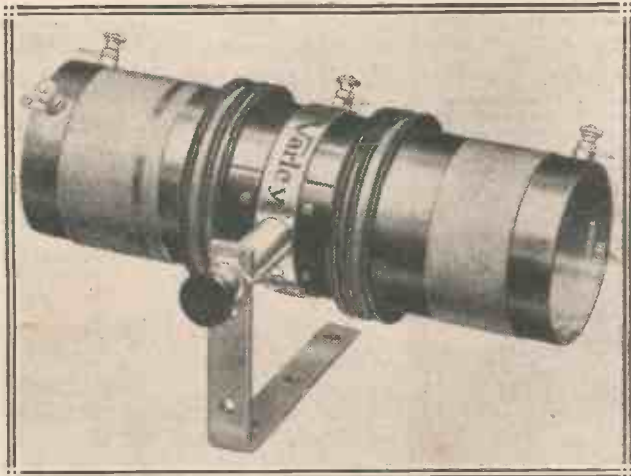
The wave-change switch passes through the centre of the one-hole fixing.

Schemes for increasing selectivity are sometimes detrimental to repro-

increase in selectivity obtained with this device there is not the loss of signal strength that some selectivity devices entail. In fact, with the Varley coil the signal strength is maintained at a surprisingly high level.

The wave-bands covered by this "Square Peak" coil are 220-600 metres, and 1,000-2,000 metres when tuned by a .0005-mfd. condenser.

## COMPACT AND EFFICIENT



*The Varley dual-range band-pass coil unit has a single-hole fixing, the wave-change switch passing through the centre. The coil provides a very high degree of selectivity.*

satisfactory scheme is a properly designed band-pass filter, but unfortunately such devices can be somewhat complicated and may tend to increase the difficulty in handling the set.

### A "Square Peak" Coil

Messrs. Varley (Oliver Pell Control, Ltd., 103, Kingsway, London, W.C.2) have successfully tackled this problem, and as a result have produced a compact unit known as the "Constant Square Peak Coil," which is an extremely compact dual-range band-pass aerial tuning coil. The device

duction, and the result is often a loss of high notes. With the Varley coil, however, there is substantially a square-peak resonant curve approximately 9 kilocycles in width. Thus it is possible to obtain high selectivity without detriment to quality.

With the ordinary simple reaction detector and one or two L.F. type of set it is never easy to obtain sufficient selectivity, and the Varley "Square Peak" coil seems to be ideal for this class of receiver. Reaction may be obtained by feeding back through the aerial winding, and in spite of the big

### Easy to Tune

The method of tuning, of course, is to employ a twin condenser with a single control, thus there is no difference between the operation of a set which incorporates one of these coils and that of a one-knob receiver.

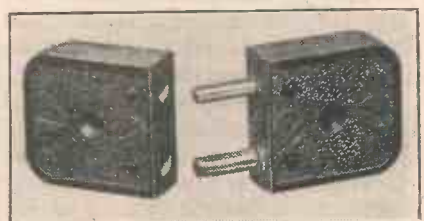
The coupling condenser used in conjunction with the Varley coil must be of the non-inductive type, and should have a capacity of .04 mfd.

This new coil is a most valuable aid towards obtaining an adequate degree of selectivity with simple receivers, and we have no doubt that it will achieve the popularity that it deserves. The retail price is 15s.

### Double-Pole Connector

Messrs. Silas Quaker, Ltd., 110, Park Street, Camden Town, N.W.1,

### A NEAT CONNECTOR



*This non-reversible connector can be obtained in several different finishes to match various colour schemes.*

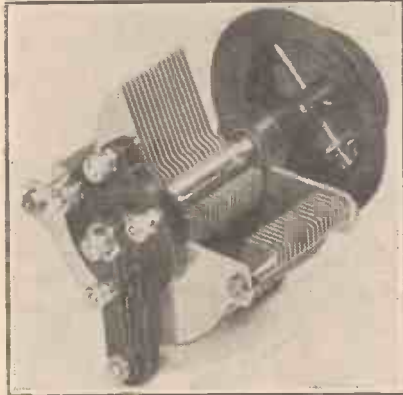
## As We Find Them—continued

have sent us a safety double-pole connector for test.

The component is made of bakelite and is non-reversible. That is to say, it is impossible to insert the plug in the socket the wrong way round.

The moulding is clearly marked positive and negative so that there is no possibility of any mistake in connecting up the leads.

### EXCELLENT WORKMANSHIP



The Formo "Extenser" is an extremely well-made component.

The connectors retail at 1s. 9d. each, and can be supplied in black, mahogany, oak or walnut finishes.

A small extra charge is made for finishes other than those mentioned. It is a useful component and should command a ready sale.

### The Formo Extenser

The rapidly increasing popularity of the Extenser has caused the leading condenser manufacturers to turn their attention to the production of models to meet the demand for this new development.

Messrs. Formo, of Golden Square, Piccadilly Circus, W.1, are never in the background in matters of this nature; and we are pleased to have had the opportunity of testing one of the 0005-mfd. Extensers produced by this firm.

It is a splendidly made component, and the operating cam which comes into use on the medium wave-band has a beautiful smooth movement.

Three contact springs are mounted upon the end of the Extenser, and their inherent springiness permits them to separate and thus to become insulated from each other over 180 degrees of travel of the moving vanes.

The cam then comes into operation and presses the three contacts to-

gether for the remaining 180 degrees of movement of the vanes.

Five terminals of generous dimensions are provided, and these are grouped together, thus facilitating wiring.

The moving and fixed vanes are accurately spaced and we were not able to detect any rock in the bearings. It is a component we can thoroughly recommend.

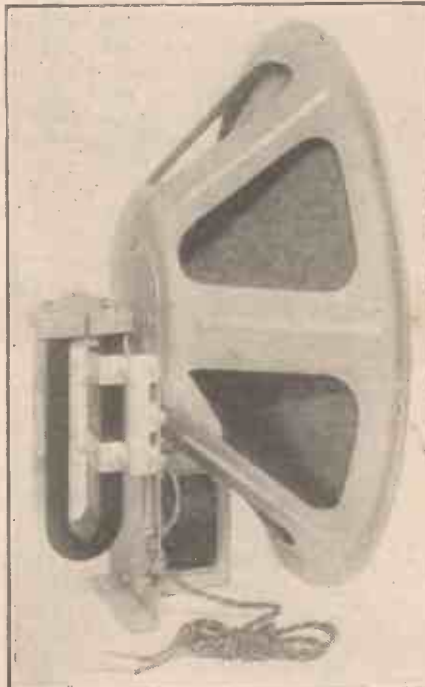
### Undy Loud Speaker

Messrs. J. Hemilik, 8, Collinworth Road, London, N.W.10, recently submitted for test one of their Undy 8-pole units and cone chassis complete.

A feature of the unit is the inclusion of an output filter choke and condenser, which isolates the speaker windings from the D.C. current in the anode circuit of the output valve.

The unit comprises a large permanent magnet, having an armature which is balanced between substantial laminated pole-pieces. The unit is well constructed mechanically. The cone itself is of comparatively large diameter, namely, approximately 13½ in.; a felt mounting being employed between the edge of the cone and the chassis frame.

### INCORPORATES A FILTER



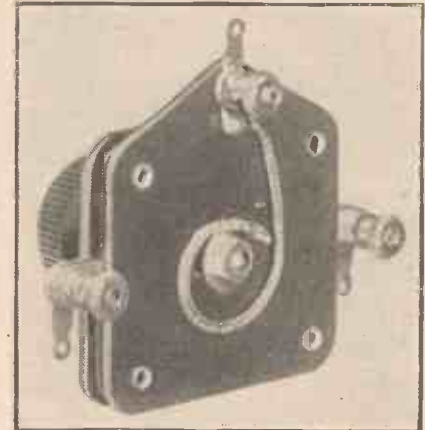
The "Undy" cone speaker utilises a large permanent magnet, the pole-pieces being laminated. An output filter is included in the assembly.

We found the speaker to be sensitive and the reproduction extremely pleasant.

### Lotus Condenser

Messrs. Lotus Radio, Ltd., Mill Lane, Liverpool, the well-known makers of radio sets and accessories, have sent us a sample model of their latest differential reaction condenser.

### FLOATING PLATES



The latest Lotus differential reaction condenser has a nice velvety movement.

One of the special features of this condenser is the "floating" plates, a scheme which does away with any inherent stickiness in the movement, and therefore assists in obtaining a fine adjustment.

Care has been taken to ensure a low minimum capacity, and the stout mechanical workmanship reduces the risk of capacity changes when the knob is pressed.

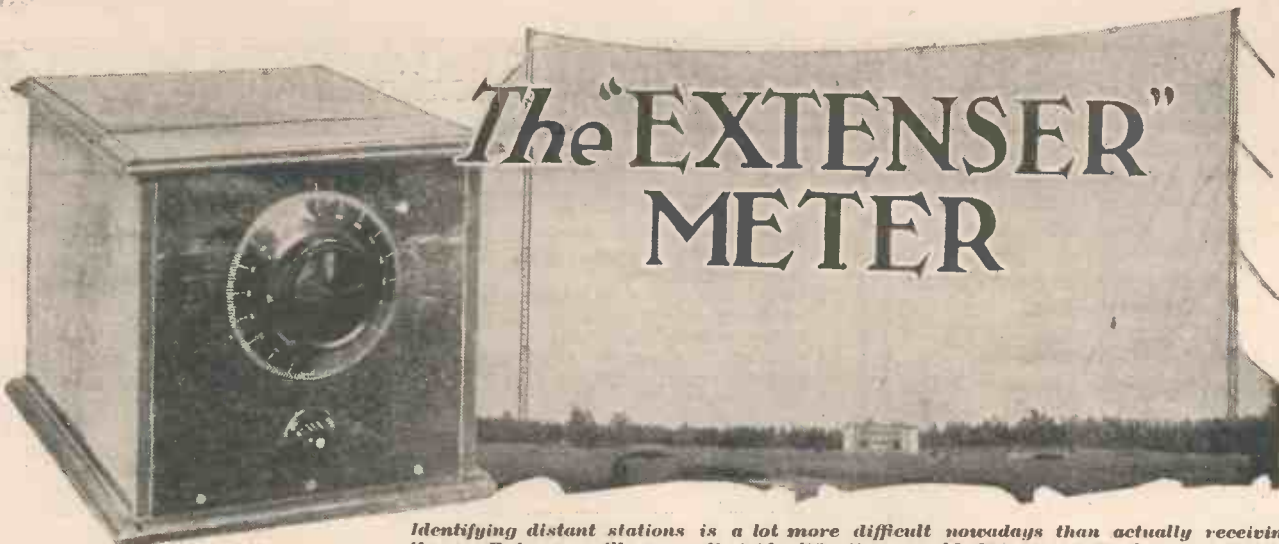
### Beautifully Made

The sample model was very nicely constructed, having a velvety action. The connection between the moving vanes and the terminal is a copper pigtail, and good-size terminals as well as soldering tags are provided for connecting up.

On test we found the insulation between the moving and fixed plates to be infinity at 500 volts D.C. and we commend the condenser to the notice of constructors.

### Parafeed Transformer

An examination of the N.P.L. curves for this new Radio Instruments' transformer reveals a wonderfully even response over the musical frequency range. We shall be publishing a full report on this instrument in our next issue.



# The "EXTENSER" METER

*Identifying distant stations is a lot more difficult nowadays than actually receiving them. But you will agree that identification would become a simple matter if you could always know exactly to what wave-length the set was tuned. That is just what the useful instrument described in this article will tell you—and tell you quickly and accurately.*

By A. S. CLARK.

**F**EEED-BACK is a pet aversion of set constructors, but there are times when one is only too pleased to make use of it. Whenever the reaction condenser is turned the slightest bit "in" we are deliberately introducing feed-back.

## Useful "Feed-Back"

What we are doing is to impress on the grid of the valve a part of the amplified high-frequency variations in its anode circuit. These act in just the same way as the original

### HERE ARE SUITABLE ACCESSORIES.

Valve. (L.F. type, 2, 4, or 6 volts).  
(Mazda, Cossor, Osram, Mullard, Eta, Marconi, Lissen, Six-Sixty.)

Batteries. H.T. (60 volts). (Drydex, Pertrix, Ever Ready, Grosvenor, Lissen, Fuller, Siemens, G.E.C., National, Oldham.)

Accumulator (to suit voltage of valve). (Fuller, Exide, Ediswan, Lissen, Pertrix, Oldham.)

variations passed from the aerial into the grid circuit, only more so.

And if we go on increasing the feed-back the result will be that the impulses going round and round will build up to an optimum point where the self-made variations will swamp everything else and the valve will start "oscillating."

## A "Wee" Transmitter!

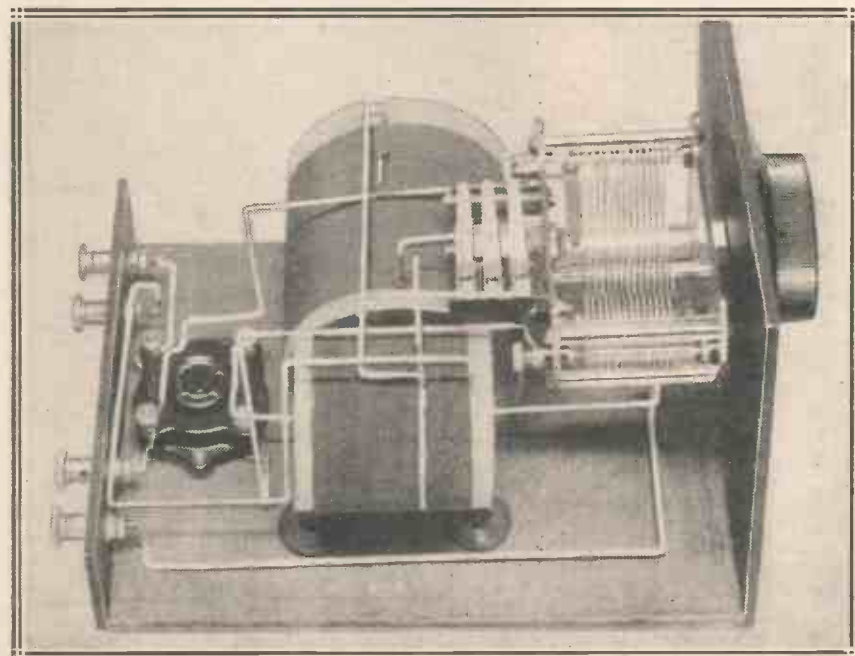
The oscillating valve is largely a requisite of the transmitter, and plays small part in normal reception. There is one very good way, however, in which we "receptionists" can make use of it, and of which it is the purpose of this article to describe.

Actually we do not divorce the oscillating valve from its accustomed routine, for the idea is to have a miniature transmitter of our own. Of course, its radiating power is very small indeed, and only covers a matter of a few feet.

accurately to any station we desire to receive.

So the "Extenser" Meter, as the unit is called, because it makes use of the new tuning system introduced by the WIRELESS CONSTRUCTOR, simplifies station searching almost to

## THERE ARE NO COILS TO CHANGE



*In most ordinary wave-meters it is necessary to change coils to cover both broadcast wave-bands, and not only is this likely to de-range the turns on the coils themselves, but the actual wiring of the instrument may be disturbed. Both of these effects are likely to completely upset the accuracy of the calibration, but they are entirely obviated in this unit by the Extenser, which makes coil changing unnecessary.*

Our little transmitter is so arranged that we can tune it to any wave-length, and then pick its transmission up on our receiver. The net result of this is that the set can be set

the level of picking up the local programme. It has other advantages as well.

For instance, suppose you are making up some experimental coils,

## The "Extenser" Meter—continued

and want to know if you have put on the right number of turns to cover the desired wave-band. You just set the tuning of the "Extenser" to the desired limits and note whether the coil will tune to them.

### Easier "Station Finding"

The scheme works just as well the other way round. Should you be receiving an unknown station, and wish to find on what wave-length it is transmitting, you simply vary the meter's tuning until you hear the heterodyne on the set. Then you read off the wave-length.

Perhaps you may wonder where the "Extenser" Meter can score over a calibrated set. Well, it does this without any doubt at all. The dial setting at which a certain station is tuned-in on a set depends in most cases to a certain extent on the amount of reaction that is being used.

Consequently, since it is impossible

**EVERYTHING YOU NEED TO BUILD IT!**

<p>1 Panel, 7 in. × 7 in. (Keystone, or Goltone, Lissen, Parex, Permcil, Becol, Wearite, etc.).</p> <p>1 Cabinet for above, with 9-in. deep baseboard (Cameco, Lock, Kay, Gilbert, Osborn, Pickett, etc.).</p> <p>1 .0005-mfd. Extenser with dial (Cylcon, Formo, Wavemaster, etc.).</p> <p>1 L.T. switch (Bulgin, or Ready Radio, Benjamin, Red Diamond, Wearite, W.B., Goltone, Junit, Keystone, Lissen, Ormond, Magnum, Igranic, Lotus, etc.).</p>	<p>14-pin valve holder (Igranic, or Telsen, Bulgin, W.B., Benjamin, Junit, Lotus, Formo, Lissen, Wearite, Clix, Dario, Magnum, etc.).</p> <p>1 Terminal strip, 7 in. × 2 in.</p> <p>4 Indicating terminals (Eelex, or Belling &amp; Lee, Clix, Igranic, etc.).</p> <p>1 2½ in. × 2½ in. former, and ditto 3½ in. × 3½ in.</p> <p>2 oz. 24 D.S.C. wire.</p> <p>2 oz. 30 D.S.C. wire.</p> <p>Glazite or Lacoline, for wiring.</p> <p>Screws, celluloid sheet, etc.</p>
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to tell how much reaction is in use, and also because the amount of reaction required to receive a certain station at a given strength varies from time to time, the dial setting for that station will also vary and the calibration will only be approximate. With the "Extenser" Meter the setting can be absolutely exact, no matter how much reaction is employed.

What we have is a tuned-grid circuit coupled to a coil in the plate

circuit of the valve. There is no need for variable coupling between the coils; all we have to ensure is that the coupling is sufficiently tight to make the meter oscillate over the whole range of the Extenser.

### Covers Both Wave-Bands!

That is to say, over the whole of the long and the medium broadcast waves. The meter covers both these bands, and wave-change switching is automatically carried out by the Extenser.

Now for the construction. Wait a minute, though; it's so simple there is really nothing to add to the diagrams. Still, a few words about the coils may be helpful, so here goes.

They are both wound on Pirtoid type formers, the long-wave one being 3½ in. in diameter and the other 2½ in. The long-wave former should be about 3½ in. long and the medium-wave 2½ in.

First the long-wave unit. Start with the grid loading coil. When you have wound on the 150 turns of this, break the wire and secure it in the usual way with two small holes in the former, and then start the reaction loading coil about ¼ in. away. This coil consists of 50 turns of the same wire (30 D.S.C.) and must be in the same direction as the first coil.

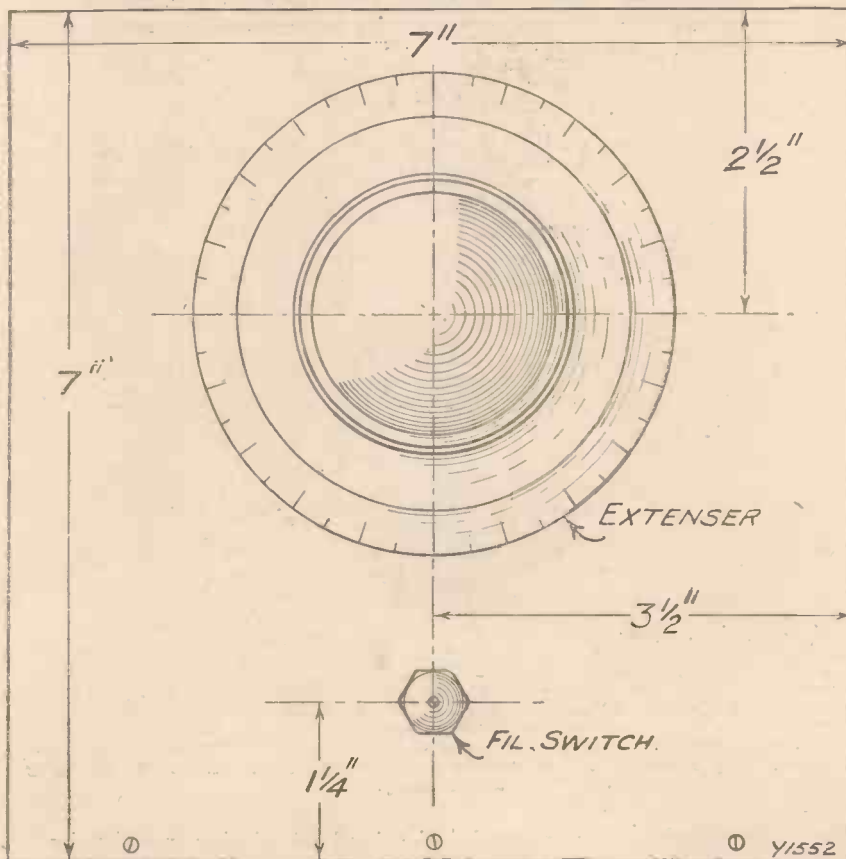
### Mounting the Coils

That's all there is to it, and the other unit is wound just the same with the exception that there are fewer turns and the wire is 24 D.S.C.

Both coils can be secured to the baseboard by screws through the formers near their ends. If you like you can follow the procedure used in the original of fixing the medium-wave unit on two wooden feet so that its top is on the same level as the other unit.

This is not necessary from the point of view of efficiency, but it greatly

### NOTHING PUZZLING ABOUT THE OPERATION



PANEL LAYOUT.

One knob to switch on and off, and one dial to set to any wave-length. The advantages of an Extenser over a condenser and wave-change switch are as great in a wave meter as in an ordinary receiver.

## The "Extenser" Meter—continued

simplifies wiring by bringing the connections on both units to the same height. Thin pieces of celluloid wrapped round the coils and secured with a little cement is a good scheme because it keeps moisture out of them, which might otherwise slightly effect the readings.

With that I think we can slip on to the time when you have completed the meter and are ready to put it into use. First of all we will deal with the batteries and valve.

### Almost Any Valve Will Do!

Any easily oscillating valve of two, four or six volts will do, and it is quite likely that one you have on hand will suit. Don't use a power valve or the high tension will run down unnecessarily quickly. An ordinary L.F. type of valve is ideal.

You should keep separate batteries for the meter, and it is desirable that

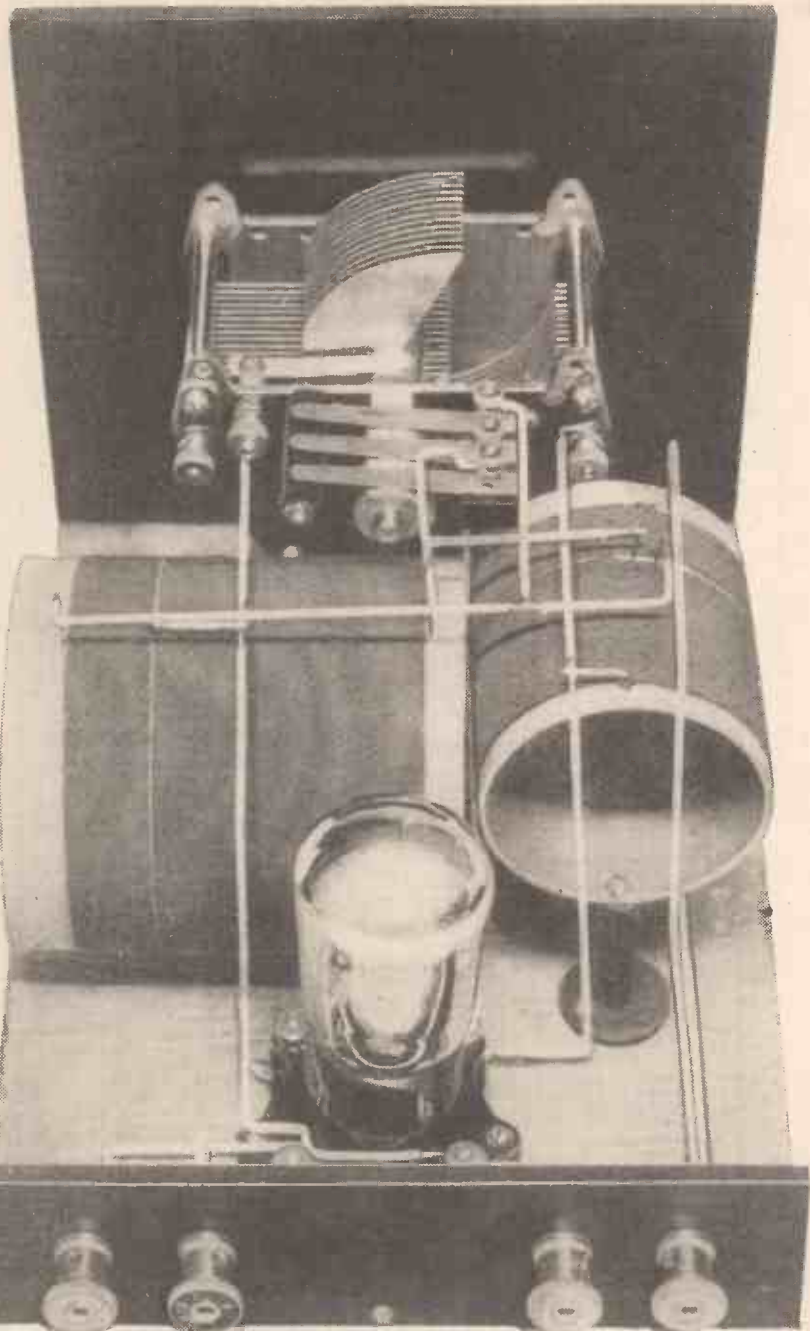
When it is in tune with the meter you will hear a carrier whistle just as though you are picking up a broadcasting station that is not modulating. It will be quite strong, for the meter should be placed quite close alongside the set.

When the set is adjusted to the silent point between the two whistles, you are dead in tune. The same

procedure applies when you wish to find to what wave-length the receiver is adjusted, except that you now adjust the tuning of the meter instead of the set's tuning.

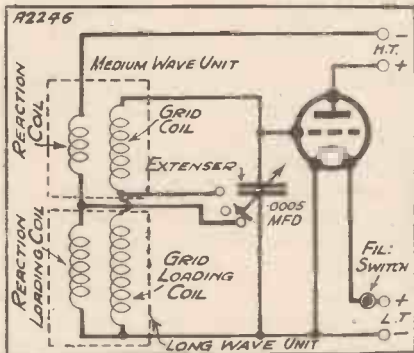
Naturally, before your "Extenser" Meter can be commissioned it must be calibrated. This can be carried out in two ways, and is much the same as calibrating an ordinary receiver.

### ANY WAVE PRODUCED AT YOUR BIDDING



The Extenser and two coils are so connected to the valve seen in the foreground that it will oscillate at any frequency between the limits of both broadcast bands.

### TAKE A LOOK AT THIS!



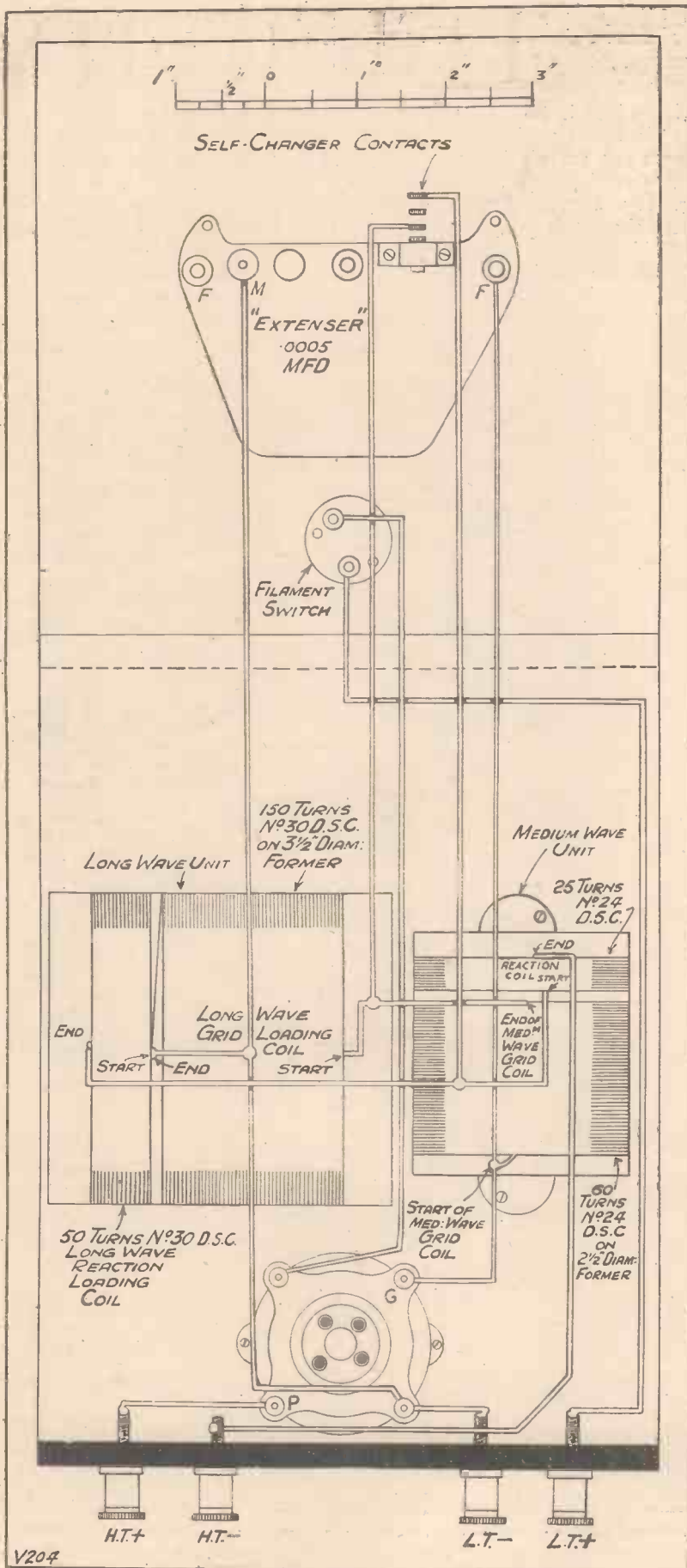
The circuit is simple enough, but is nevertheless very interesting. Note the method of connecting the high-tension on the plate side of the reaction windings.

the voltage of the high-tension should always be somewhere about the same. Forty or 50 volts of a 60-volt battery will usually be enough, and the higher taps can be brought into use as the battery's voltage drops to keep the H.T. constant.

Use short leads to the batteries, and always stick to the one valve. To change the valve will mean that the meter will require re-calibrating.

The first important operating point is how to tell when the meter and the set are tuned to the same wave-length. You proceed as follows.

Suppose the meter is oscillating on 300 metres. You alter the tuning of the set from the bottom of the medium wave-band upwards, keeping it just oscillating.



THE "EXTENSER" METER

—continued

The first way is for you to simply ask someone who already has a calibrated wave-meter to calibrate yours against his. Quite likely you do not know such a person though, and in that case you must do it yourself.

Calibrating the Unit

You have to tune in half a dozen or so stations on both wave-bands, of known wave-length, and note the readings on the meter corresponding to these wave-lengths. Choose stations that are not continually altering their wave-lengths or wandering about the ether the whole time.

Wiring up will probably be the easiest part of the construction. It is merely a matter of connecting up the points shown joined together by double lines in the clear diagram on this page.

The British stations are quite O.K., and so are the crystal-controlled Continental stations such as Rome. When you have taken these readings you can make a graph.

Along the bottom of the squared paper mark the degrees of the Extenser from 1 to 200, and up the side the wave-lengths from the minimum to the maximum covered on the medium wave-band, and then the same on the other band. Having plotted the various points, you can join them up with one curve, which will give you the wave-lengths for all the intermediate dial readings.

How to Use It

I say curve because that is the correct term. Actually it will approximate more nearly to a straight line, although an angle may appear at the point where the change-over from medium to long waves takes place.

To find on what wave-length the meter is set proceed as follows. Note the dial reading and find the same number along the bottom line of the graph.

Now proceed vertically upwards from this spot until you arrive at the point where the "curve" is cut. From here you follow a horizontal line to the left of the graph, and the number at which you arrive is the wave-length on which the meter is set. And that's all there is to it.



# The "SELECTIVITY" THREE

*A one-knob-tuning receiver with extraordinary station-separating powers. It is inexpensive and easy to assemble, and embodies in its construction features and qualities hitherto associated only with intricate multi-valvers.*

By VICTOR KING.

WE are much better able to get to grips with modern selectivity problems by thinking in terms of frequency, rather than in terms of wave-length.

If we know, for instance, that a particular set has a 9-kilocycle cut-off or separation (a very good figure indeed for anything short of a multi-tuned arrangement), then we also know—at least, in theory—that we should be able to separate two stations transmitting on adjacent

"channels." According to the Geneva rating, a "channel" is 9 kilocycles wide.

### Good Separation

Now I'm not going to say definitely that this new "three" has a 9-kilocycle cut-off, or anything rash like that, for that would mean it would be possible completely to separate the Regional station from Mühlacker—nothing less than "flick and it's gone" tuning, in fact.

But what I am going to say is that, for the type of set—a straightforward det. and 2 L.F.—it is one of the most selective I have ever tried! The Regional and National programmes, for instance, received under what one might call average conditions, can be wiped off the dial completely in a matter of four or five degrees.

What a striking difference from the popular "three" of a year or so ago, when the universal cry was "how can I separate the two new stations?"

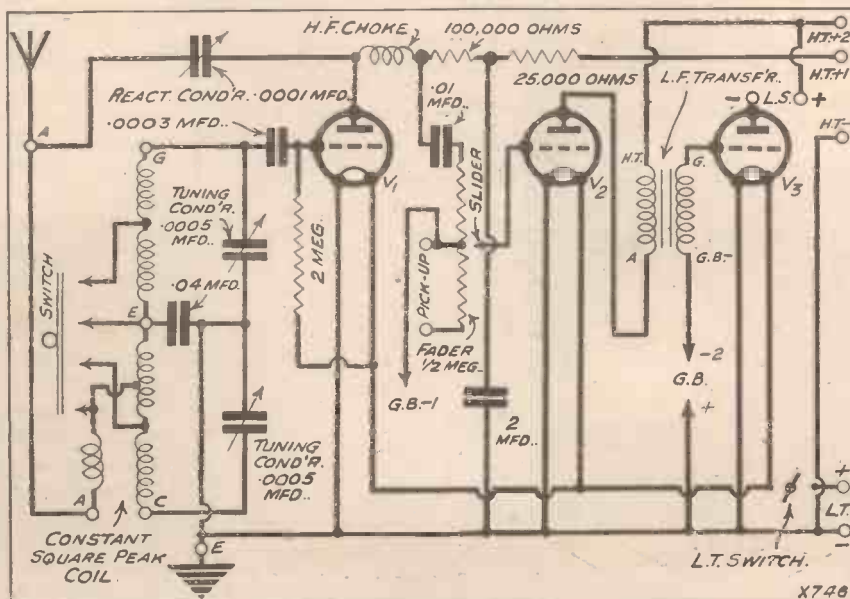
## HERE IS YOUR "SELECTIVITY" THREE SHOPPING LIST

- 1 .0005-mfd. double-gang condenser with trimming device (Polar "Tub," or Formo, J.B., etc. See text).
- 1 Constant Square Peak Dual Range coil (Varley).
- 1 .04-mfd. fixed condenser (Dubilier).
- 3 Sprung-type valve holders (Lotus, or Telsen, W.B., Igranic, Lissen, Clix, Bulgin, Benjamin, Junit, Formo, Wearife, Dario, Magnum, etc.).
- 1 H.F. choke (Lewcos, or Ready Radio, Lotus, R.I., Lissen, Telsen, Dubilier, Keystone, Varley, Parex, Watmel, Magnum, Wearife, etc.).
- 1 .0003-mfd. fixed condenser (Ferranti, or Graham Farish, Formo, Watmel, Igranic, Mullard, Lissen, Ediswan, T.C.C., Dubilier, Telsen, Ready Radio, etc.).
- 1 .01-mfd. fixed condenser (Lissen, or see above).
- 1 .0001-mfd., or larger up to .0002 mfd., reaction condenser (Astra, or Lotus, Telsen, Ready Radio, J.B.,

- Dubilier, Lissen, Magnum, Parex, Burton, Formo, Wavemaster, Igranic, Ormond, Polar, etc.).
- 1 2-mfd. fixed condenser (Franklin, or Formo, Mullard, Hydra, Ferranti, Igranic, Lissen, Dubilier, T.C.C., etc.).
- 1 100,000-ohm Spaghetti-type resistance (Lewcos, or Ready Radio, Bulgin, Magnum, Lissen, Sovereign, Graham Farish, Keystone, etc.).
- 1 25,000-ohm Spaghetti-type resistance (Bulgin, or see above).
- 1 L.F. transformer of moderate ratio

- (R.I. General Purpose, or Telsen, Lewcos, Mullard, Ferranti, Varley, Lissen, Igranic, Lotus, etc.).
- 1 Fada-type volume control, .5 meg. (A.E.D., or Magnum "Dissolver," etc.).
- 1 L.T. on-off switch (Bulgin, or Ormond, Junit, Wearife, Red Diamond, Magnum, Keystone, W.B., Benjamin, Lotus, Igranic, Lissen, Goltone, Ready Radio, etc.).
- 1 Grid-bias battery clip (Burton, or Bulgin, Magnum, etc.).

### SIMPLE BUT EFFECTIVE BAND-PASSING



*A novel band-pass arrangement is the outstanding feature of this virile circuit. Also, provision is made for pick-up working, and one of those fascinating radio-record "faders" is included.*

- 11 Engraved-type terminals and wander plugs (Ealex and Belling & Lee in set, or Igranic, Clix, etc.).
- 1 2-meg. grid leak and holder (Ferranti, or Igranic, Dubilier, Lissen, Mullard, Telsen, Graham Farish, Ediswan, Watmel, etc.).
- 1 Base board, 14 in. x 9 in.
- Ebonite strips as follow: One 14 in. x 2 in., three 7 in. x 3 in.
- Wood for cabinet (see dimensioned diagram).
- Glazite or Lacoline, for wiring.
- Flex, screws, etc.

## The "Selectivity" Three—continued

And what a refreshing thought it is to think that with our old friend the popular det.-and-two you can now tune in a whole gamut of stations, not only below the National and above the Regional, but in between the two stations as well!

The success of this new "three" is largely due to a very creditable achievement on the part of the Varley people. They have just introduced a new dual-range coil—the Constant Square Peak Coil, as they call it—which goes a long way towards the solution of our present-day selectivity problems with simple kinds of sets.

### Band-Pass Principle

The coil has been designed on what is known as the "band-pass" principle—the principle, to give you a non-technical definition, of two tuned circuits, coupled together in a special way and operated by a single tuning control.

If we endeavour with a single-tuned circuit to obtain razor-edge tuning, unless special precautions are taken there is a danger of interfering with the quality of the reproduction given by the outfit.

For in addition to the fundamental or main frequency on which a station transmits, it also requires, as most of you will know, a small band of fre-

quencies all to itself on either side of the fundamental. If we aim at producing a set so sharply tuned that it accepts only the fundamental

marring the quality. "Band-pass" tuning enables us to tune-in not only the fundamental frequency of a particular transmission, but the side-

### THE "WIRELESS CONSTRUCTOR" "SELECTIVITY" THREE

Circuit: Very selective detector and 2 L.F.

VALVES.	VOLTAGES.
1st: H.F. or special detector type.	L.T.: 2, 4, or 6 volts, according to rating of valves chosen.
2nd: L.F. type.	H.T. + 1: 50-80 volts. Adjust for smooth reaction.
3rd: Power or super-power type.	H.T. + 2: Maximum available up to 150 volts.
	G.B. - 1: 3-4½ volts. G.B. - 2: See maker's recommendation for particular valve chosen for output.

#### CONTROLS.

**CENTRAL CONTROL:** Main tuning condensers ganged together and controlled by single knob.  
**TOP KNOB ON LEFT-HAND SIDE:** Reaction control.  
**LOWER KNOB ON LEFT-HAND SIDE:** Wave-change switch (in for long waves and out for medium broadcast band).  
**TOP KNOB ON RIGHT-HAND SIDE:** Combined volume control and gramophone change-over device.  
**LOWER KNOB ON RIGHT-HAND SIDE:** L.T. on-off switch.  
**NOTE:**—Terminals between volume control and L.T. switch are for gramophone pick-up, which can be left permanently connected.

#### OPERATION.

**FOR RADIO:** Place volume control on radio side, and tune with central dial. For distant stations use reaction control situated on left-hand side (see above).  
**ADJUSTMENT OF TRIMMER ON TUNING CONDENSER:** Tune set to distant station, then adjust either trimmer for loudest results. **NOTE:**—Once trimmer has been set, it need not again be touched.  
**FOR GRAMOPHONE:** Simply change volume control over to gramophone side.

quency, then it's obvious that we shall be missing something!

That is where the "band-pass" idea comes in, for although it enables us to obtain sharp tuning between one station and another, it does so without

bands, as they are called, as well, before it cuts off.

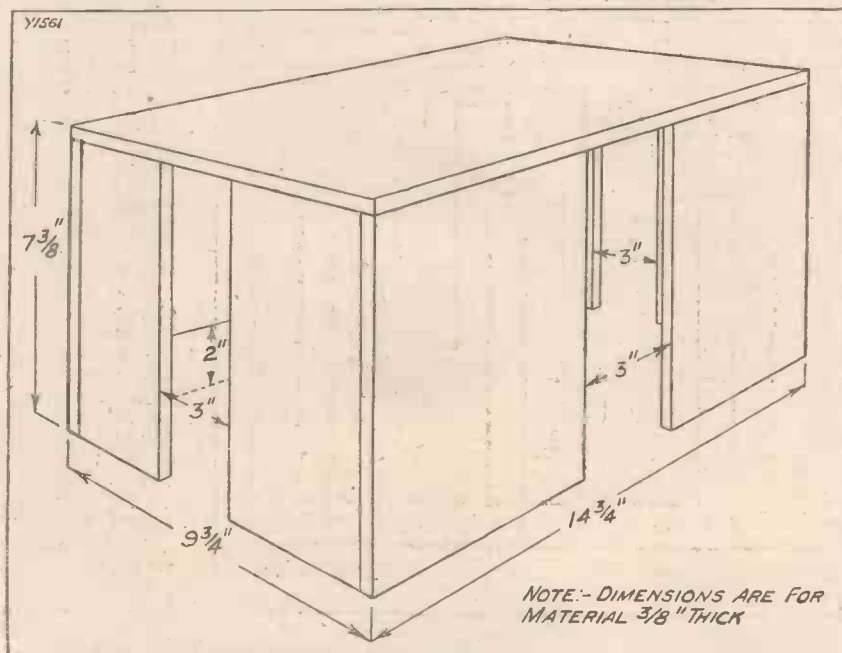
I don't want you to imagine because I have mentioned that there are really two tuned circuits that the set is difficult to operate. The fact of the matter is that the two tuning condensers are ganged together on a common spindle, and when the preliminary "trimming" has been done it is not a scrap more difficult to operate than any ordinary det.-L.F. circuit.

### Constructional Simplicity

And now let me tell you something about the construction, which, to be absolutely honest, is about as simple as could be imagined for a set of this type.

Following the usual procedure, a complete list of the parts required is given elsewhere in the article. With regard to the double-gang condenser, one or two of the various makes available are arranged to be mounted parallel with the front of the set, instead of, as in the original, at right-angles to it. It doesn't really matter which type you choose so long as you remember that if you select the parallel-with-the-front type it will be necessary to make a slight re-arrangement of the parts on the baseboard.

### YOU CAN EASILY BUILD THIS CABINET



It is just a matter of simple rectangles of wood, although it looks quite attractive for all that.



## The "Selectivity" Three—continued

That need not worry you, because it won't be likely to make any difference to the efficiency of the set, whichever type you choose.

When you have collected all the necessary parts, start the construc-

### ACCESSORIES WE RECOMMEND

**Loud Speakers.** (Amplion, Celestion, Blue Spot, B.T.-H., Undy, Mullard, Ormond, Donotone, Rolls-Caydon.)

**Valves** (2-, 4-, or 6-volt type). 1 H.F. or special detector, 1 L.F., and 1 output. (Mazda, Cossor, Osram, Mullard, Eta, Marconi, Lissen, Six-Sixty.)

**Batteries.** H.T. and G.B. (dry.) (Drydex, Ever-Ready, Pertrix, Grosvenor, Lissen, Fuller, Siemens, G.E.C., National, Oldham.)

**Accumulator.** (Fuller, Exide, Ediswan, Lissen, Pertrix, Oldham.)

**Mains Unit.** (Westinghouse, Regentone, Ekco, Tannoy, Atlas, R.I., Junit, Varley.)

tional work by first drilling the ebonite strips in accordance with the details given in the drilling diagram. This should not be a difficult job, because all the dimensions are given on the diagram, and with the aid of this it won't take you two ticks to mark out the positions of the various holes.

Before you secure the ebonite strips to the baseboard you will find it simplifies the constructional work if you first mount the rest of the components on the baseboard. As a matter of fact, you can even go a step farther than this and do the wiring as far as is possible without the ebonite strips in position, or, at least, perhaps I should say without the three vertical ebonite strips in position.

### A Cabinet Break-Away

The completion of the set then becomes just the straightforward business of fixing the vertical "panels," and, of course, wiring-up the components.

As will already have been apparent, I have endeavoured in designing this set to break away from the conventional panel and baseboard assembly. That means to say that there is scope for all sorts of ingenious ideas in the way of cabinet design.

Those of you who are not keen on the woodwork side of the business can stick to the original design and construct a cabinet on the lines of the one shown in the diagram. It is not a very difficult job, particularly if you get the wood all ready cut to size and shape.

### Scope for Ingenuity

But for those of you who *are* handy with wood-working tools, well—need I say more?

To give the set a try-out is not a long job, and by the time the set is

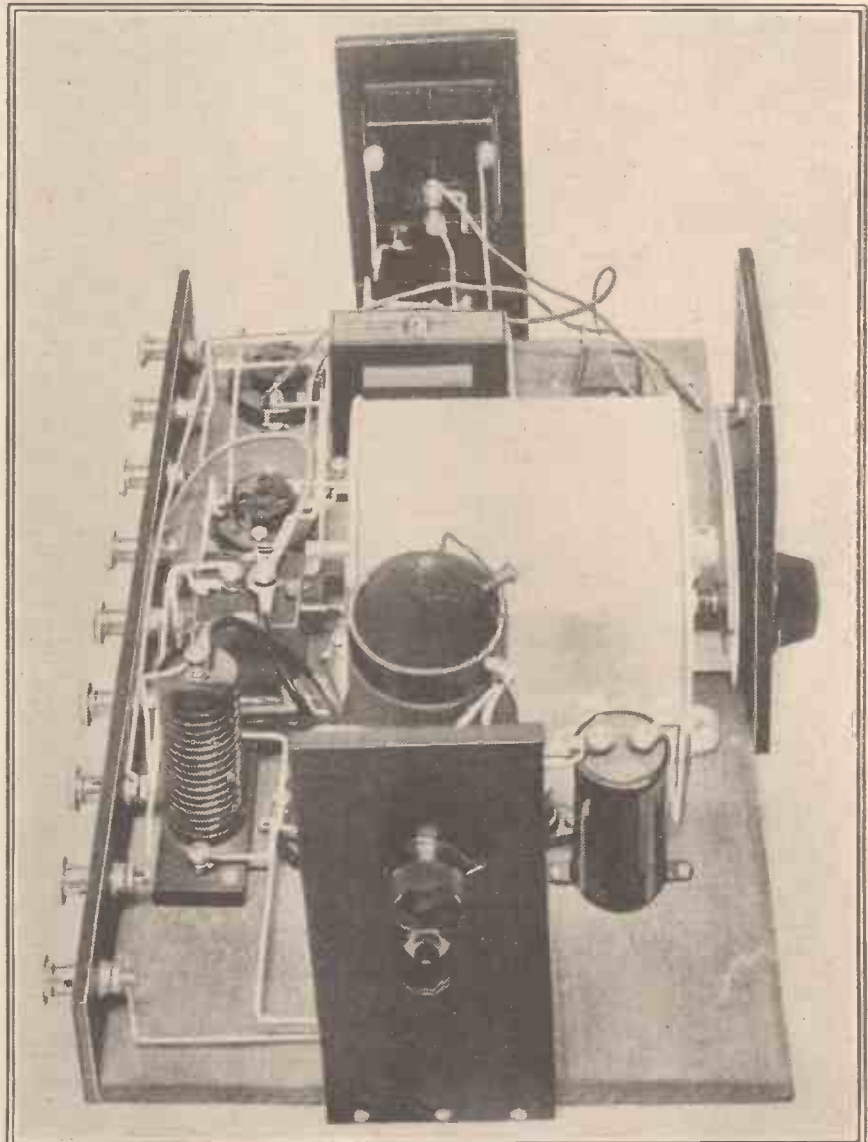
completed I wouldn't mind betting that you will be anxious to see what it will do, before ever you think about the cabinet!

### The First Test

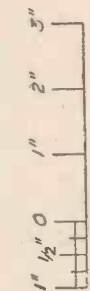
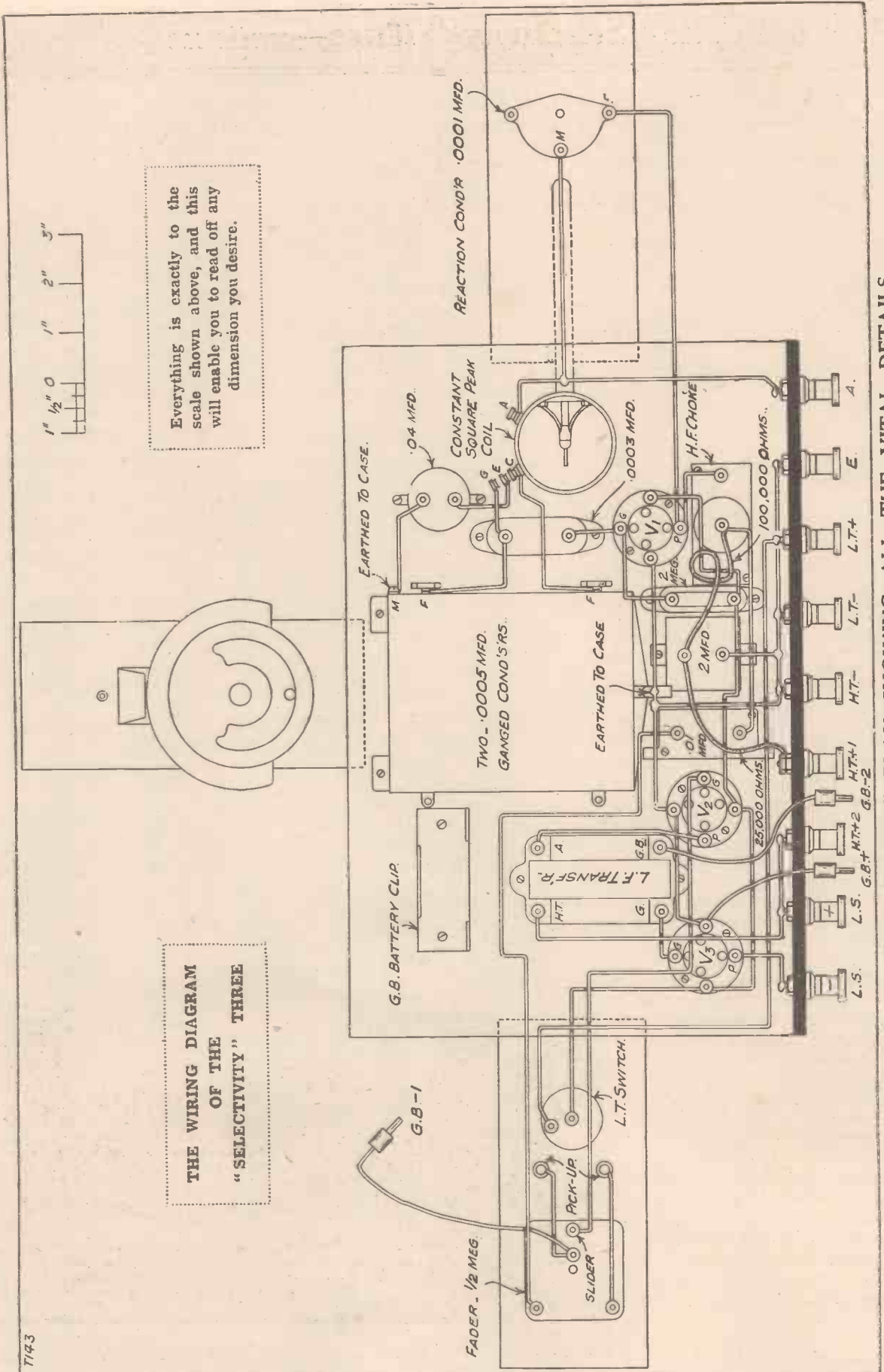
So first of all insert the valves and connect up the necessary batteries. I advise you to refer to the list of recommended accessories for information regarding valves, batteries, etc., to buy.

With regard to voltages, the H.T. battery for best results should not be less than 120 volts, and with this and

### EXTRAORDINARY STATION-SEPARATING POWERS



The special coil unit operating in conjunction with the two-gang tuning condenser and special non-inductive fixed condenser gives an exceptionally keen degree of "band-passing."



Everything is exactly to the scale shown above, and this will enable you to read off any dimension you desire.

THE WIRING DIAGRAM OF THE "SELECTIVITY" THREE

THIS IS A "SPREAD-OUT" PLAN SHOWING ALL THE VITAL DETAILS

## The "Selectivity" Three—continued

a small power valve in the output position a 9-volt unit for grid bias should be adequate.

Join H.T.+1 to a tapping at

loudest results. Once this trimmer has been carefully adjusted it need not again be touched.

When you want to use the set on

pick-up—which can be left permanently joined across the pick-up terminals—is then in circuit.

Now, I think you know all about the "Selectivity" Three, and all I hope is that it will please you as much as it has pleased me. It really is a jolly good set for modern conditions, and, what is more, it's a set that will be likely to keep you happy for many months to come.

By the way, the information given in the article regarding grid-bias voltages is based on the assumption that you will be using a valve of the small power class in the output position.

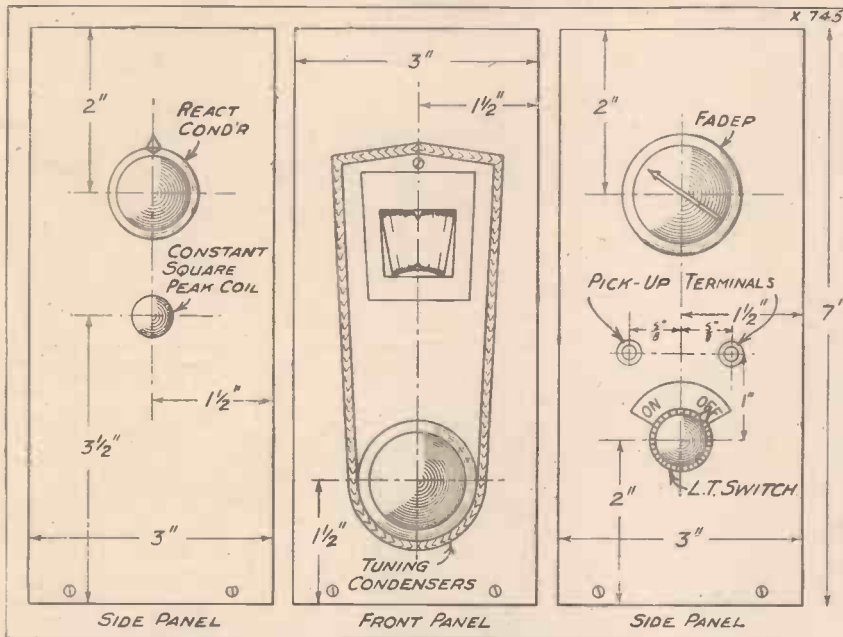
Such a valve should be adequate for all normal domestic requirements, but if you want a really large undistorted output for a moving-coil loud speaker, then you will find it necessary to use a super-power valve.

### For Super Power

In these circumstances, the voltage for G.B.—1 will remain as before, from 3 to 4½ volts; but G.B.—2 may want as much as 15 or 16½ volts in order to obtain correct operating conditions. The correct voltage will, of course, depend upon the valve chosen. The best plan is to follow the maker's instructions for the particular valve chosen.

Incidentally, you will need large capacity batteries, or a mains unit with a suitable output, if you go in for super-power work.

### ONLY ONE TUNING CONTROL



The single station selector has the front panel to itself, the subsidiary controls being tucked away at the sides.

about 70 volts on the H.T. battery, and H.T.+2 to the maximum voltage available. The correct grid-bias voltages will depend upon the particular valves in use, but as a rough guide try from 3 or 4½ volts for G.B.—1, and connect G.B.—2 to 6 or 7½ volts.

The L.T. switch is on the panel on the right-hand side of the set, and when this is in the on position, with the reaction condenser set at zero, you should, by turning the central tuning control, be able to hear local stations.

### Adjusting the Ganging

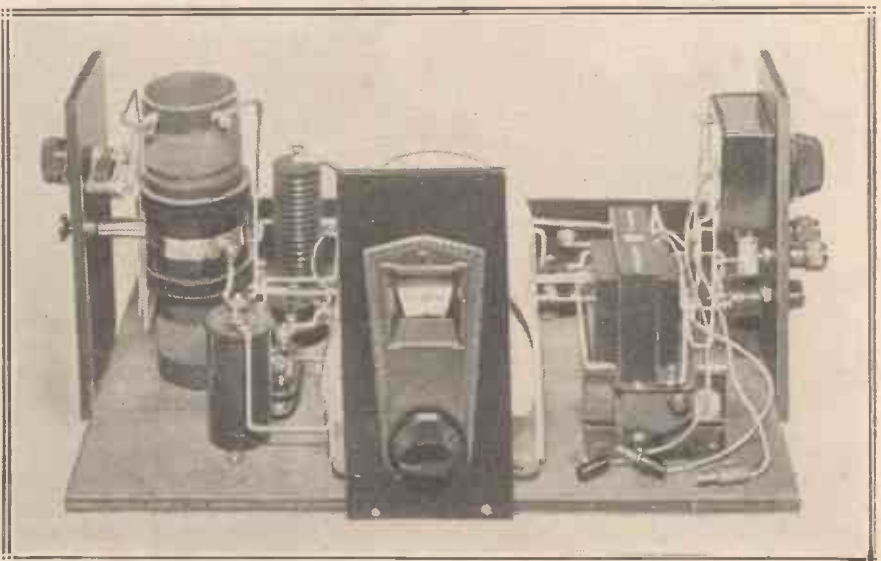
By the way, don't get caught out by the fader volume control! You won't hear anything at all unless this is over on the radio side.

In order to adjust the "trimming" on the ganged condenser (a procedure necessary to obtain the best results from distant stations), it will first be necessary to find a distant station. So increase the reaction control, and search round until you come across a fairly weak transmission.

All you then have to do is to leave the set adjusted and just vary one "trimmer" until you obtain the

the long waves, just push in the switch on the special coil unit and the deed is done. And when you tire of radio and want to change over to the gramophone, well, just turn the volume control round from the radio to the gramophone side, and the

### EVERYTHING IS IMMEDIATELY ACCESSIBLE



The cabinet lifts straight off just like a sewing machine cover!

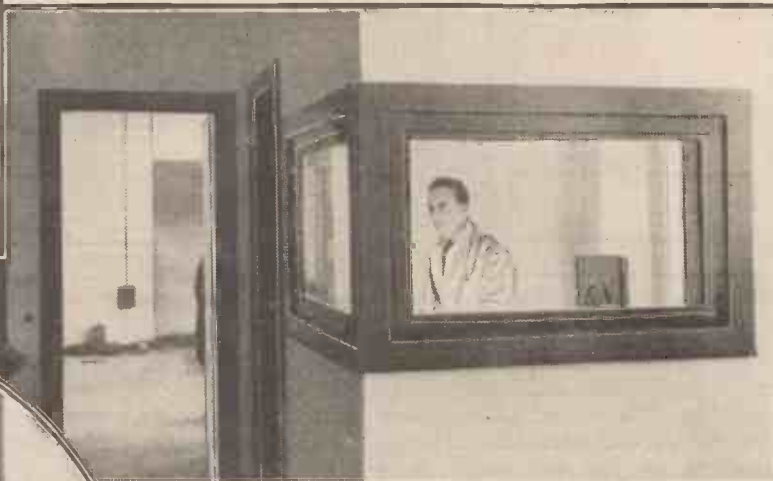
# INSIDE BERLIN'S BROADCASTING HOUSE



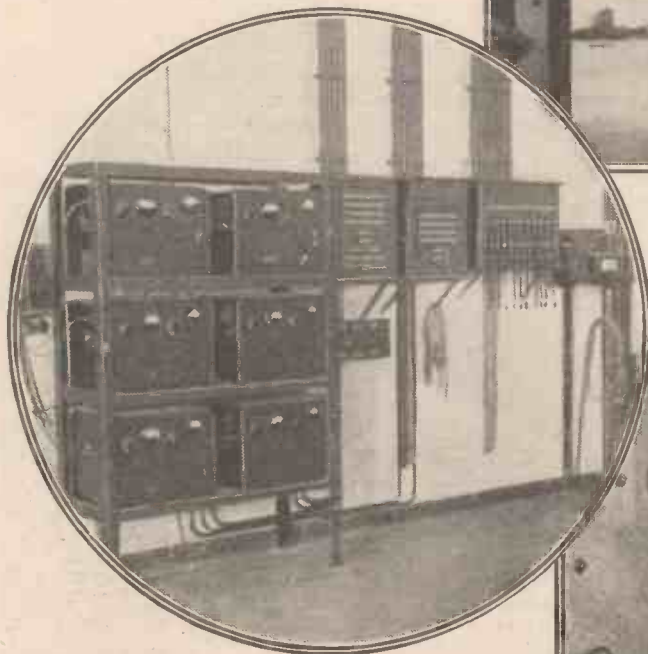
*Extremely neat, though unusual, control desks are used in the amplifier room.*



*The vastness of the largest studio can be realised from this photograph.*

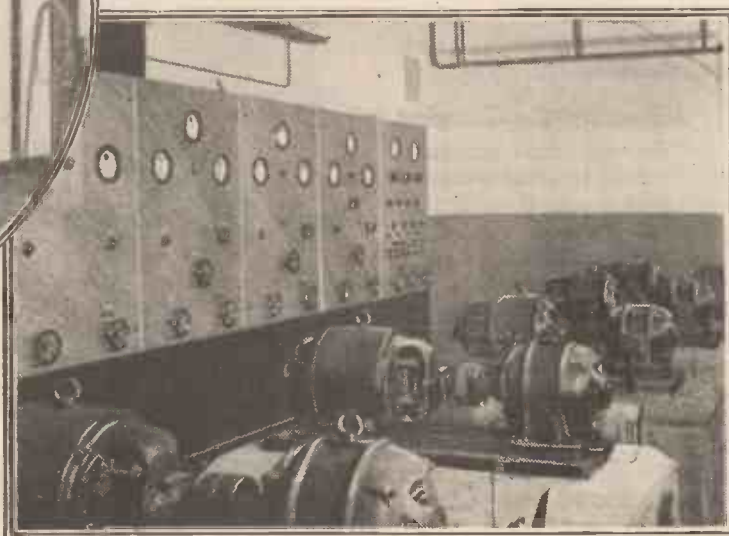


*In this photograph we see an engineer at work in one of the control rooms. From his little glass house, he can see what is going on in the studio while listening to the broadcast by means of a loud speaker. This is a necessary state of affairs if the broadcasts are to be carried out with ease and certainty, and the engineer is not restricted in any way by the silence restrictions imposed on occupants of the studio.*



*Above is a photograph of some of the intermediate line amplifiers and switchboard, while on the right we get a glimpse of a corner of the machine-room, wherein power for the microphones and their associated amplifiers is generated.*

*Very great care has been exercised in the laying down of the various leads and cables between the studios and their respective amplifiers, for any sort of electrical interaction between the connections would spell disaster.*





THE "House of Broadcasting," the new joint home of the various broadcasting companies in Berlin, has now been occupied by them for quite a while.

One of the problems that had to be solved in planning this remarkable building was that the managing rooms of the three corporations—German Radio Corporation, Berlin's local broadcasting company, and the company operating the Königswusterhausen wireless transmitter—as well as the studios of the Berlin Company and those of the Königswusterhausen Company, should be so accommodated as to be sheltered from the hustle and bustle of street traffic and separated from one another by courtyards.

### Sound Stoppers

That is why the outline of the ground plan has the form of a Gothic arch, resting upon the straight main façade, which as seen from the street gives the impression of a pure office building. All the offices have been accommodated in the outside portion of the building bordering upon the three façades, the studios radiating from a central light-well, so that there is nowhere any extensive contact surface between the two sections.

In fact, there is hardly any contact surface, the wall common to both sections being duplicated and there being a sound-damping insulating joint about seven centimetres wide between the two individual walls. Thus any sound transmission from one studio to the other, as well as to neighbouring offices, and vice versa, is avoided

*Our contributor shows you over the new wonder building which is now the home of the three leading German broadcasting concerns.*

By Dr. ALFRED GRADENWITZ

The iron supports of the studio buildings were placed on insulating plates, thus doing away with any floor resonance in the studios. Moreover, there is an horizontal insulating joint below these plates, passing through all the outer walls of the studio buildings.

Where two studios had to be placed above one another, in the same studio structure, their interior was lined all

over with insulating mats, in front of which there was placed a thin pumice-stone wall, thus preventing the sound from reaching the iron structure and being transmitted to the other studio.

### A Huge Organ

The Grand Studio of the Berlin Broadcasting Company, which is situated in the centre of the house, has a horizontal section of conical shape (the same as the two smaller studios of the company), and is about 132 ft. long, and 70 ft. wide in the central part, and 40 ft. high. At the level of the first floor it is widened out by a gallery 10 ft. long.

Behind a large opening in the shortest wall, room has been provided

### WELL LIGHTED AND VENTILATED STUDIOS



The studios are arranged around a central light-well.

## German Radio's New Home—continued

for a huge organ. This gigantic hall has not yet been fitted out, because, being of unique dimensions, it will require special investigations into the acoustic field to ascertain the most suitable interior fittings and finish.

One of the smaller studios has, however, been fitted out completely, a convertible wall lining—wood and cellotex—enabling a suitable amount of acoustic damping to be obtained in each case, in accordance with the actual performance to be broadcast and the number of artistes. The dimensions of this studio are 80 ft. in length, 36 ft. and 46 ft. in width respectively, and 11½ ft. in height.

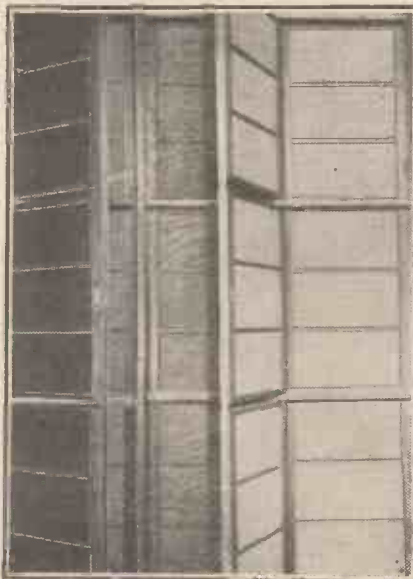
Of the two short walls, the longer is used as an *absorbing wall*, the shorter one acting as a *reflecting wall*. The organ is placed on a gallery above the latter.

### On the Second Floor

The other one of the minor studios is of mainly identical layout, but for the organ being dispensed with. Draperies are used to damp the sound.

The remaining studios and surveying rooms are situated on the second floor. From the surveying rooms, producers and musical conductors will watch what is going on in the studios through a sound-proof window, the design of which is the outcome of comprehensive tests at

### CHANGING THE WALLS



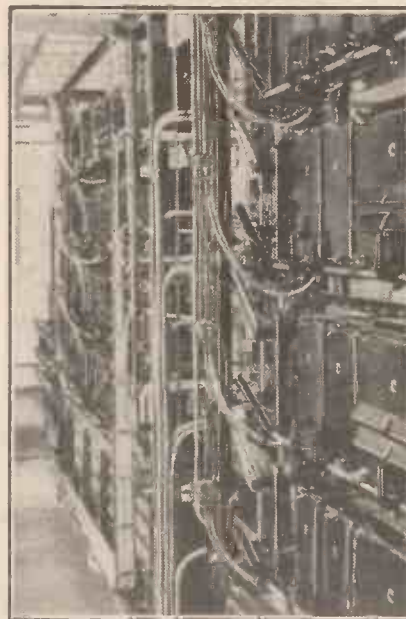
By means of an ingenious folding mechanism the walls of No. 3 studio can be changed from wood to cellotex.

the Heinrich-Hertz Institute of Wave Investigation. Hearing as they do the actual performance only through a loud speaker, they are able thus to control the transmissions.

### Carefully Wired

The various conductors leading from the microphones and surveying rooms to the operating rooms, where a preliminary amplification takes place, call for strict uniformity in layout. Telephone lines are placed exclusively along walls bordering upon the streets; the horizontal light distributing lines being accommodated on every second floor, so that microphone lines could be laid out at the

### SOME SWITCHING!



A section of the main amplifier switchboard.

greatest possible distance from the latter on the remaining floors.

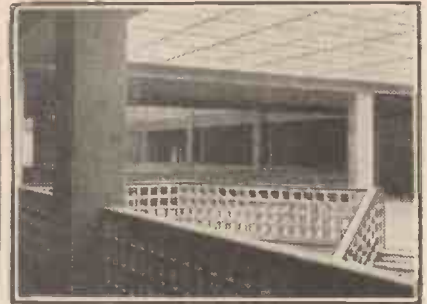
Both the microphone and loud-speaker lines are arranged on special cornices along the vestibule walls.

### No Stone Floors

Inasmuch as leading-in conductors passing through walls in sound-insulated rooms might jeopardise the whole sound insulation, these have either been done without or suitable measures of precaution taken, such as inserting lead pipes, fusing with wax, etc. The same caution against involuntary sound transmission has been exercised in connection with the water supply and central

heating plants, a point being made particularly of avoiding any transmission of noises via the ventilating

### LIGHT AND AIRY



A "light" well that ensures an adequate distribution of daylight through the immediate interior of the building.

and hot-air heating channels of the studios.

No stone floors have been used throughout the building, thus avoiding any resounding. In fact, the floors and offices, as well as the large light-well, have all been lined with linoleum.

The layout of all the rooms is as simple as possible, any luxury being avoided. All the beams and bearers are plainly visible. A Radio Museum now in course of preparation will be accommodated in a large hall on the fourth floor.

### The First Performance

The "House of Broadcasting" was opened by an excellent concert with a carefully chosen programme before an audience of invited guests in one of the minor studios, accommodating about 200 persons. The Grand Studio has room for an audience of about 1,000.

Some of the halls and studios will from time to time be placed at the disposal of radio clubs and societies for their meetings.

This last illustrates the freedom with which the German broadcasting authorities co-operate and assist all the various interests concerned with radio.

There is, too, a very close alliance between German broadcasting and the German radio industry—a much closer alliance than exists between similar bodies in most other countries.

It may be that this is largely the reason why German broadcasting is progressing at such a pace—a pace that is exemplified by the great new Berlin building.



# A PRACTICAL MAN'S CORNER

*Some useful tips for home constructors.*

By R. W. HALLOWS.

**M**ost of us have a few old variable condensers lying about in the junk box, and no doubt there will be more of them now that the Extenser has come to stay. Can these time-expired components be made to serve any useful purpose? As a matter of fact they can. Not a few of my own ancient variable condensers are now giving excellent service as fixed ones.

## "New Lamps for Old!"

Fig. 1 shows a plan view of one of these air-spaced fixed condensers. You will see that only the large vanes are used, and that they are interleaved back to back on pillars. The original spacer washers and other certain small parts are employed to make the transformed condensers.

In Fig. 2 you see the base upon which the air-spaced fixed condenser is built up. The lettering of the pillars is the same in Fig. 1 and Fig. 2. You will see now just how a condenser is constructed. The first plate slips on to the pillars A, B and C. Spacer washers follow and then comes the second plate on pillars D, E and F. More spacer washers, then the third plate goes on to A, B and C, and the process continues until sufficient plates are in place.

It does not matter in the least whether the resurrected condensers are straight-line frequency, straight-line wave-length, straight-line capacity, or straight-line nothing in particular.

## Easily Constructed

Any kind of vanes will do as long as they are in good condition. The pillars are best made from 2 B.A. countersunk screws.

To ascertain the size of the base lay one of the vanes which you intend to use on a piece of paper and draw an oblong round it. This should be just a little longer and a

little wider than the greatest dimensions of the vane. The base is cut from  $\frac{1}{4}$ -in. ebonite, and the vanes themselves are used as templates for drilling the holes for the pillars.

## How Many Plates?

Countersink these deeply on the underside so as to keep the heads of the screws from making contact with anything below. Fix each screw in position with a 2 B.A. nut. Two of the screws, say, A and D, should be half an inch longer than the others so that there may be room on them for terminal nuts for the connections.

And now comes an important question: How many plates are needed to furnish a given capacity? You

Owing to the excellence of air as a dielectric, an air-spaced condenser is much more efficient than one with solid material between the two sets of vanes. Air-spaced condensers can, therefore, be used with advantage in many positions in the receiving set. They make, for example, excellent and highly efficient grid condensers. Or, again, one may be used as a low-loss series condenser between the aerial lead-in and the aerial coil.

They are, in fact, distinctly good, particularly in sensitive sets in any position on the high-frequency side, where capacities up to about .0005 or even .001 mfd. are required.

## Improved Results

My own experience is that air-spaced condensers of this kind make a noticeable difference to the performances of a short-wave receiving set.

Air-spaced fixed condensers made in this way have several other good points to recommend them. Their capacity does not vary, but remains definitely fixed, and their high-frequency resistance is very small. They are completely immune from breakdown troubles, and so long as dust is not allowed to accumulate between the vanes they are never guilty of noisiness.

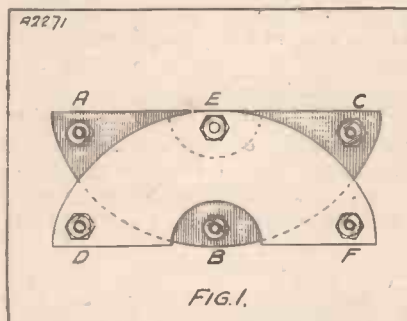
Lastly, they give you the opportunity of discovering exactly what is the best capacity to use in certain positions. What grid condenser, for example, is best suited to the detector of your short-wave set? Start with, say, three plates meshed with three.

## Try Different Capacities

Then see what happens if you reduce the capacity by removing one plate, as you can very easily do. Try also the effect of adding one or more plates.

In this way you can find by experiment just the grid condenser which enables your short-wave set to be at

## FROM THE JUNK BOX



*How to make useful small-capacity fixed condensers out of old variables. The method of remounting the old plates, back to back, is depicted above.*

may take it as a rough-and-ready guide that if the same spacer washers are used a variable condenser will "boil down" in this way into a fixed of about half the original capacity. Thus you can turn a .0005-mfd. variable into an approximately .00025-mfd. fixed condenser; or, again, the fixed vanes from two .0003-mfd. variables will make up into one air-spaced fixed condenser of about the same capacity.

## A Practical Man's Corner—continued

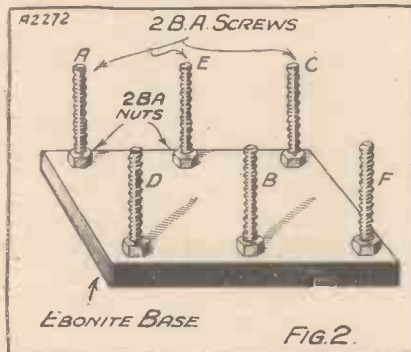
its best. If you are of an experimental turn of mind you can treat the high-frequency and detector departments of your medium- and long-wave set in the same way.

It often happens that no matter if you do possess a fair stock of resistances you cannot put your hand on one of just the value that you want. You may, for example, need one of 50,000 ohms, but for the life of you you cannot find anything but "25,000's" or "100,000's." Not a few people I know would dash forth immediately and purchase a "50,000." But if you think for a moment of the values already mentioned you can produce 50,000 ohms in two different ways.

### An Easy Way Out!

First of all, if resistances are placed in series the total resistance is the sum of all the values. Thus if you have two "25,000's" the total is 50,000

### THE NEW BASE



This gives you an idea of the base on which the old condenser plates are mounted. A piece of scrap ebonite and six short lengths of screwed rod are all the parts required.

ohms. For method number two you make use of two 100,000-ohm resistances and place them in parallel. When two equal resistances are wired in parallel the total resistance is half that of one.

Thus with your two "100,000's" side by side you will obtain 50,000 ohms. Similarly, you can obtain 75,000 ohms either by wiring a 50,000-ohm and a 25,000-ohm in series or by placing two "150,000's" in parallel. Actually, if you have in your stock five resistances only you can produce any value in 10,000-ohm steps between 10,000 and 200,000 ohms. The resistances required are two of 10,000 ohms, one of 30,000, one of 50,000 and one of 100,000. To produce 80,000 ohms, for example, you place the "50,000"

and the "30,000" in series; and for 160,000 ohms you wire in series the "100,000," the "50,000" and one of the "10,000's."

A very handy gadget is that illustrated in Fig. 3, which enables you to place your resistance in series at a minimum of trouble. Any kind of clip mountings can be used in this way.

### Built from "Scrap"!

All you need is a small piece of ebonite, six clips, two terminals, and the screws and nuts necessary for fixing the clips.

There is no need to give dimensional drawings, since these will vary according to the type of clips and resistances used. One other small part will be needed. As they are arranged the clips provide for three resistances in series. It may well happen, though, that you require only two to make up the value desired. You must therefore be able to short-circuit one pair of clips, and this you can do with the aid of a suitable length of brass rod.

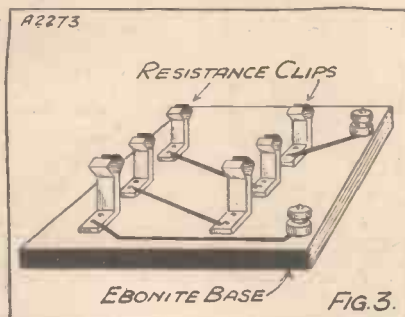
You can play with capacities in exactly the same way except that the rules governing the combinations are precisely the opposite of those affecting resistances.

### "Juggling" with Condensers

That is, the values are added together when condensers are placed in parallel, but if you put two of the same value in series the total capacity is reduced to half.

If you care to make a similar arrangement of holders for clip-in condensers, but doing the wiring in parallel as shown diagrammatically in Fig. 4, you can obtain any capacity you want between .0001 and .002 microfarad in .0001-mfd. steps from a set of five fixed condensers with

### A HANDY GADGET



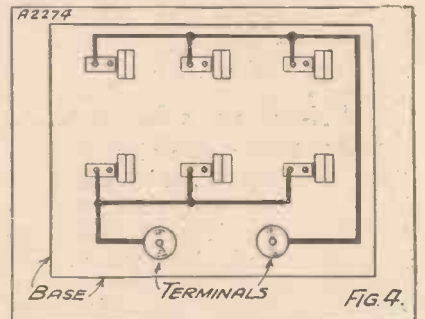
Here is a very useful resistance holder which can also be made from the little odds and ends found in your junk box.

capacities of .0001, .0001, .0003, .0005 and .001 microfarad. Here are the various combinations up to .001 mfd.

- .0001 = .0001
- .0002 = .0001 + .0001
- .0003 = .0003
- .0004 = .0003 + .0001
- .0005 = .0005
- .0006 = .0005 + .0001
- .0007 = .0005 + .0001 + .0001
- .0008 = .0005 + .0003
- .0009 = .0005 + .0003 + .0001
- .001 = .001

The small cells of a high-tension accumulator set one problem about which I have been asked by correspondents. Having been recommended to use a hydrometer for

### FOR "CLIP-IN" CONDENSERS



With the help of this little affair, and only five "clip-in" condensers, you can get any capacity you want between .0001 mfd. and .002 mfd. It will not take long to make either.

keeping a check on their condition these people wonder how the business end of the instrument is to be inserted into the cell far enough to allow a sufficient amount of the electrolyte to be drawn up.

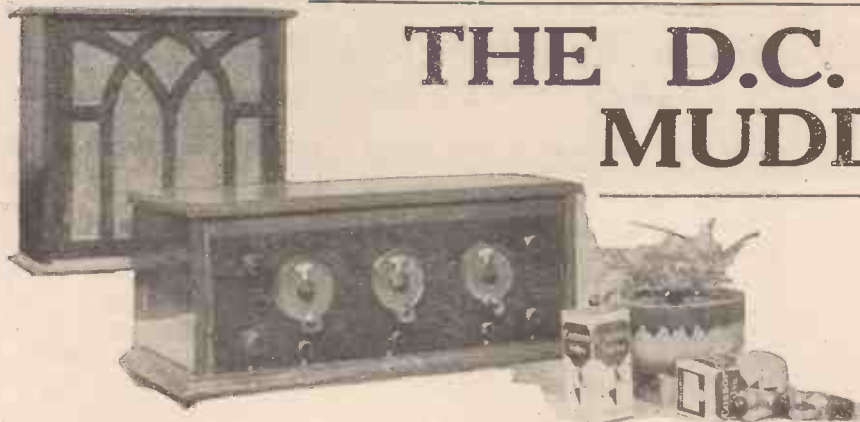
### A Hydrometer "Tip"

You can, of course, use a miniature hydrometer which has a fine nozzle and requires only a small amount of electrolyte so that you need not insert it beyond about half-way. But small hydrometers have frequently the disadvantage of being not very accurate. Here is a method you should try which works very well with instruments of the syringe type of ordinary size.

Obtain from any chemist a piece of rubber tubing that can just be worked over the nozzle. This can now be inserted deeply into most cells without any fear of damaging the plates.



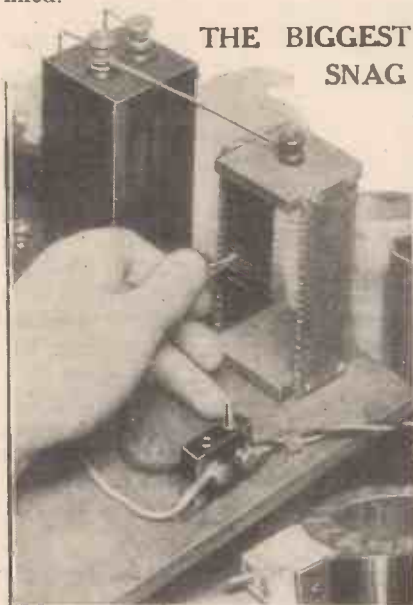
# THE D.C. MAINS MUDDLE



*In this article G. W. EVANS explains the delay that has occurred in the bringing out of the indirectly-heated D.C. valve.*

THE new indirectly-heated D.C. valves seem to be causing a great deal of discussion in radio circles. In fact, at the time of writing not a little confusion seems to exist owing to the fact that no standard of heater wattage has been fixed.

## THE BIGGEST SNAG



*The greatest problem the D.C. set designer has to solve is that of breaking down the mains voltage and keeping cool the resistances used for this purpose.*

The "spot of bother" may all be settled by the time this is in print, but at the moment there seems to be three distinct camps. One whose D.C. valves are already well known has fixed .5 amp. for the heater current, and I have tried these valves out in a special set designed expressly for them. I refer, of course, to the Mazda D.C.S.G., D.C.H.L., and D.C. Pen.

### Other Suggestions

But other valve manufacturers appear to have other ideas, and I believe that .25 amp. has also been suggested to the B.V.M.A. as the solution of the matter. Yet a third

current consumption has been put forward, however. This is .18 amp., and has the merit of being a far easier current to deal with than either of the other two. Which "side" will win I do not know, nor whether it will be decided to place more than one "variety" of indirectly-heated D.C. valves on the market. As I say, at the time of writing it is all very much in the air.

### A Series Arrangement

"But," you may ask, "why all this bother over so small a point?"

It isn't really a "small point." Given that equal efficiency is obtainable with any current from .18 to .5 amp.—and I cannot vouch for that as a fact at present—there still remains the problem of breaking down the voltage of the D.C. mains.

The scheme of heater connections and their characteristics provide for the valves to be placed with their heaters in series. Obviously better than a paralleled arrangement, for the total current consumption from

the mains is only that of one valve, and not of three or four, as the case would be if the heaters were in parallel. With heaters in series, then, it remains for extra series resistance to be placed in the mains-heater leads so that only the requisite amount of current is passed. In other words, the voltage of the mains is broken down.

Let us take the .5-amp. valves as examples. We have, say, a three-valve set, using the D.C.S.G., D.C.H.L., and D.C.Pen. The heater current is .5 amp., and we want to use the set on a 240-volt main.

Now, by Ohm's law,

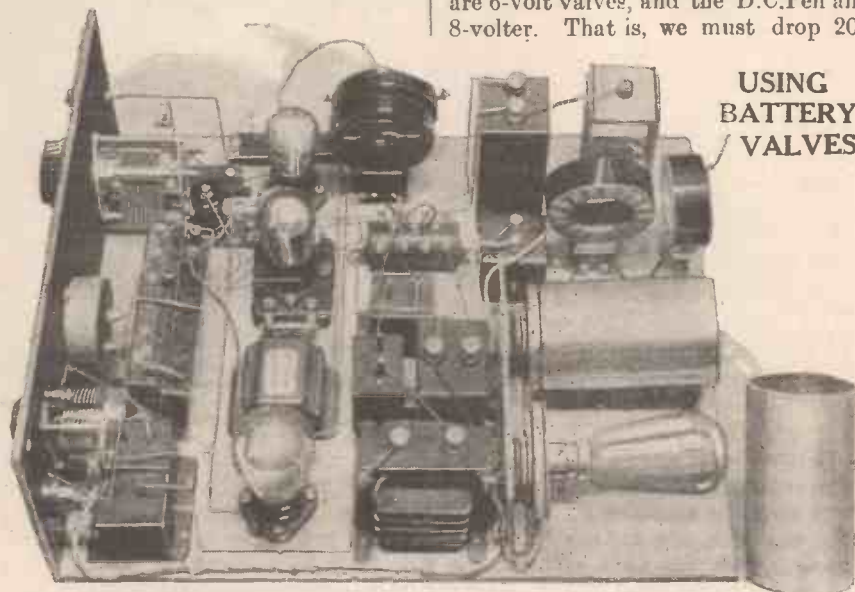
$$R = \frac{E}{C}, \therefore R = \frac{240}{.5} = 480 \text{ ohms.}$$

That is, 480 ohms are required across the mains (in the heater circuits) to limit the current to .5 amp.—or, if you prefer it, to drop the voltage so that each valve gets the right voltage across it.

### Voltage of Valves

But in that 480 ohms must be reckoned the resistance of the three heaters. This is told us by the makers by saying the D.C.S.G. and D.C.H.L. are 6-volt valves, and the D.C.Pen an 8-volter. That is, we must drop 20

## USING BATTERY VALVES



*A D.C. mains set using .1-amp. battery valves, and electric light lamps for the mains resistances in the supply leads.*

## The D.C. Mains Muddle—continued

volts across the three heaters, leaving  $240 - 20 = 220$  to be dropped across the external resistance scheme. That makes the external resistance necessary 440 ohms.

Thus we waste in heat dissipation through this resistance  $220 \times .5$  watt = 110 watts; using only 10 watts for the actual heating of the valves, D.C. sets are bound to be more wasteful than the A.C. variety, owing to this necessity for breaking down the mains voltage.

### Wattage Consumption

This is where the D.C. valve controversy comes in; for if the heater current can be kept down, obviously the wattage consumption of the set will be reduced. Thus if .18 valves required 20 or even more volts across each heater, the wattage taken from the mains would be much less than that where .5-amp. valves are used. A strong point in favour of .18-amp. valves—if the efficiency can be maintained.

ance with the composition and design of the resistance.

Therefore, in the case of a set where  $\frac{1}{2}$  amp. has to be passed through a resistance, the heat generated (due to the large wattage to be dissipated) is greater than that which is generated in the case of a set where .18 amp. has to be dealt with.

The heat factor is a very real one, but at .5 amp. is by no means insuperable, so that the .5-amp. valves are quite practical propositions, and are, as I know from experience, very efficient. As a matter of fact, the characteristics are quite as good as those of the A.C. variety, and in the construction of a D.C. set using indirectly-heated valves one can largely forget they are for D.C. mains and can regard them in the same light as the indirectly-heated A.C. type.

### Enhanced Results

The coming of the indirectly-heated D.C. valve will make a great difference to the home constructor with

greatly enhanced due to the higher efficiency of the indirectly-heated valves.

At the present moment there are only three different D.C. valves of the indirectly-heated variety on the British market, but soon we shall have as many of the D.C. as of the A.C. variety. And then the owner of D.C. mains will be no longer left with a makeshift of battery and mains unit, or mains-run battery valves. He

### NEXT MONTH

Look out for the September number of the

**"Wireless Constructor"**

On Sale on August 15th.

will be able to construct a properly designed D.C. set, with the full knowledge that he can get results equal to the best of the A.C. receivers with a similar number of valves.

The A.C. set has for long been held up as the best type of receiver from the results point of view. Now the D.C. set is likely to oust it from its proud perch for all general purposes where voltages not exceeding 240 volts are required, and—here is a strong feature in favour of the D.C. set—in spite of the fact that a somewhat expensive voltage regulator is required, the set will not be expensive to run, and will be cheaper than its A.C. cousin to construct.

\*\*\*\*\*  
\* THE "ZIZZ" AND THE CURE \*  
\*\*\*\*\*

I N not a few cases I have traced peculiar and very unpleasant "zizzes" in loud speakers of the balanced-armature type to actual vibration of the baffle board. Some of these instruments produce in themselves a great deal of vibration, and these vibrations are transmitted to the board. The result is that whenever a note of the natural frequency of the board comes along resonance effects are observed.

Personally, I don't care about fixing chassis to any kind of baffle, but prefer to make a stand for the unit and its cone and to place it behind the baffle so that the front edge of the chassis is just not in contact with it.

R. W. H.

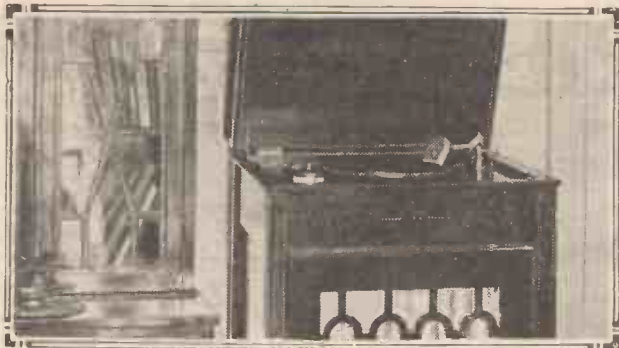
### WHEN SEEING IS BELIEVING



A group of American business men watching a television broadcast as received on the Jenkins' Radiovisor apparatus in New York.

There is a side-issue, so to speak, in this voltage break-down business that also must be considered. I refer to the fact that the voltage wasted is dissipated in the form of heat, the amount of heat radiated from the resistance being variable in accord-

D.C. mains. Hitherto he has been forced to use the ordinary battery valves, and troubles due to this have not been particularly infrequent. Now, however, he will find things somewhat simplified, and into the bargain his results will be



# WITH PICK-UP AND SPEAKER

*Modifying the "Extenser" Four—The wiring alterations—  
A sensitive pick-up.*

Conducted by A. JOHNSON-RANDALL

**I**N the last month's issue of this journal Mr. Victor King described a highly efficient four-valve receiver employing one of the latest twin Extensers.

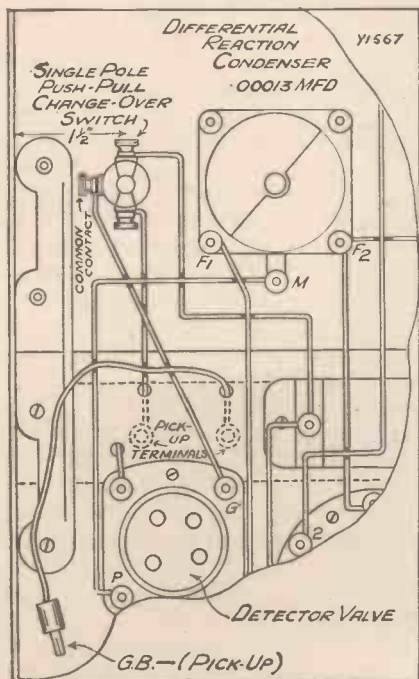
This receiver is bound to become popular, and many readers will no doubt wish to know how they can re-arrange the wiring to include a pick-up switch and terminals. This set, as a matter of fact, is ideal for radio-gram work, and will give splendid reproduction and plenty of volume.

## Modifying the "Extenser" Four

The volume control on the 1st L.F. stage enables the necessary adjustment of volume to be carried out in the most effective way.

If you look at the back-of-panel diagram published on page 120 of the July issue, and compare it with the

### A SIMPLE MODIFICATION



*This diagram shows the few slight alterations which enable a pick-up to be used with the "Extenser" Four.*

drawing given on this page, you will see that all you have to do is to drill a hole in the panel on the centre line of the reaction condenser; that is,  $3\frac{1}{2}$  in. from the top of the panel and  $1\frac{1}{2}$  in. from the end. Obtain an ordinary single-pole push-pull change-over switch of the one-hole fixing type, and mount it in position. Then at a point underneath the push-pull switch, and half an inch or so from the bottom edge of the panel, drill two more holes to take a couple of terminals for the pick-up leads.

The alterations in the wiring are as follow :

Referring to the back-of-panel diagram for the "Extenser" Four, remove the lead which is connected from G on the detector valve holder to a point along the wire joining the grid condenser to one side of the 2-megohm grid leak. Then, having removed this short lead, connect one side of the .0003 grid condenser (that is, the side which previously went to the grid of the detector valve) to one of the terminals on the push-pull switch. Join one of the other terminals on the switch to the grid terminal on the detector valve holder, and take the remaining terminal on the switch to one of the new terminals on the panel for the pick-up.

### The Wiring Alterations

Connect the remaining pick-up terminal to a length of flexible terminating in a wander plug for G.B.—. This wander plug should be inserted in the grid-bias battery so as to apply about  $1\frac{1}{2}$  to 3 volts to the detector valve, which, of course, when the pick-up is in use becomes the additional L.F. amplifying valve.

You will now see that when the switch is in one position the receiver will function in the normal manner for the reception of radio programmes, and then at a simple movement of the switch knob an instant change-over to the gramophone can be effected.

Those of you who are interested in radio-gram work will find this simple

modification well worth while, and the cost of the switch, terminals, etc., should not exceed a couple of shillings.

### A Sensitive Pick-Up

The Standard Battery Company, of 184, Shaftesbury Avenue, London, W.C.2, recently sent me one of their improved Wates' Star pick-ups. This is a pick-up which is sold at the extremely moderate price of 16s., and is designed for fitting on to the ordinary gramophone tone-arm in place of the sound-box. It is quite a neat little job, and is light in weight, the protective casing being of moulded bakelite.

### MODERATELY PRICED



*This pick-up has a neat moulded case, and is obtainable in several colours.*

This pick-up is suitable for either steel or fibre needles, and means are provided for adjusting the movement until the best results are obtained.

One advantage of this type of instrument is that it is very easily fixed in position, as it simply replaces your present sound-box.

The makers recommend the use of a volume control. This may quite easily be fitted to the gramophone cabinet near the turntable.

Those who are contemplating the purchase of a really moderately-priced pick-up will do well to bear the Wates in mind.

# QUEER QUERIES



Some suggestions about unusual radio faults that may help you towards better reception.

By P. R. BIRD.

## "Blanketing" a Portable

Now that the portable set owner is being tempted to move his set into unaccustomed positions—perhaps, out into the garden, or to the other side of the house—it may be as well to remind readers of the ease with which such a set is "blanketed" when placed in an unsuitable position.

I am reminded of this by a friend who discovered that he could adjust volume on his set by moving a fire-screen near it. The screen was of metal, and when quite close to the frame aerial reception went down to whisper-weakness and could be restored only by moving the screen or the set.

So do not expect your set to do well if it is placed close to a tin roof or other large conductive surface. And do not forget that such screening surfaces may not appear to be conductors, but may be masquerading in the guise of a large mirror or similar innocent-looking article of furniture.

## An Aggravating Trouble

Have you ever built a good little set, using the best components and a sound circuit, and then found that its action is spoilt by a threshold howl?

The thoroughly aggravating aspect of such a threshold howl is that it makes a set quite useless for long-distance work. For though it may sound quite O.K. on the local station, the howl always develops as soon as reaction is pushed up to the sensitive condition where the set should be able to pull in the foreigners.

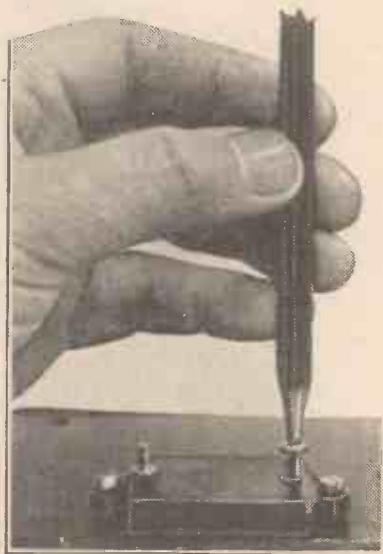
A distracted correspondent who suffered from this affliction recently sent in a long list of things he had done to try to stop it, with the remark: "I have done everything possible to cure it." But he hadn't.

The following possible "cures" had been overlooked, so they are given for the benefit of those who may not realise what a large variety of circuit conditions can affect this trouble:

## Five Things to Try

- (1) Changing over the primary leads of the first or second L.F. transformer.
- (2) Changing the valve.
- (3) Connecting a grid leak—usually 2 megs. or so—across the primary of an L.F. transformer.
- (4) Inserting an extra H.F. choke or resistance (Spaghetti of 20,000 ohms will do) between H.F. choke and primary of first L.F. transformer.
- (5) Connecting a small fixed condenser (about .0001 mfd. or so) between one end of H.F. choke and filament of detector.

## "STARTING" A NUT



A pencil, or similarly rounded implement, pushed into a nut will often enable it to be started on its thread without difficulty, even when placed awkwardly on the baseboard.

## Adjacent Aerials and Interference

Writing from one of Surrey's selectest beauty spots, a reader of the WIRELESS CONSTRUCTOR asks a question that has been put to him by the lady in whose employ he is. She has a large house, with aerial fixed to a tall tree, and would like to give him permission for another aerial to be fixed to an adjacent tree, ten yards away, provided the two sets can be worked "free of interruptions" from each other.

## HOW'S THE SET GOING ?

If you are puzzled by a radio problem, remember that the "Wireless Constructor" Technical Queries Department is fully equipped to help you.

Full details of the service, including scale of charges, can be obtained on application to the Technical Queries Department, "Wireless Constructor," Fleetway House, Farringdon Street, London, E.C.4.

SEND A POSTCARD, on receipt of which the necessary application form will be sent by return.

LONDON READERS, PLEASE NOTE. Application should not be made by telephone, or in person at Fleetway House or Tallis House.

The two sets would be quite different, the present one being a 4-valver, and the proposed new one a Det.-L.F., for 'phone reception. Could they be worked independently, or would the new one "take away" from the old?

Most of us who live amidst little clusters of neighbouring aerials know the answer to that question.

## No Noticeable Difference

So far as strength of reception goes another aerial erected nearby makes no noticeable difference, provided it is not very close and running parallel.

Ten yards away is not at all close, so in the situation in question there would be absolutely no question of reduction of strength, nor of interference, provided that the sets were worked properly.

Careless use of reaction on the small set might result in setting up squeals in the adjacent receiver, but this would certainly not take place if ordinary care and a modern circuit were employed.

In fact, neighbours with parallel aerials only three or four yards apart often notice no mutual interference whatever, especially when one or both of the sets employ a screened-grid H.F. stage.

# DON'T GUESS—BE SURE!

Calibrate your set in wavelengths by means of the "Extenser Meter."

Don't go on working in the dark trying to find and identify those elusive foreigners. Build the "Extenser Meter" and get the station you want first time!

Simple to operate—easy to construct—absolutely efficient—it uses Ready Radio Coils.

You can buy the complete Kit of Parts for £2-14-0, or you can buy the finished instrument, complete, £3-3-0

Also obtainable on Easy Payments.

## THE "EXTENSER METER"

	£	s.	d.
1 Black, polished ebonite panel 7 in. x 7 in. x 3/8 in., drilled to specification	2	1	
1 Oak cabinet with 9-in. baseboard	12	6	
1 Cyldon '0005-mfd. "Extenser" condenser with dial	17	0	
1 ReadiRad L.T. switch	10		
1 Telsen 4-pin valve holder	6		
1 Terminal strip 7 in. x 2 in. x 3/8 in., drilled	7		
2 Coils, wound to specification	10	0	
4 Belling-Lee "R" terminals	1	0	
1 Valve as specified, L.F. type	8	6	
Wire, flex, wander plugs, etc.	1	0	

TOTAL (including valve and cabinet) **£2 14 0**

**KIT A** (less valve and cabinet) **£1 13 0**  
or 12 equal monthly instalments of **3/-**

**KIT B** (with valve cabinet) **£2 1 6**  
or 12 equal monthly instalments of **3/10**

**KIT C** (with valve cabinet) **£2 14 0**  
or 12 equal monthly instalments of **5/-**

## THE "EXTENSER METER"

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## "SELECTIVITY" THREE

	£	s.	d.
3 Black, polished ebonite panels, 7 in. x 3 in. x 3/8 in.	2	9	
1 Baseboard, 14 in. x 10 in. x 3/8 in.	1	0	
1 J.B. double '0005-mfd. condenser, model P.2, with disc drive	1	0	0
1 Varley Constant Square Peak coil	15	0	
1 Dubilier '04-mfd. fixed condenser	2	0	
3 Telsen 4-pin valve holders	1	6	
1 Telsen H.F. choke	2	0	
1 ReadiRad '0003-mfd. fixed condenser	10		
1 T.C.C. '01-mfd. fixed condenser	2	6	
1 ReadiRad '0001-mfd. "Brookmans" condenser	2	6	
1 T.C.C. 2-mfd. fixed condenser	3	10	
1 Lewcos 100,000-ohm flexible resistance	1	6	
1 ReadiRad 25,000-ohm flexible resistance	1	3	
1 Telsen "Radiogrand" L.F. transformer, ratio 3-1	8	6	
1 A.E.D. Fada-type volume control	10	6	
1 ReadiRad L.T. switch	10	6	
1 Atlas bias clip	6		
11 Belling-Lee engraved "R" type terminals	2	9	
1 ReadiRad 2-megohm grid leak and holder	1	4	
1 Ebonite terminal strip, 14 in. x 2 in. x 3/8 in., drilled	1	2	
1 Pkt. ReadiRad "Jiffilux" for wiring	2	6	
3 Mullard valves as specified: Det. L.F. and Power	1	7	6
Flex, wander plugs, etc.	1	9	

TOTAL (including valves and baseboard) **£5 14 0**

**KIT A** (less valves) **£4 6 6**  
or 12 equal monthly instalments of **8 0**

**KIT B** (with valves) **£5 14 0**  
or 12 equal monthly instalments of **10 6**

You can now buy any Ready Radio Kit from your local dealer, but be sure that it is a genuine Ready Radio Kit.

## A.C. "ACE"

	£	s.	d.
1 Black, polished panel, 21 in. x 7 in. x 3/16 in., drilled to specification	6	3	
1 Oak cabinet, with 10-in. deep baseboard	1	10	0
1 ReadiRad '0005-mfd. variable condenser	4	6	
1 ReadiRad "Duograph" slow-motion dial	6	6	
1 ReadiRad 3-pt. wave-change switch	1	6	
1 ReadiRad '00015-mfd. differential reaction condenser	5	0	
1 Bulgin toggle L.T. switch, type S.80	1	9	
1 ReadiRad "Paratune" coil unit	8	6	
1 Lewcos 50,000-ohm flexible resistance	1	6	
1 Lewcos 1,000-ohm flexible resistance	9		
1 ReadiRad 2-megohm grid leak and holder	1	4	
1 Telsen 4-pin valve holder	6		
2 Telsen 5-pin valve holders	1	4	
1 ReadiRad '0003-mfd. fixed condenser	10		
3 T.C.C. 2-mfd. fixed condensers	11	6	
2 Dubilier 4-mfd. fixed condensers, type B.C.	12	0	
1 Formodensar, type "G"	1	6	
1 Sovereign condenser, type "J"	1	6	
1 Telsen "Radiogrand" L.F. transformer	8	6	
1 Tetric L.F. output choke	10	6	
1 Atlas L.F. smoothing choke	1	1	0
1 Atlas mains transformer for 4-wave valve rectifier	1	5	0
2 Ebonite strips, 3 in. x 2 in. x 3/16 in.	6		
4 Belling-Lee "B" terminals	2	0	
1 ReadiRad P.J.1 coil unit	4	6	
1 ReadiRad wound long-wave coil quito	4	6	
1 Pkt. ReadiRad "Jiffilux" for wiring	2	6	
3 Mullard valves to specification: AC/HL, AC/P, and US0/250	2	7	6
Flex, screws, plug adaptor, etc.	1	9	

TOTAL (including valves and cabinet) **£11 5 0**

**KIT A** (less valves and cabinet) **£7 7 6**  
or 12 equal monthly instalments of **13 6**

**KIT B** (with valves less cabinet) **£9 15 0**  
or 12 equal monthly instalments of **18 0**

**KIT C** (with valves and cabinet) **£11 5 0**  
or 12 equal monthly instalments of **£1 0 9**

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**C.O.D. ORDER FORM.** Please despatch to me at once the goods specified for which I will pay in full the sum of £.....

**EASY PAYMENT ORDER FORM.** Please despatch my Easy Payment order for the goods specified for which I enclose first deposit of £.....

NAME.....

ADDRESS.....

**TO INLAND CUSTOMERS**  
Your goods are despatched post free or carriage paid.

**TO OVERSEAS CUSTOMERS**  
All your goods are very carefully packed for export, and insured, all charges forward.

**KIT REQUIRED**.....

# PICK-UP HINTS and TIPS



Interesting notes on some practical aspects of radio-gram reproduction.

By A. BOSWELL.

I HAVE had several letters lately from readers who are in trouble with mains hum (even on battery-driven sets) whenever the pick-up is being used. When radio is being received everything is quite normal, but as soon as the set is switched over to "gramophone" in comes the hum.

The trouble is almost certainly due to direct induction in the pick-up leads caused by their proximity to the electric-light mains. Especially will this trouble be manifest if the mains are A.C., and if the leads between the set and the pick-up are long.

### Eliminating "Hum"

The cure is obvious. Keep the leads as short as possible, keep them well away from electric light wiring and, if possible, use metal-covered wire, earthing the metal covering.

single or double stranded lengths. The wire is quite flexible, is not of too heavy a calibre, and the two leads inside the twin-wire cable are well separated by the rubber insulating material.

### Use Metal-Sheathed Leads

Theoretically the use of such wire, with its earthed covering, is not good. Its capacity to earth will tend to reduce the high-note response of the radio-gram; but in practice I do not think you will find any deleterious effect, and I always use it myself with excellent results.

And that reminds me, this wire is also very useful in the construction of mains receivers, and similar material is used in the H.M.V. radio-gram model 521.

I have just been carrying out some

The circuit, which is reproduced below, is a novel one in two or three respects, and consists primarily of two S.G. valves, a detector and a pentode. The latter is a D.C. valve with the filament heated by A.C.—the other valves are of the indirectly-heated variety.

An ingenious H.T. potentiometer arrangement, which controls the radio volume by raising or lowering the cathode potentials of the S.G. valves with respect to the H.T.—, is coupled mechanically with an audio volume control in the pick-up circuit.

### Limited Input

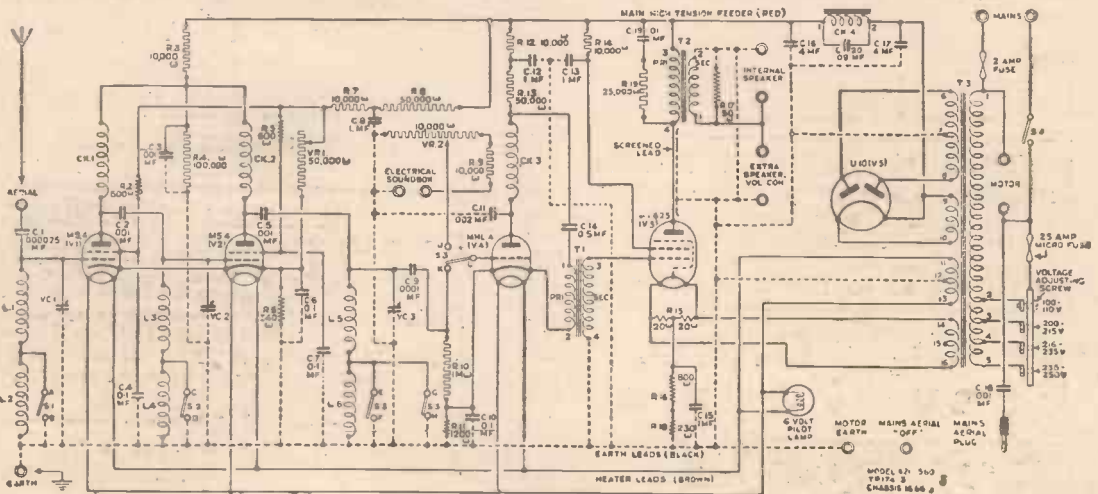
The pick-up is placed across the audio-potentiometer, in series with a resistance of equal ohmage (10,000 ohms), and this limits the voltage input to the detector to not more than half that developed by the pick-up. Incidentally, the 10,000 ohms is a somewhat low value and probably has a lot to do with the scratchless gramophone reproduction.

The motor is quite silent, mechanically and electrically, and the instrument can be obtained in either A.C. or D.C. models for 48 guineas. Provision is made for either an outdoor aerial or (in the case of the A.C. model) mains aerial reception. With its well-finished cellulose walnut the H.M.V. radio-gram is undoubtedly one of the finest radio-grams on the market.

I have just been trying out some of the new D.C. indirectly-heated valves in a radio-gram set. They are every bit as good as the A.C. valves, although at present the choice of

## HOW THE ENGINEERS AT HAYES HAVE SOLVED THEIR RADIO-GRAM PROBLEMS.

This is the theoretical circuit of the H.M.V. 521 Radio-Gramophone. Note the ingenious way the S.G. cathode potential is varied so that smooth and efficient volume control on radio is achieved. Controlled by the same knob is the 10,000-ohm potentiometer across the pick-up, this resistance being operative only when the instrument is switched to "gramophone."



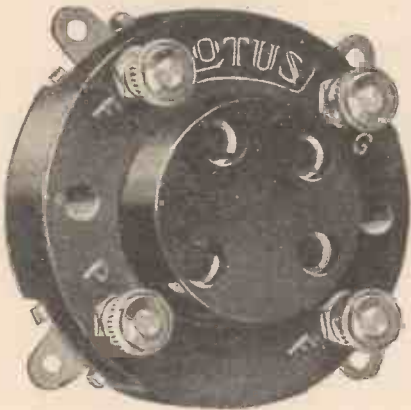
Ordinary twisted flex is not always good enough, and it is best to employ some of that braided metal-covered wire that can be obtained from the London Electric Wire Co., in either

tests with this instrument, and was astonished at the capabilities it has, not only for the reproduction of gramophone music, but also for the reception of radio.

types is somewhat limited. Before long, however, we shall have a pretty full range I expect, and then the D.C. mains users will be as well off as their (now) more fortunate brothers.

# SPECIFIED for the "SELECTIVITY" 3. the A.C. "ACE" and every efficient receiver

## BECAUSE experience has proved their reliability



**VALVE HOLDERS.**  
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Finest Bakelite Mouldings. One-piece phosphor-bronze springs and leg sockets. With or without terminals, 1/- each.

Confidence in LOTUS Components prompts the designers of every modern set to specify them to constructors.

They know from actual experience that LOTUS Components are reliable and give the results they have achieved.

Far too many sets are working inefficiently through the substitution of other makes of components for those specified. To ensure the results obtained by the designers it is essential to follow their recommendations. Be sure to ask for LOTUS and ensure success

The LOTUS range comprises Condensers, Transformers, Valve Holders (Rigid and Anti-Microphonic), Dials, Coils, Jacks, Plugs, Switches, Dual-Wave Coils, etc.

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**REACTION CONDENSERS.**  
Moving and fixed vanes interleaved with Bakelite discs of highest dielectric qualities. Chemically treated all-brass parts.

- \*00007, 4/9 ;
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- \*0002, 5/3 ;
- \*00027, 5/3 ;
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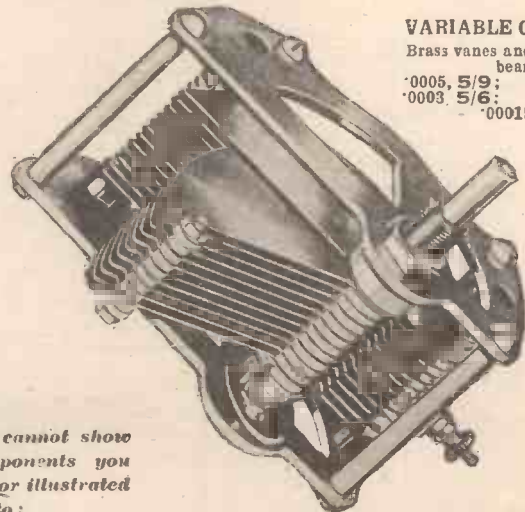


**VARIABLE CONDENSERS.**  
Brass vanes and end-plates, ball bearings.

- \*0005, 5/9 ;
- \*0003, 5/6 ;
- \*00035, 5/7 ;
- \*00025, 5/3 ;
- \*00015, 5/- .



**L.F. TRANSFORMERS.**  
Ratios 3-1 and 5-1. The special method of winding ensures remarkable reproduction of all frequencies. Price 12/6 each.



If your dealer cannot show you the Components you require, write for illustrated list to :

**LOTUS RADIO LTD., MILL LANE, LIVERPOOL**

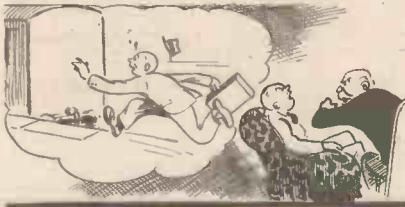


I WAS running madly after a train which, though steaming quite slowly, always managed to keep the tail end of its retreating guard's van just one yard beyond my grasp. I knew that I must catch that train and yet I couldn't.

**Suggestions Wanted**

My feet seemed to have great lead weights attached to them; my lungs were bursting. It was awful. And then suddenly the stationmaster plucked out his aerial pole and caught me the father and mother of a swipe in the region of the brisket.

**IN THE LAND OF DREAMS**



"My feet seemed to have great lead weights attached to them. It was awful."

"Stop snoring and answer the chairman," he bellowed in my ear.

I rubbed my eyes. That aerial pole must have been Captain Buckett's elbow after all.

"If—er—" I said, "the chairman will kindly put his question again I will do my best to reply. I am afraid that I did not catch his words owing to the noisy interruptions of Captain Buckett and the way in which he will wave his elbows about."

"I was inquiring," remarked Sir K. N. Pepper rather huffily, "whether you had any suggestion to make for the Club's summer outing this year?"

**An Accumulator Race**

This seemed to demand a little thought. I was just getting well away with my thinking when Captain Buckett stove in two ribs with his elbow and turned my left eardrum inside out with a roar.

"Why not wireless sports?" I suggested. "We might have a race to an imaginary charging station for

competitors carrying six-volt hundred ampere-hour accumulators; and then we could have climbing the greasy aerial mast to replace the halliards that have slipped through the block; and a hurdle race with everyone carrying a home-made portable; and an earth-plate competition—digging holes, you know. We might have a Victoria Cross race; everybody runs twenty yards carrying a hot soldering iron (and, by Jove, Primpleson, if you try any bumping and boring tactics I'll iron your pants for you), and when he gets to the other end he joins two wires held by his partner—"

**A Little Interference**

They didn't seem to like my suggestion at all, but I must say that I think they might have been rather more polite in the expression of their disapproval. I mean that when things start with a low murmur of "bilge" and "tosh" and work up to a crescendo in which everybody is roaring "blither," "rats," "rot," "sit down," "shut up," or "put a sock in it," it becomes impossible for any true Briton to take things, so to speak, lying down.

I simply emptied the nearest inkpot over Captain Buckett and wiped his face on Tootle's waistcoat. Tootle, who had not seen that I was the propelling force behind the captain, promptly aimed a swing at the mariner's jaw, but missed him and hit Primpleson. Not wishing to take part

**PLENTY OF VOLUME**



"I was singing—'Drink, Brothers, Drink.'"

in any horseplay I retired under the table until the ensuing fracas had subsided, contenting myself merely with slugging any pair of shins that

came into view with a boot that I had been able to remove from the professor's right foot.

When the lads had worked off their high spirits a little the meeting got down to business once more and I was able to emerge from my retreat. A lot of very silly suggestions were made. This, of course, was only natural, since I refrained from putting forward further ideas myself.

**Some Brainwave!**

At last the professor had a brain-wave.

"Let's go hiking," he cried. He turned to me. "Do you know what hiking is?" he asked.

"Why, of course," I cried. "You dress up like a boy scout, give your

**HIS COMPLETE "KIT"**



"I pointed to the toothbrush stuck in my hat band, and produced the grid leak from my trousers pocket."

face, arms and knees a rub over with dark oak floor-stain, stick a bag thing on your back and take a train—"

"Oh, no you don't. You walk."

"In theory, yes," I admitted. "In theory, too, you sleep in barns or pigstys. In practice it is far simpler to go by train and to stay at hotels."

**Our Radio Equipment**

The rest of the meeting did not agree with my views, and it was decided that the Club should go on a walking tour. I consented to accompany the party provided that there was not too much of the walking about the tour. I told them that so far as sleeping accommodation was concerned I should be easy to cater for owing to my ability to sleep practically anywhere and in any position.

There was some discussion over the question of wireless equipment for the



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THREE



**Varley**  
CONSTANT  
SQUARE  
PEAK  
COIL

and the

**DUBILIER**

·04 NON-INDUCTIVE  
(Inductance-free) CONDENSER

Make certain of the best results from the Varley Constant Square Peak Coil by using the Dubilier Type 9200 Non-Inductive Condenser specially designed for use with this coil.

DUBILIER CONDENSER  
CO. (1925) LTD.,  
Ducon Works, Victoria Rd.,  
N. Acton, London, W.3.

Your dealer has  
this Condenser  
in stock. Price

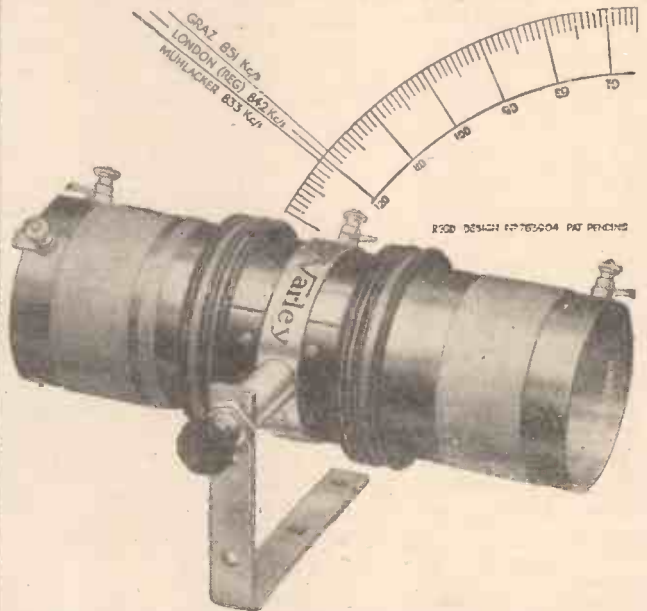
**2/-**

“... the sharpness of tuning is uncanny..”

“ May I congratulate you on the performance of your new Constant Square Peak Coil. I have fitted it in the aerial circuit of my receiver in the place of another dual-range coil of well-known make, and the results are amazing. No other word can express my feelings. The sharpness of tuning is uncanny.

“ On the lower end of the medium band, where previously the stations were an inseparable jumble, I can now get lots of stations absolutely clear of interference, and this performance holds good over the rest of the dial, long waves included.”

This extract is from one of the many letters we are receiving from all parts of the country.



**CONSTANT  
SQUARE  
PEAK  
COIL  
15/-**

The Varley Constant Square Peak Band-Pass Coil—the ideal pre-selective device for any set; S.G., Reacting Detector or Super-het.

Confines local station to 3-4 degrees. Enables programmes—now swamped by powerful transmissions—to be heard and enjoyed. Actually improves quality of reproduction. Abolishes all interference by medium waves on long waves. Supersedes wave-traps. Easily replaces existing aerial coils. Needs no screening.

This new Coil combines negative inductance and capacity coupling, so giving a constant square-topped peak and separation of substantially 9 kilocycles over the whole of both wavebands.

Supplied complete with extension rod for switch and universal mounting bracket.

Ask your dealer for the Free Colour Folder, or write direct.

**Varley**

Advertisement of Oliver Pell Control Ltd., 103, Kingsway, London, W.C.2. Telephone: Holborn 5303.

## In Lighter Vein—continued

tour, but eventually it was decided that the professor should design a special take-apart receiver and that every member should carry one component.

Being naturally quick I bagged the grid leak as my burden before anyone else had thought of it. Pottleson and Goshburton-Crump being a little slow in the uptake were landed respectively with the H.T.B. and the accumulator.

### Simple Preparations

Zero hour was fixed for 9 a.m. on the following Monday, the rendezvous being the lawn of the "Microfarads." Being an old campaigner, my preparations, though thorough, were very quickly made. A call upon Tootle whilst he was out doing his shopping resulted in the acquisition of an excellent pair of trousers which were easily turned into shorts with the tin shears.

In the same way I provided a cricket shirt, kindly, though unwittingly, furnished by Goshburton-Crump, with elbow-length sleeves. My boots appeared to require a little attention to their soles, and this I accomplished with handy strips of stout rubber from Sir K. N. Pepper's spare wheel.

Towards eleven o'clock on the great day I was singing "Drink, Brothers, Drink" in my bath when the Professor came crashing at the door. In response to his polite inquiry I declared that I was practically on my way to the "Microfarads" and that they might expect me almost at once. There is no harm in expecting, is there?

### A Good Outfit

When I arrived a couple of hours later I found the Professor's lawn in a state of extreme confusion. Everybody was there—even Miss Worple—garbed in the appropriate outfit. Each back supported a huge rucksack, whilst haversacks, kettles, cooking stoves, hatchets, sheath knives and other bits and pieces seemed to be slung to every waist or pair of shoulders. People were still hanging things on to themselves from the heap of equipment that lay on the grass.

"Hi! Where's all your stuff?" called Captain Bucket, as I strolled up.

I pointed to a toothbrush stuck in

my hatband and produced the grid leak from my trousers pocket.

"You can't hike like that!"

"Oh, yes I can!"

"Well, you're going to be jolly uncomfortable."

"Just you wait and see."

### The Start at Last

Since it was getting towards lunch time and everybody was feeling peckish it was proposed by me and carried with acclamation that we should have our last civilised meal before starting. With a little persuasion the Professor was made to ask us all to lunch. After lunch we assembled on the lawn, prepared to start after half an hour's easy for digestive purposes.

Unlikely as it may seem, I was the first to wake up. A glance at the

### AWAITING THE "NEWS"



"I found a comfortable room for myself at the "Dog and Duck," and arranged for the rest to have a disused cowshed."

watch which I instantly transferred from the wrist of the sleeping Pimpleson to my own showed me that it was four o'clock. Leaping to my feet (and incidentally on to Sir K. N. Pepper's pet toe), I quickly had them aroused, and off we started.

Down the street we walked; most of the junior population of Mudbury Wallow, which had just been released from school, turning out to speed us on our way. As I was widest awake, I led the party, and instinctively I turned into Sir K. N. Pepper's gate when we came to it after proceeding about a hundred yards.

The others followed me in. "This," I said, "appears to be just the place for tea." Sir K. N. Pepper was quite willing and we all made a good meal.

We got under way again about seven o'clock. Less than a quarter of a mile ahead of us was Miss Worple's house, and into her gates I turned with the party following behind me. Miss Worple responded at once to the suggestion that a little supper might be welcome. And very well she did us. It must have been about nine o'clock when the great trek began

once more. Everyone now was beginning to feel the effects of so strenuous a day and all were greatly relieved when, after a couple of hundred yards of good healthy walking, I led the way into the clubhouse. "This," I said, "seems to be just the place for us to camp for the night."

In a matter of minutes bedding rolls were flung down on the floor and weary limbs were seeking after rest. Having on the previous day borrowed Sir K. N. Pepper's car to bring round a mattress and a pile of bedding borrowed during his absence from the Professor, I knew that I should be all right.

### Useful Components

Captain Bucket admitted under pressure that he had a spare pair of pyjamas in his rucksack, and the Club decided unanimously that these should be lent to me as I had forgotten to bring any.

On the next day we managed breakfast most comfortably at Pimpleson's and accepted Tootle's invitation to lunch. Tea was provided by Pottleson. Then we struck out into the great open spaces. At least they did.

Explaining that it would be best if I took the bus to Bilgewater Magna and arranged for sleeping quarters, I left them to their healthy exercise. It was pelting with rain before I had accomplished half of my two-mile journey. I found a very comfortable room for myself at the "Dog and Duck" and arranged for the rest to have a disused cowshed.

On the following morning we struck out across the fields and I led the way. Towards five o'clock our eyes were rejoiced by the view of a town on the horizon. Miss Worple thought that it must be Brighton, whilst Sir K. N. Pepper held that it was undoubtedly Salisbury.

### Home from Home

"I'm sure that we shall have a jolly time here," said the Professor. "I shall feel quite at home, for those gasworks are exactly like the ones at Mudbury Wallow."

Step by step everyone began to pick out landmarks that reminded them of the old home town. And presently I led the way into a gate of a house exactly like the "Microfarads," where a charming lady exactly like Mrs. Goop provided a wonderful supper.

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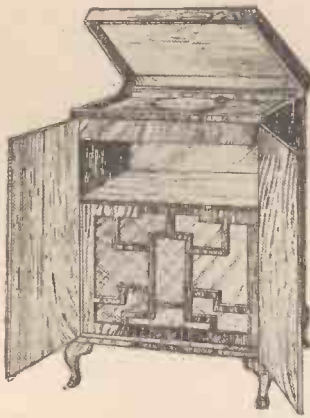
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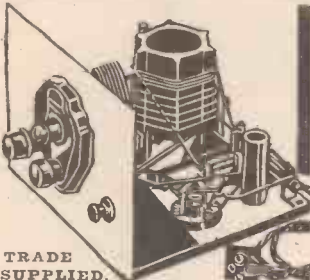
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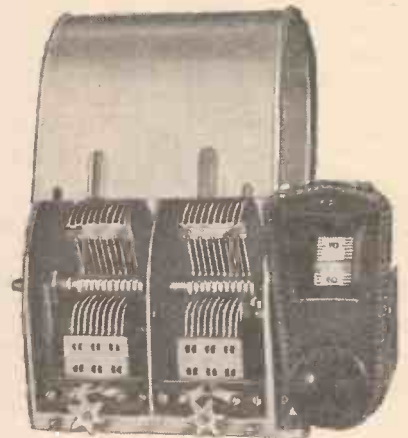
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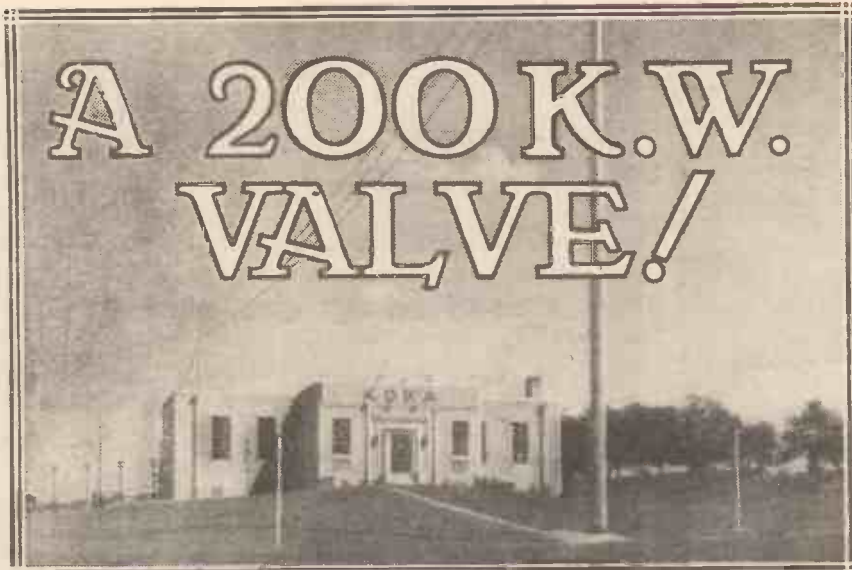
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# A 200 K.W. VALVE!



A new radio wonder in the form of a colossal valve, 6 ft. high and 8 in. in diameter. Read all about it!

THE success of the new transmitting station of KDKA, which is being built near Saxonburg, is largely dependent upon a number of developments in broadcast transmission made by the Westinghouse Electric Company.

Of these one of the most important is the new 200-kilowatt transmitting valve which will be used.

### Cooling the Grid

This valve is not merely an enlarged edition of a smaller valve, but has an entirely distinct and novel design.

The mere building of a larger valve following the style of a smaller type would not produce the results desired. The quality of output and the life of such a valve would not be up to the desired standard.

The new valve, called the AW-220, is 72 in. in height, has a diameter of 8 in., and weighs 60 lb.

In its design the engineers found one of their greatest problems to be that of cooling the grid. This difficulty has been overcome by producing a double end construction which has the necessary mechanical strength.

An idea of the cooling problem which was overcome may be obtained from the statement that approximately five tons of cooling water must be passed through the water jacket of the valve each hour it is in operation.

### Power Comparisons

This water cools the valve in the same manner as water in a motor-car radiator cools the engine. One hour's operation of the valve heats enough water to supply the domestic require-

ments of the average home for several weeks.

While, of course, AW-220 valves will only be used to generate high-frequency power for radio stations, an appreciation of the power capacity of one of them can perhaps best be gained by a comparison with familiar household devices.

For example, a similar amount of power of the kind distributed com-

### SOME BABY!



Here you see one of the huge transmitting valves referred to in this article, and which are for use in the KDKA broadcasting station.

mercially would operate simultaneously hundreds of electric fires. This would also be the equivalent of power required to light 1,000 average homes of five to six rooms each.

These tremendous valves are the result of many months of careful experimenting and were designed by some of the greatest radio engineers in the country.

### Thousands of Volts

Although of such high power, a valve of this type is very similar to the ordinary receiving valve. It has a plate, grid and filament just the same, but, of course, it is very much enlarged and made immensely strong.

Some constructors might consider an H.T. of a few hundred volts quite high, but these colossal transmitting valves necessitate many thousands.

As mentioned before, it is because of the big power handled that they get so hot, and the electrodes must have a large area in order to dissipate satisfactorily the enormous amount of heat generated; the anodes being actually in contact with the cooling water.

\*\*\*\*\*  
 \* MORE "KILOTRAP" \*  
 \* COMMENTS \*  
 \* A Birmingham Reader's \*  
 \* Experiences. \*  
 \*\*\*\*\*

Sir,—I would like to thank your Construction Department for the design and construction of the "Kilotrapp" short-wave receiver. I built this set a fortnight before the great 7 L O broadcast, and so had tested it out.

I have received on it so far: 7 L O (Nairobi), W 2 X A F, K D K A, four foreign S.W. stations, which I could not identify, and numerous Morse stations, also S.W. amateurs.

But the 7 L O broadcast has been the best I have received so far; the strength of the station was R4, atmospherics nil, fading fair, and "mush" was pretty bad, but I could hear plain enough to understand what was going on. The tom-toms were very plain indeed. I could also hear the chattering birds, but could not distinguish what sort they were.

But let's have another broadcast of this kind soon, if it can be arranged, as I think they are interesting, and you get a thrill from it.

Thanking you for your interesting monthly book and splendid receiver.

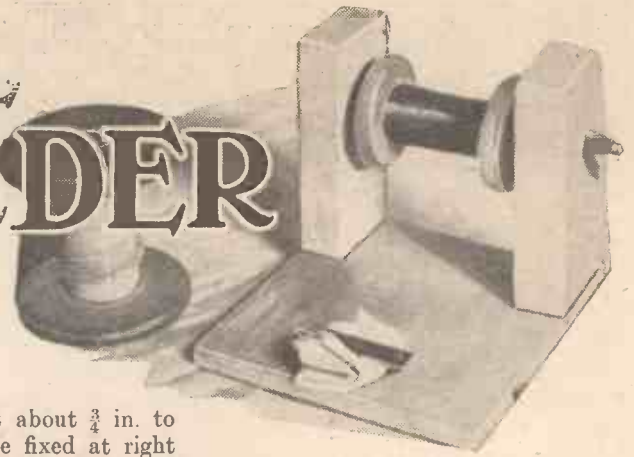
Yours truly,  
 W. LEGG.

Birmingham.

# A USEFUL WIRE-HOLDER

Two easily made and really useful gadgets which will take the sting out of your coil-winding.

By C. P. ALLINSON, A.M.I.E.E.



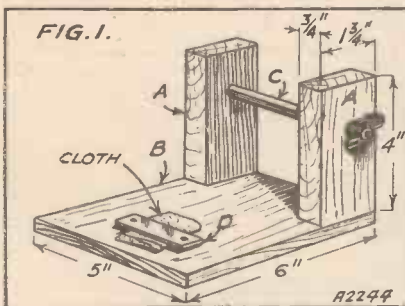
I EXPECT you, like myself, are frequently winding up coils during your experimental work.

I know that hardly a day passes that I do not have to wind up one coil at least. That's one of the things in experimenting that sometimes bores me.

## This is the Problem

There is generally something in the vice that is being glued, and that I therefore do not want to take out, and so I have to find some means for fixing the spool and for tensioning

## READY FOR USE



This is how the holder will appear when completed, and it is so simple that you should have no difficulty in making it from this drawing.

the wire so as to get it on the former nice and tight.

Of course, if you have a lathe you're all right, but I haven't.

However, one day a brain-wavelet washed an idea up on the shore, and here it is.

## Inexpensive Materials

The photograph shows the finished article—a spool holder and tensioning device which can be either fixed to the bench or kitchen table, or put in the vice. It is made out of a couple of (sorry, three) bits of wood and a brass or steel rod, a bit of flat metal strip and a few screws.

The working drawing in Fig. 1 shows all the constructional details.

Two pieces of wood, 4 in. long,

cut off any odd bit about 3/4 in. to 1 in. thick (AA), are fixed at right angles to a wooden base B. They are made high enough to allow the largest spool you have to turn freely and are placed wide enough apart to accommodate it. The dimensions given will be found suitable in nine cases out of ten, but should a very large spool have to be accommodated they must be altered accordingly.

## Tension Easily Adjusted

These two pieces of wood are fixed at right angles to the base, and a rod, C, passed through, as shown. A nut and washer are put on one end of the rod and the rod hammered over the nut so that it can't work loose. For the other end you want a large knurled or milled nut, or a wing nut.

This completes your spool holder. The tensioning device is a simple affair. A small strip of flat brass or iron, D, has a couple of holes drilled at each end through which wood screws are passed. Between this and the baseboard into which the screws go is a bit of soft, folded cloth, through the centre of which the wire is fed. The two screws are tightened down until the desired tension is obtained. The tension is easily adjusted while winding a coil.

## The Gadget in Use

To use this gadget fix it to a table with a clamp, or put it in the jaws of the vice. Remove the wing nut from the spool spindle and withdraw the spindle.

Put the spool in position, put the spindle through it and put the wing nut on again, tightening it just enough to prevent the spindle from turning with the spool, no more.

Slack off the two screws of the tensioning device, and feed the wire through the centre of the folded cloth pad and retighten till you feel the desired amount of resistance when you pull on the wire. You can now wind your coil in peace and comfort.

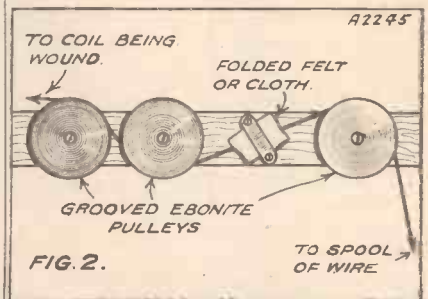
You may find it necessary, as the wire beds itself down in the cloth pad, to tighten the two screws, or one of them anyhow, after you have put a few turns on to keep the tension even. Remember that the first and last turns in particular need as much pull on them as you can get, as they are the most likely to slack off.

If you have a lathe a simple feeding arrangement is sketched in Fig. 2. A hard-wood arm carries three ebonite pulleys, each having a small groove in it. Between two of them is a tensioning device similar to that described above.

## If You Have a Lathe

The arm is fixed in the tool rest and the wire is fed in over one pulley, through the tensioning device, then

## AN ALTERNATIVE



If you have a lathe you will find this arrangement very useful. It will enable you to wind neat coils with a minimum of trouble.

under and over the other pulleys, as shown. The tensioning of the wire can be regulated very nicely, and whether winding in slots or not this arrangement will be found exceedingly useful.

It should be noted that the pulleys should rotate freely, though the last one should be free from play, or the wire may tend to wander a bit when you are putting on a spaced winding.



# OUR NEWS BULLETIN

## What an Idea!

It is curious what strange ideas well-known scientific men sometimes get. According to Lord Russell, who is perhaps better known as Mr. Bertrand Russell, philosopher and scientist, newspapers are a passing phenomenon. Lord Russell thinks that reading will gradually die out, and its place be taken by radio.

## An Explanation

"The growth of our present scientific civilisation," he explained, "is notably seen in our newspapers. Modern methods have made it much more profitable to have a small

number of newspapers with enormous circulations rather than a large number of papers."

## Effect of Inventions

Lord Russell goes on to say that thus propaganda is more effectively concentrated in a few hands. This is due to technical causes. All modern inventions have increased the power of propaganda and decreased the power of the ordinary individual to find out what is happening. He learns what is good for him to know. There has been a great diminution of knowledge of political facts, and that is likely to become very much more marked as time goes on.

## A Better Thing

In short, Lord Russell thinks that the habit of reading will probably die out altogether, for to him it seems quite clear that people like listening

to the radio rather than reading, and that newspapers are merely a passing phenomenon—they won't last for ever.

Luckily, this is a mere speculation on Lord Russell's part, and there is no scientific fact to support the theory. But it would be better for the world if broadcasting were to die out instead of reading, for there is no doubt—whatever the merits of broadcasting—its influence is much more ephemeral than the written word.

## Supernatural Light

Another famous scientist, the inventor of the thermionic valve—Sir Ambrose Fleming—has also been delivering some rather unorthodox opinions. He recently suggested that there might be supernatural light from another world about which science knew nothing.

Sir Ambrose referred to writings of the Scriptures; for example, the pillar of fire over the tabernacle which guided and guarded the Hosts of Israel. Sir Ambrose thinks there must have been something unearthly in this light; in his opinion it was clear that there had been many manifestations of light which were supernatural.

(Continued on page 206.)

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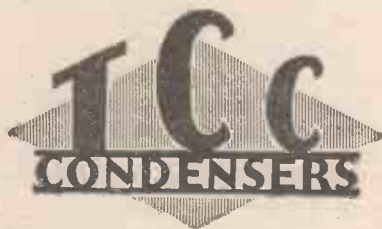
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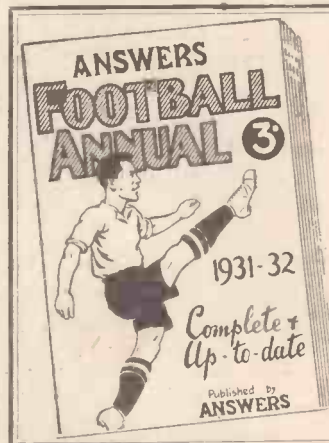
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**OUR NEWS BULLETIN**

—continued from page 204

**Why Not ?**

Isn't it possible, Sir Ambrose, that in the old days manifestations of the aurora borealis might have inspired ideas of supernatural fire in the minds of those who did not know its scientific explanation ?

However, as Sir Ambrose says, inquiry into those mysteries lies far beyond our present powers.

**Shopping by Television**

A writer in the "Daily Telegraph" has been dealing with the question of shopping by television, the idea being that you ring up a shop and say, "Show me those rugs"—or those hats, by television, of course.

The writer goes on to say : " Remains only the spade work of perfecting television sets for making the public television-conscious."

Good heavens! Aren't we more than television-conscious these days? Haven't we heard so much about television and what it is going to do in the near future that perhaps it would be best for television if we gave it a rest ?

**Licences Still Increase**

Again the facts prove that the popularity of broadcasting is on the increase. The number of wireless licences issued by the Post Office increased by 38,056 from 3,672,886 on April 30th to 3,710,942 on May 31st, excluding 23,211 licences issued free to the blind.

**"Listening Group" Leaders**

The first Broadcasting Summer School organised by the Central Council for Broadcast Adult Education opened at New College, Oxford, on June 27th. The tuition is free, and, where necessary, expenses are being paid. Listening groups which meet for the purpose of study and discussion are becoming numerous, according to a B.B.C. official, and it is to train leaders for these groups that the school has been organised.

**Amplifying Baby's Cry**

Listening-in on baby is a new stunt in New York, for cradles and prams are being sold with a microphone attachment to amplify baby's cry, so that it can be heard by mother when she is in another part of the house.

Babies can also be watched by television, at the cost of only a mere £7,000.

We should have thought, however, from our knowledge of babies (although we haven't any ourselves), that baby's cry would not need the microphone or any amplifying apparatus!

**There's More in It . . .**

According to Mr. Sydney A. Moseley, television—especially the brand of television devised by Mr. Baird—has been dogged by envious enemies from its very onset. It appears that Mr. Baird cannot understand the consistent hostility of fellow-countrymen.

**More Facts Wanted**

Perhaps if Mr. Baird more closely studied the psychology of instructing the public in the exact possibilities of his invention, and if he would exercise a more restraining influence upon some of his more enthusiastic

**LOOKING FOR A SUPER-HET. ?**

Then be sure to get a copy of the JULY

**"MODERN WIRELESS"**

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JULY . . . . 1/-

supporters, he would not find so much difficulty in understanding the criticisms to which television in this country has been subjected. And perhaps in due course Mr. Moseley will realise that honest criticism is not necessarily made at the dictation of hostile feelings.

**A Radio Millionaire**

A good deal of fuss has been made about Mr. William S. Paley, a millionaire of his own making, who is not only President of the Columbia broadcasting system, but has been visiting us, and especially the B.B.C.

It appears that in three years Mr. Paley built up the C.B.S., and, in fact, in ten months did so well that he sold half the interests for a million pounds!

(Continued on page 207.)



OUR NEWS BULLETIN

—continued from page 206

Out for Business

Mr. Paley governs eighty broadcast- ing stations, but his chief interest in life is still business, and a seventeen- hour day. Mr. Paley has been con- ferring with B.B.C. officials in order to discover how far radio can be used to improve international relations.

Another "Big Noise"

David Sarnoff, another phenomenon of the New World, who rose from newsboy to be President of the Fifty Million Dollar Radio Corporation of America, has been circulating all the papers and various officials concerned with his views on television.

Mr. Sarnoff thinks that by the end of 1932 television sets will be in thousands of homes, and pictures of important events will be broadcast through great experimental stations.

A Considered Opinion

It is interesting to contrast Mr. Sarnoff's view to that expressed by the July issue of the "The Scientific American" "Frankly," says that old-established journal, "it is our opinion that television systems based on mechanically-operated parts— scanning discs and the like—are not the ultimate solution to the problem of placing in every home a talking- motion picture."

Hopes of Something New

"Certainly," continues "The Scientific American," "with the many experimenters that are working on television to-day the art is going to suffer from a plethora of methods and from the growing pains of financing problems. But from the chaos there may emerge something new, some- thing so startlingly simple that it will place television on the basis that it deserves."

Our Own View

This is more or less repeating what Sir Oliver Lodge, Captain Eckersley, and many other experts said two or three years ago, that television is possible but the present methods will have to be abandoned, and television will probably be accomplished in the real sense of the word when a revolu- tionary and new principle is discovered.

And that principle has not yet been discovered.

YOUR RADIO-GRAM RECORDS

The useful hints given in this contribution from Dr. J. H. T. ROBERTS, F.Inst.P., are also applicable to ordinary gramophone practice.

MOST ordinary gramophone records are intended to be played at a speed of about 78 to 80 revolutions per minute and you should take care that your records are played at the correct speed. Perhaps the commonest mistake which is made in the reproduction of records is to play them at too high a speed.

Importance of Speed

The frequency of the vibrations of the sound-box diaphragm or needle is equal to the frequency with which the "waves" in the sound track pass under the needle, so that the faster the record rotates the higher the frequency of the vibrations which form the sound given out from the instrument.

If the record is rotating at the same speed as the original wax record was rotating when the record was being made originally, then the frequency of the sound given out by the gramophone will be the same as the frequency of the sound when it was being recorded.

If the speed of the record is higher than the original recording speed, the sound given out will be higher in pitch than the corresponding sound when it was being recorded, whilst if the speed of the record is too low the sound given out will be too low in pitch. You know, of course, that the frequency of the vibrations constituting the sound determines the pitch of the sound; the greater the frequency the higher the pitch of the note.

Faithful Reproduction

When we play a record our aim should be to reproduce the sound as nearly as possible identical with the sound which was originally recorded. The three properties which differentiate one sound from another are pitch, quality and loudness.

As regards the loudness, that is a matter which, to a large extent, may be varied to suit individual tastes, and a mere increase or decrease in loudness does not necessarily make the sound seem essentially different from the original.

(Continued on page 208.)

Vestinghouse Metal Rectifiers are reduced in price...

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Table with 3 columns: Model, Old Price, New Price. Rows include H.T.5, H.T.6, and H.T.7.

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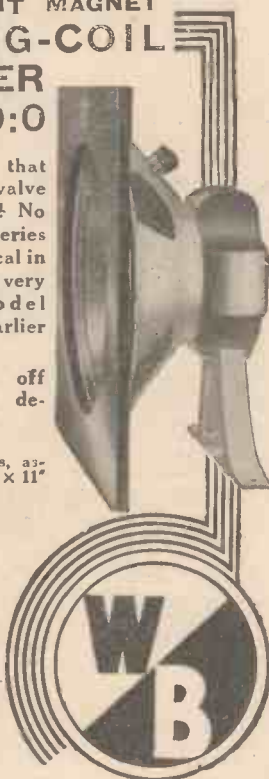
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Whiteley Electrical Radio Co., Ltd., Radio Works, Nottingham Road, Mansfield, Notts.  
Irish Free State Distributors: Kelly & Shield, Ltd., 47 Fleet Street, Dublin.

## YOUR RADIO-GRAM RECORDS

—continued from page 207

Quality, however, should be kept as closely as possible to the quality of the original, and the whole of the reproducing apparatus, whether electrical or acoustical, is designed with this object constantly in view.

Perhaps I may mention, in passing, that the *quality* of a sound is determined by the number and type of the overtones which it comprises. No one would have the slightest difficulty in distinguishing, for instance, the sound of a violin string from that of the human voice, or one human voice from another; these differences are essentially differences in *quality*.

### Obtaining Correct Pitch

Now as regards the pitch of the reproduced sound, this is the easiest of the three characteristic properties to reproduce with faithfulness to the original. There are many difficulties in the way of getting absolute faithfulness in *quality*, but there is no reason in the world why the *pitch* of the reproduced sound should not be the same as that of the original; to secure this object it is only necessary to run the record at the right speed.

The change in the character of, for instance, a recorded voice is very noticeable with even a small variation in the speed of the record. You can verify this very easily by taking a record of a bass voice and playing the record at an unduly slow speed, when it will sound like a low growl, the enunciation of the singer being distinguishable only with difficulty.

### Effective Experiment

Then play the record at a high speed and the voice will sound like that of a tenor or choirboy and the utterance will be correspondingly rapid. A few simple experiments of this kind will emphasize the need for playing your records at the proper speed if the best results are to be obtained.

There is a temptation to play records at a rather higher speed than the normal, since the loudness, or apparent loudness, of the reproduction also increases with the speed. I do not know whether you have ever noticed this, but if you try it you will find that it is so, and if you consider the matter for a moment you will easily see the reason.

The amplitude of the waves determines the loudness of a sound, the

amplitude being the extent of the to-and-fro motion of the air caused by the sound waves passing through it. If we have two sounds of the same pitch and quality, but of different amplitudes, the one having the greater amplitude will sound louder than the other.

Supposing, however, we have two sounds of the same quality and the same amplitude, but different pitch, then the sound which is of *higher pitch* will seem *louder* than the other one. This is the sort of thing you get when you play a record too fast.

### Apparently Louder

The amplitude of the waves on the record remains the same, and roughly (though not accurately) the amplitude of the sound waves produced from the diaphragm remains the same, but as the speed of the record is increased the pitch of the sound rises. Consequently the sound reproduced from the record not only rises in pitch, but also apparently increases in loudness.

This question of the relation of loudness and pitch for a constant amplitude is a very fascinating one, but its full discussion depends upon mathematical and psychological considerations which would be out of place here.

### Making the Sound "Come Out"

It is, nevertheless, an ascertained fact that if we have a high-pitched note and a low-pitched note which the ear estimates to be of about the same loudness, the amplitude of vibration in the lower note is greater than in the higher note. In other words, it does not require so great an amplitude of vibration in a high note as in a low one to produce the same loudness as judged by the ear.

You can see from all this why it is that people often play a record too fast, because, perhaps unconsciously, they have found by experience that it seems to "come out" better. You can try the experiment very simply with an old record or a very faint one, when you will find that parts of the record which may be barely audible at the correct speed are heard without difficulty if the speed is sufficiently increased.

### Testing for Correct Speed

The speed of the turntable should be tested from time to time to make sure that it is correct. A simple way to do this is to pin a small piece of white paper, say, half an inch square, lightly to the felt of the turntable, and keeping one eye on this rotating piece of paper, and the other eye, so to speak, on the second hand of a watch,

(Continued on page 209.)

**YOUR RADIO-GRAM RECORDS**

—continued from page 208

count the number of revolutions of the turntable whilst the second hand travels 30 seconds.

The counting should be done in this way: 0, 1, 2, 3, etc., the word "nought" being pronounced at the commencement of the period estimated on the watch. If the number of revolutions per half minute does not fall between 39 and 41, or, in fact, between  $39\frac{1}{2}$  and  $40\frac{1}{2}$  (assuming the correct speed to be 80 revolutions per minute), the speed regulator should be adjusted until this condition is fulfilled.

**Test Speed While Playing**

As a matter of fact, it is better to test the speed whilst a record is actually playing, since the speed when playing a record is often appreciably slower than when the turntable is running unloaded. When testing the speed during the playing of a record you should stick the white piece of paper upon the record.

It is really surprising how careless most people are about the question of record speed, but a few minutes spent in adjusting your gramophone on the lines indicated above will well repay you.

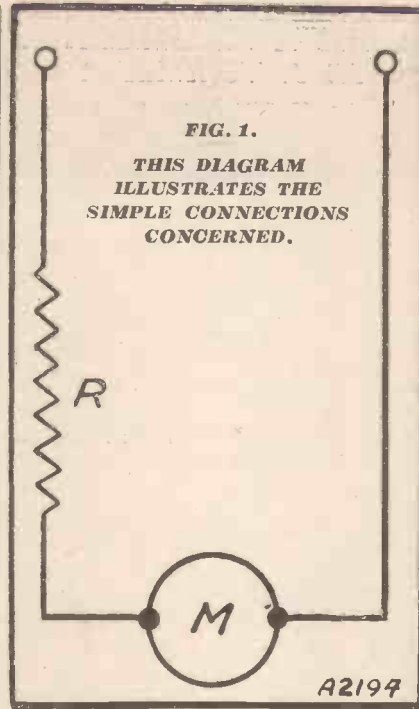
\*\*\*\*\*  
 \* USING A MILLIAMMETER \*  
 \* AS A VOLTMETER \*  
 \* A practical economy for the \*  
 \* constructor. \*  
 \* By H. REES. \*  
 \*\*\*\*\*

It is not generally known that a milliammeter can serve also as a voltmeter provided a suitable resistance R is connected in circuit as shown in Fig. 1.

Thus consider an instrument reading from 0 to 10 milliamps. The current for a full-scale reading is obviously 10 m.a., or .01 ampere, and in order to measure voltages, values of the external resistance R must be chosen that will always limit the instrument's current to a range of 0.01 amp.

**One Volt per Milliamp**

Now Ohm's law states that the current in amperes through a resistance of R ohms when the latter is connected across V volts is given by  $V/R$ . From this the current would be one thousandth of an ampere (or 1



**FIG. 1.**  
 THIS DIAGRAM ILLUSTRATES THE SIMPLE CONNECTIONS CONCERNED.

milliamp.) when  $V = 1$  volt, and  $R = 1,000$  ohms.

Consequently, by making the total resistance of our instrument circuit 1,000 ohms, the meter will read 1 m.a. per volt across its terminals. In other words, the milliamp. scale would

be converted into a corresponding direct 0-10-volt scale.

Since the total resistance of R and the instrument in Fig. 1 is to be a thousand ohms, the value of R can be found by simply deducting the resistance of the instrument itself from 1,000, or, if  $r =$  the resistance of the instrument, and  $R =$  the external resistance, then  $R = (1,000 - r)$ . In the above example we have taken a scale range of 0-10 milliamps., but this reasoning is true for any scale, provided, of course, it is remembered that the available voltage range is that of the particular scale.

**Indirect Readings**

So far, however, we have considered only direct readings, i.e. the milliamp. scale is made to read directly in volts. But suppose we required the 0-10-milliamp. meter to read up to, say, 100 volts. In order to keep the current to its range of 0-01 ampere, the total resistance must now be 10,000 ohms and  $R = (10,000 - r)$ .

Under these conditions the readings will remain the same as before (0-10 m.a.), and to give the actual voltage they must be multiplied by 10. All that this means is that we have increased the resistance in proportion to the voltage so as to give

(Continued on page 210.)

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**USING A MILLIAMMETER AS A VOLTMETER**

—continued from page 209

the same readings as before, so that the readings are now only 1/10th of the actual voltage measured. Similarly, to read to 200 volts R would be (20,000 - r), the readings being multiplied by 20, and so on.

Since the resistance of a milliammeter is relatively small, it can be neglected for the higher voltage ranges without causing appreciable error, because the external resistance is so high in comparison.

As an illustrative example we will now work out two ranges for an instrument reading from 0-25 milliamps. and having a coil resistance of 10 ohms.

(a) *Direct Reading*: 0-25 volts.  
 Total resistance will be 1,000 ohms.  
 External resistance = 1,000 - 10  
 R = 990 ohms.

(b) The instrument is required to read 0-125 volts, the readings being multiplied by 5.  
 In order to keep the current to its previous value the total resistance must be 5,000 ohms.  
 R = 5,000 - 10  
 = 4,990 ohms.

The instruments would read respectively 1 per cent and 0.2 per cent low by neglecting the 10 ohms and using external resistances of 1,000 and 5,000 ohms. For higher values of instrument resistance the error would be higher, but for most practical purposes it can be entirely neglected.

\*\*\*\*\*  
**CONVERTING YOUR SET FOR THE MAINS FROM A CORRESPONDENT.**  
 \*\*\*\*\*

THERE are two ways in which a set can be converted into an all-mains receiver. If you are at present working off bat-

teries throughout, the first obvious method which suggests itself is a combined H.T. unit and trickle charger. This is certainly the cheapest method, and it is perfectly satisfactory provided a well-designed unit is chosen.

On the other hand, there are listeners that simply detest batteries in any shape or form. Their ideal is the all-mains set *par excellence*, requiring no attention beyond that involved in switching on and tuning.

We can well appreciate this point of view, and it is proposed to consider now some methods of meeting this demand in the cases of receivers which have been primarily designed for battery working.

The remarks made in this article apply exclusively to A.C. supplies, because the writer is not one of those who believe that the design of a satisfactory receiver is a problem to be left in the hands of the home constructor.

**Two Distinct Classes**

Unless the reader is pretty well versed in electrical matters he would be well advised to refrain severely from experimenting with a D.C. mains unit, or eliminator, on sets which have not been designed specifically for that purpose. This warning is thoroughly justified, and a word to the wise is sufficient.

Coming to "all-mains units," we find that there is a wide variety to choose from. They may be broadly divided into two classes, according whether or not additions or modifications are required to the receiver.

One class includes all those units which provide an H.T., L.T. and grid-bias supply of a steady form similar to batteries, so that they have only to be connected to existing sets. In most cases dry rectifiers are used, and the advantages of these units are obvious; the only disadvantage being that they may be more expensive than other types.

Next we have the type that supplies raw alternating current for filament

(Continued on page 211.)



NEW  
**SIX-SIXTY VALVESCREEN**  
 1/3

**SAY SIX-SIXTY**

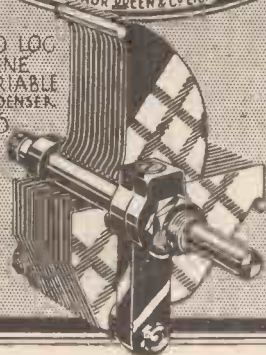
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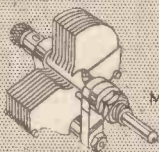
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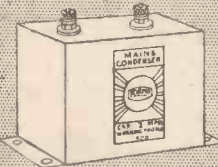


MIDGET CONDENSER

2/9

MAINS  
CONDENSER  
CAP 2

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## CONVERTING YOUR SET FOR THE MAINS

(Continued on page 210.)

heating. It is well known that A.C. mains valves are made to-day with either directly- or indirectly-heated filaments.

### A.C. Valves

The former have heavy filaments heated direct by the passage of alternating current, with little or no variations in temperature due to the alternations of the current. The filament voltages and currents vary somewhat with different makers, but the majority are 0.8 volt, 0.8 ampere.

Indirectly-heated types, as the name implies, have a special heater winding separate from the filament, so that no alternating current passes through the latter; the standard heater consumption in all types is 4 volts, 1 amp.

The directly-heated valve is the cheaper of the two, and its filament consumption is only 0.64 watt against 4 watts in the case of the indirectly-heated type. The exponents of the latter can, however, point out that their valves give very much better results.

### The Heater Wiring

It is pretty clear then that we must compromise between economy and efficiency, so that we will proceed on the assumption that readers will range themselves in one or other camps according to their respective pockets and standards of efficiency.

Since alternating current will be carried by the filament circuits of the set, means must be provided to prevent hum due to induction between the L.T. wires and other parts of the receiver. A very effective method is to make the filament connections throughout of twisted flex, or, better still, one of the varieties of metal-covered wires.

### Greater Efficiency

With a well-designed set and mains unit this is about all that is required. It is assumed, of course, that all circuits have been effectively decoupled in the unit itself, and that the connection instructions have been observed to the letter.

It must be remembered, of course, that mains valves are often considerably more efficient than battery types, so that any instability on either the high- or low-frequency side of the receiver is apt to be accentuated. Thorough de-coupling is usually provided in the best mains units, but it might still be advisable to incorporate a choke filter output.

The voltages will be decided according to the requirements of the receiver. For a plain Det.-2 L.F. the H.T. voltages should include a tapping variable from about 50 to 80 volts for the detector, and a fixed tapping of about 150 to 200 volts for the L.F. stages. The requirements of more complicated receivers incorporating S.G.s and pentodes must be similarly decided.

The matter of current output is quite as important. It is a mistake to buy a unit giving rated maximum currents just equal to the average demands of the set.

Liberal margin should, therefore, be allowed for best results.

## SAFEGUARD BOTH DANGER POINTS

If you use a super-power valve with high grid-bias voltage it is advisable to use a fuse in both H.T.— and G.B.+ leads.

The Bulgin Universal Fuseholder is designed for this purpose and safeguards your valves from two angles. Instead of connecting L.T.—, H.T.— and G.B.+ together, insert one of these fuseholders and be safe. Connections are clearly marked.

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# WORKSHOP WRINKLES

Some practical hints to help the constructor with his wiring and woodwork.

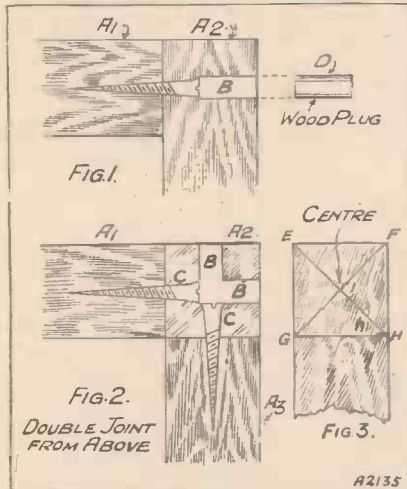
## A Substitute for Tenon Joints

To make a good wireless or loud-speaker cabinet usually means tackling the type of joints known as tenon joints. To be effective these require considerable skill, but the following instructions will enable most of the difficulties to be overcome.

The writer first used this method in the construction of a cabinet in which the framework was made of deal 1½ in. square. This is a handy size for the job, besides making a strong article when finished. The diagrams require very little explanation.

Fig. 1 shows two pieces of wood connected at right-angles to each

### A STRONG JOB



It is quite easy to make strong, neat-looking joints without going to all the trouble of making a special job of them. A full description is given in the text.

other, and Fig. 2 shows where a third piece has been attached in a similar manner, as would be done at the corner of a cabinet.

The centre point is found by drawing diagonals as in Fig. 3, and where these cross is the centre. With

## KEEPING IT CLEAN

The metal tube effectively protects your soldering iron from the fire.



square section of wood, EF, EG, and FH are all equal.

At the centre a hole is bored, using a five-sixteenths bit, slightly more than half-way through the wood. A 1¼-in. screw, about 7 or 8 gauge—not a very thick one—can now be screwed into the hole, and into the other piece to which it is to be fastened.

## Filling the Holes

A little glue on the end of A<sub>1</sub> will prevent it turning when finished. The neatness of this operation depends on the end of A<sub>1</sub> being cut truly square, and also on the piece being held true with A<sub>2</sub>.

If another piece is to be attached the same process is repeated as at Fig. 2. The next item is to cut off some short pieces of ¾-in. dowel rod to insert in the screw holes. The dowel is better to be a shade larger in diameter than the hole, to allow for any error in boring, and also a tight fit is assured.

When these have been inserted in the holes B they should be left flush with the surface of the wood. If a wood ornament or button is now fastened over the dowel pin, the result is a strong and neat joint which is difficult to tell from a tenon joint

## Fire-Heated Irons

A clean soldering iron is, naturally enough, a *sine qua non* for speedy and successful soldering. It is, of course, an easy matter to retain electric and gas-heated irons in good working condition.

Not so, however, the soldering

irons which the more modest constructor thrusts into the fire between the bars of the grate every time he embarks upon a soldering operation.

Still, even these "fire-heated" soldering-irons can be retained in a perfectly clean condition without much trouble. For this purpose obtain a 6- or 8-in. length of brass or iron tubing, sufficiently wide in bore to admit of the soldering iron being inserted into it.

Anyhow, having obtained a suitable metal tube, insert this into the fire between the bars of the grate, and then push the soldering iron into the tube.

It will be seen that the metal tube forms a sort of heater for the iron. It protects the latter from becoming contaminated with cinders and ashes, and although the iron may take rather longer to heat up when thus protected, the saving in time resulting from always having a clean iron to work with will more than cancel out the extra time taken in heating the iron.

## INDEX TO ADVERTISERS

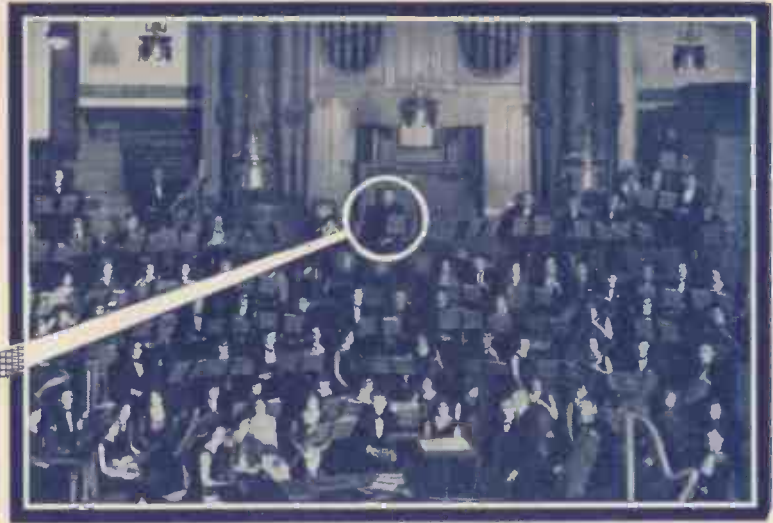
	PAGE
"Answers Football Annual"	205
"Astra" Condenser	204
Belling & Lee, Ltd.	208
Bird, Sydney S., & Sons, Ltd.	211
British Blue Spot Co., Ltd.	Cover iii
Bulgin, A. F., & Co., Ltd.	211
Burne-Jones & Co., Ltd.	161
Carrington Mfg. Co., Ltd.	210
Cossor, A. C., Ltd.	162
Dubilier Condenser Co. (1925), Ltd.	199
Ediswan Electric Co., Ltd.	Cover ii
Eastick, J. J., & Sons.	210

	PAGE
Formo Co.	211
Gilbert, J. C. (Cabinets)	201
Graham Farish, Ltd.	206
Hayberd, F. C., & Co.	205
International Correspondence Schools, Ltd.	205
Igranic Electric Co., Ltd.	161
Jackson Bros.	209
Lanchester Laboratories, Ltd.	204
Lotus Radio, Ltd.	197
"Modern Wireless"	201
Peto-Scott Co., Ltd.	201
Pickett's Cabinet Works	211

	PAGE
Radio Instruments, Ltd.	Cover iv
Ready Radio	195
Regentone, Ltd.	204
Six-Sixty Radio Co., Ltd.	210
Telegraph Condenser Co., Ltd.	205
Varley Products	199
Westinghouse Brake & Saxby Signal Co., Ltd.	207
Whiteley Electrical Radio Co., Ltd.	208
Wingrove & Rogers, Ltd.	201

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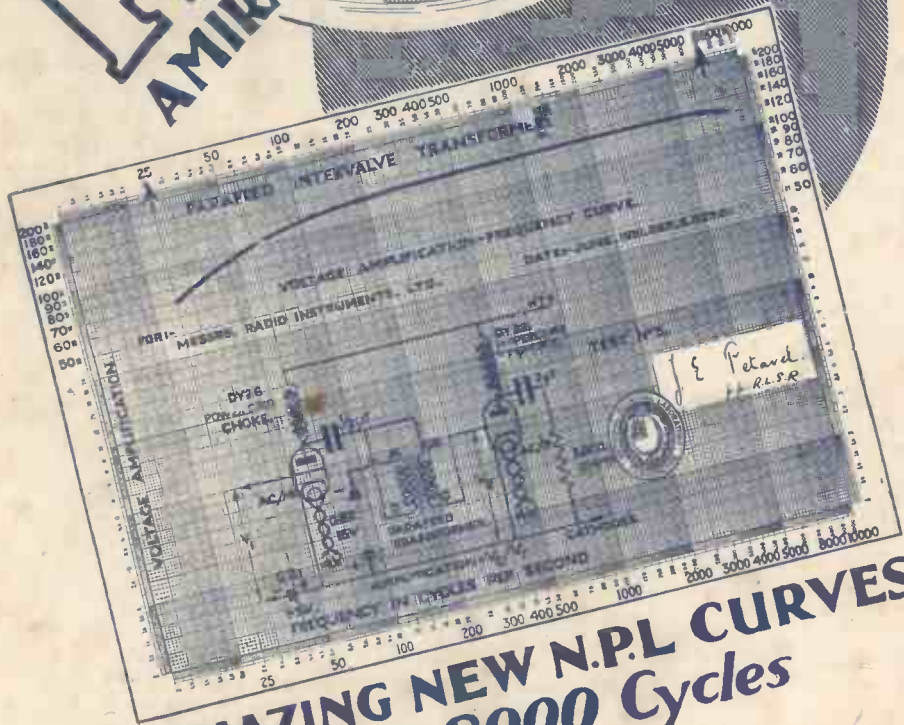


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