

The Wireless Constructor

Vol. XVII.

NOVEMBER, 1933.

No. 85.

A FINE *How-to-Make* ISSUE

A TELE-VIEWER
FOR
30%

THE
CONSTRUCTOR'S
TWO

A MAINS
UNIT FOR
CLASS B
SETS

ALSO
IN THIS NUMBER:
FROM MY ARMCHAIR
AND
QUESTIONS I AM ASKED
BY
JOHN SCOTT-TAGGART,

F.Inst.P., A.M.I.E.E.

A CLASS B
AMPLIFIER



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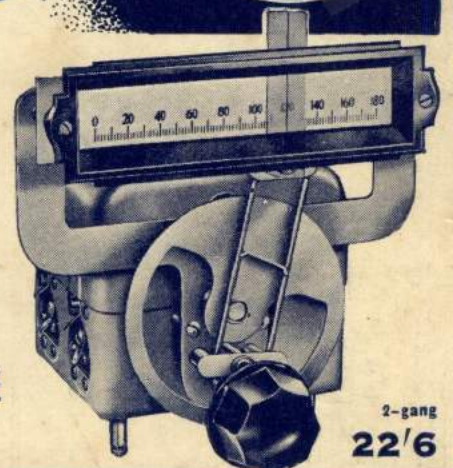
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CONTENTS

	Page		Page
The Editor's Chat	3	Constructing Metal Chassis	22
"On the Grid"	4	How to Make a Class B Amplifier	23
The Month on Short Waves	4	As We Find Them	25
The New Economy Circuits	5	A Practical Man's Corner	27
The Constructor's Two	7	A Sliding Mains Connector	39
Round the Dials	12	How to Make a Tele-viewer for 30/-	31
Points for Purchasers	12	Questions I Am Asked	33
B.B.C. News	13	In Lighter Vein	49
A Mains Unit for Class B Sets	15	Constructing Matched Coils	44
Automatic Quiescence Control	18	Our News Bulletin	48
From My Armchair	19		

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

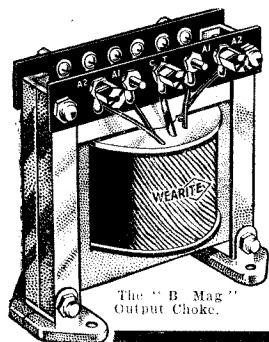
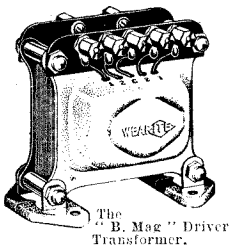
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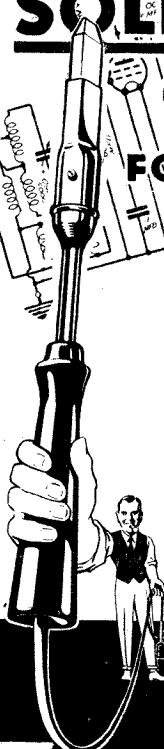
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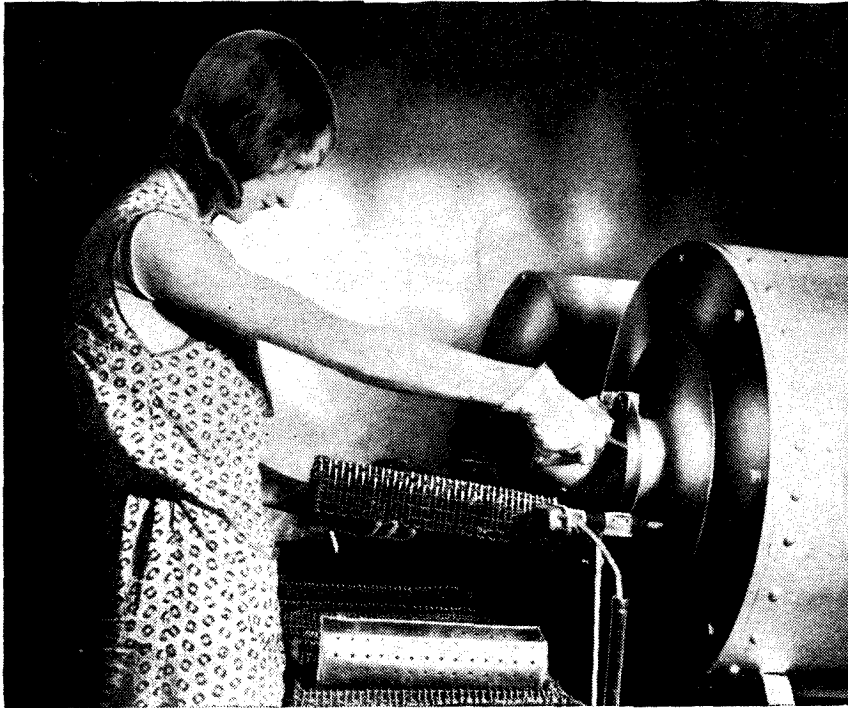
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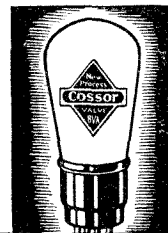
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The WIRELESS CONSTRUCTOR

The EDITOR'S CHAT

European Wavelengths—Low-Cost Vision Reception—Mains Supply for Class B.

IN his "From My Armchair" article in this issue of THE WIRELESS CONSTRUCTOR, our distinguished contributor, Mr. Scott-Taggart, asks a question which, we suppose, every reader of this journal has asked, is asking, or will ask: "Why do the European wavelength allotments not clear up the messy stations which are supposed to be insignificant in range and are, therefore, placed within less than 9 kes. of decent stations?"

Mr. Scott-Taggart quotes what is, to him, the most glaring case—the fact that the Eiffel Tower station and the Warsaw transmitter are allowed to operate within 5 kes. of each other. Well might Mr. Scott-Taggart ask: "Is it a case of stealthy increase of power, or did some fool imagine that Warsaw's waves could be kept within the frontiers of Poland?"

An Important Meeting

Now, by the time this issue of THE WIRELESS CONSTRUCTOR is on sale, the members of the Union Internationale de Radiodiffusion will have met again in Holland, and possibly they will once more have tackled the problem of controlling the chaotic state of affairs in the ether to-day.

And they will have to decide whether their new wavelength plan, which is supposed to come into force in the New Year, will be really effective.

Many critics in this country maintain that it but touches the fringe of the problem, and that so long as various unimportant broadcasting stations are allowed to increase their power *ad lib*, and so long as the Union is not backed up to the hilt by the various Governments represented, the conditions will not get better, but very definitely worse.

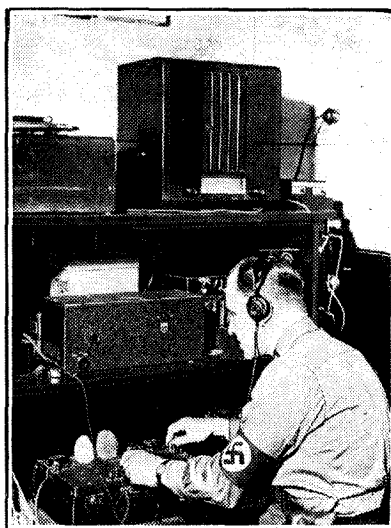
Deliberate Interference

France is about to embark on a most ambitious National Regional scheme,

which, it is reported, will cost ten million pounds. There is evidence of a growing radio power complex in Europe which bodes ill for the future. The U.I.R. will also have to deal with the growing practice of certain broadcasting stations deliberately interfering with other stations for propaganda purposes.

In spite of diplomatic protests, a certain station on the Continent still

CONTROLLING PROPAGANDA



With the creation of a Ministry for National Education and Propaganda in Berlin, propaganda talks have now become a regular feature of German broadcasting. Above is the control room at the Ministry which is used in conjunction with the talks.

continues to attempt to influence the political views of a neighbouring country by means of broadcast propaganda. The U.I.R. had a remedy—it could have boycotted this station; and other U.I.R. members could have refused to collaborate in the matter of programmes. But the U.I.R. has done nothing. It has made a protest, but the danger of certain Continental

stations being used for unfriendly propaganda purposes is growing, and may one day lead to an outburst as far-reaching and as devastating in its effects as did a certain incident in Sarajevo in 1914.

The Television Position

Things are decidedly looking up in the television world. Great improvements have been made in the Cathode Ray Tube, and there is every possibility of a new short-wave television service being started by the Baird Company from the Crystal Palace in the near future. There are also strong rumours at Broadcasting House that more satisfactory experimental transmissions will shortly be made.

Anyway, apart from the controversial question: "Has television reached a definite programme stage of development?" many more amateurs in this country are realising that to build a television viewer does not mean that one has to have a very deep pocket.

In this issue, for example, a contributor describes how he made a tele-viewer for 30s. As he points out, it is not generally known that television pictures are being picked up and enjoyed on comparatively simple apparatus, and it is with a view to exploding the theory that this experimental field is confined to the "expert" that he has described for readers of THE WIRELESS CONSTRUCTOR the building of an outfit which cannot fail to arouse the interest of all who have at one time or another had hankers after a television viewer of their own.

Mr. Pratt's viewer is definitely worth your attention, and although we cannot guarantee you results comparable with, say, the latest Cathode Ray type of television receiver, we feel confident that, for your outlay of 30s. you will get not only a great deal of amusement, but results which—

(Please turn to page 50)



Camouflaging receivers—Some poser!—Home-made iron-cored coils—A Class B note.

To make radio receivers handsome pieces of furniture and to make them harmonise with various styles of furnishing are decidedly worth-while aims. But to disguise them so that they cannot be recognised as receivers seems hardly necessary.

Let sets be elegant by all means, but let them develop along their own particular lines. After all, a radio receiver as such is deserving of a place in any home.

Pianos have always been pianos, and no efforts are made to make mechanical gramophones "look like what they ain't," so why this attempted camouflaging of wireless receivers?

The Answer's a—?

What explanation would you give if you were asked a poser like the following? If you were wise, I think

you would do the same as I did—state candidly that you could offer no solution.

The set worked perfectly on medium waves, but on long waves no worthwhile results could be obtained until the aerial lead-in was touched against a gas-pipe, then they were fine! Different aerials were tried and also another set, with the same results.

I was asked this question at the Radio Show, and I feel positive there was no leg-pull about it!

Real Home Construction

"Wireless Wayfarer" got some fun last month into his "In Lighter Vein" by describing the home construction of iron-cored coils. But he is not the only one to get entertainment from this source!

I met a real enthusiast a little while ago who had made some iron-cored

coils at home—and, what is more, had obtained efficient results with them. This was his process as I understood it.

A tin of metal cement was obtained from Woolworth's, and heated until it was quite liquid. While still hot the iron was extracted from it with a magnet.

This iron was then immersed in melted paraffin wax, the desired core being subsequently moulded from this mixture. Not so bad! I wonder if any other reader has evolved a better home-made iron-core?

Avoiding Distortion

A number of newcomers to Class B are puzzled to find that quality seems to deteriorate after they have been using the amplifier for a comparatively short time. The usual initial fall in the H.T. battery voltage is generally the cause of this.

As there is no grid bias on the majority of Class B valves, it is not possible to reduce this to keep pace with falling H.T. voltage as can be done in the case of an ordinary power valve.

The solution is to obtain batteries with a higher voltage than that required so that the voltage in use can be kept up to scratch by moving the positive wander plug to a higher rating as necessary.

A. S. C.

GENERALLY speaking, the past month on short waves has been disappointing. The first part of the period under review was particularly bad, and even my usual American "punch merchants" were in many cases so weak as to be almost unintelligible.

Conditions at the time of writing are certainly better, but even now my log compares very unfavourably with the corresponding period of last year. W 8 X K, for instance, normally a reliable stand-by, has been very erratic, and the transmission has almost invariably been marred by deep fading.

A Lot to Learn

One rather curious aspect of the recent bad spell is that atmospheric troubles have, if anything, been worse than usual, which completely upsets the usually accepted theory that when X's are bad, signals are good. It seems that we still have a lot to learn about the vagaries of short-wave reception!

In the absence of anything really outstanding in the way of short-wave reception news, an excellent oppor-

 * **THE MONTH ON** *
 * **SHORT WAVES** *
 * *The latest happenings in this* *
 * *fascinating waveband.* *

tunity presents itself for me to reply at length to a letter from S. G. (West Ealing), especially since it is a subject that will no doubt be of interest to so many others.

S. G. is apparently a little perturbed because he is at present using a short-wave receiver which he has taken the trouble to calibrate very accurately, but which he now wants to rebuild into something a little more modern. In other words, as soon as he rebuilds it all the calibrations will be upset and he will have to start over again.

All You Want

What's the matter with a short-wave absorption wave-meter, S. G.?

All you want is a four- or five-turn short-wave coil and a .0005-mfd. variable condenser with a low minimum. Mount the two on a tiny base-board and panel, and join the coil

across the two terminals of the condenser. The condenser dial, which need not necessarily be one of the slow-motion type, should have a wide open scale, and apart from that, there is nothing else in it.

Using a Wavemeter

To use it, you just bring the wave-meter coil near (within six inches or so) to the coils in the set, and, with the set just oscillating, slowly turn the wave-meter condenser until the set ceases to oscillate. The setting of the wave-meter dial at which the main set ceases to oscillate corresponds with the wavelength to which the set is adjusted. By following this procedure throughout the wave-range of your set, it will not take you long to calibrate the wave-meter.

Once that is done, to transfer the readings to the new set is quite straightforward since it is just the reverse process.

Leave the wave-meter set, and with the new receiver just oscillating, slowly turn the main tuning condenser until you strike the silent point.

G. T. K.



**MODERN DEVELOPMENTS
THAT ARE KILLING RADIO'S
GREATEST BUGBEAR**

It is curious that the problem of economy in battery set working has only of late been tackled widely and seriously. Of course, by certain concerns an immense amount of valuable work has been done; but, on the other hand, there are others who would still seem to be pursuing the policy of increasing trade for battery makers with almost heartless persistence!

Class B Amplification

The introduction of Class B has focused attention on the whole subject, and Class B amplification is the first favourite among the H.T. current-saving systems.

Low tension demands little or no attention. Modern valves are extremely economical so far as L.T. is concerned. The average is barely about point one of an ampere per valve.

That is all we want. A lower current would not result in any practical saving. As it is, a fair-sized accumulator will run a four- or five-valve set for a month quite easily. And it is advisable to charge an accumulator and give an expert the opportunity to give it a "once-over" at least every four weeks.

Hungry Receivers

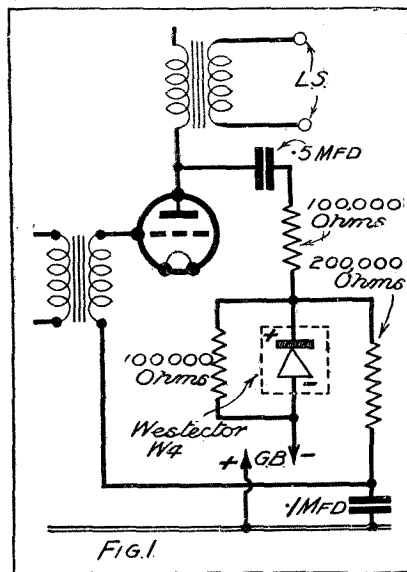
With H.T. it is a very different matter. Most of us use dry batteries because of their compactness and cleanness, but how they do get "eaten" up!

We are often led to believe that so long as we buy the treble or super-capacity type (which costs a tidy figure, by the way), H.T. renewals are quite infrequent.

In the early days of its inception, it was the L.T. battery which was responsible for the major portion of radio's running costs. Economical valve filaments were the gift of research engineers some considerable time ago, and now the sphere of their endeavours has been shifted to solving the problem of reducing battery H.T. consumption. With what notably successful results may be judged from Mr. Victor King's characteristically comprehensive survey given below.

Well, I suppose four times a year could be said to be infrequent, but when each renewal time comes along

A REAL MONEY-SAVER



By means of this ingenious circuit, employing the recently developed Westector, real radio economy is effected. It can be fitted to virtually any battery receiver, results in quality and volume remaining "as you were," but running costs being some 30 to 40 per cent less than hitherto.

it doesn't seem so long since we last had to fork out a nasty little packet, does it?

Class B is an economy system, but with it you've got to go up before you can go down, as it were.

Increased Output

Taking a "small" battery three of the S.G.-det.-L.F. type as a starting point, I think it is fair to say that in adding Class B the volume output is magnified about six times for comparatively little extra H.T. consumption.

That is a tremendous result. Of course, you couldn't expect the addition of a complete valve amplifier stage to increase the volume and reduce the H.T.; that would not be reasonable.

I firmly believe that is what many think. Also, I fancy others hold the opinion that we tack a Class B valve and all its components on to a circuit merely to save H.T.

No; whereas a "small" three-valver might provide an output of a couple of hundred milliwatts or so, and require 9 or 10 milliamperes of H.T. current, you can work up to 1,500 or so milliwatts' output with Class B and take only about a dozen milliamperes.

See the idea?

Add It to Your Set

An economising scheme pure and simple is that shown in Fig. 1. This can be added to an existing set to reduce its H.T. consumption without affecting the volume.

It neither puts it up nor down.

The valve is, of course, the output valve, for that is where most of the

The New Economy Circuits—continued

H.T. is spent. But it can be either a big or little power valve.

The essential item in the economising arrangement is a Westector. The grid-bias battery must serve no other valve, though in many sets this won't mean that an additional G.B. battery is needed, because, in any case, it is used in connection only with the output valve. (In, for instance, straightforward single L.F. stage sets using ordinary S.G., H.F. valves, and not variable μ 's.) Later: this disability has since been removed and a separate G.B. battery is no longer needed.

Really Cunning

It is a cunning scheme and works exceptionally well.

An insignificant quantity of the L.F. energy is drawn off the valve by the Westector, and this rectifies it. The rectified voltage is then applied in opposition to the grid bias.

Initially, the grid bias is set so that only about a tenth of the normal H.T. current flows.

Now you will see what happens. The greater the input to the valve, the greater will be the G.B. opposing voltage developed by the Westector.

So for the louder signals the grid bias is reduced, and the valve brought nearer to its ordinary H.T. current-consuming conditions.

The saving of H.T. during programme pauses and quiet passages in music, and so on, is very considerable, and may be as much as 4 or 5 milliamperes' average over the whole period of working the set.

Not Expensive

This is one further use of the "cold valve" which emphasises the value of the new device.

The only snag is initial cost. There are, however, as you can observe from the diagram, only a few inexpensive components needed.

The whole outfit will generally cost about fifteen shillings, although, on top of that, it will sometimes be necessary to have an extra grid-bias battery.

However, there is this to be said: Westectors are everlasting, and the economiser system can be carried from set to set. So I think you will all agree that it is a proposition deserving close consideration.

Mr. Robinson, of the Technical Staff of this journal, has recently developed a special application of this Westector economising idea.

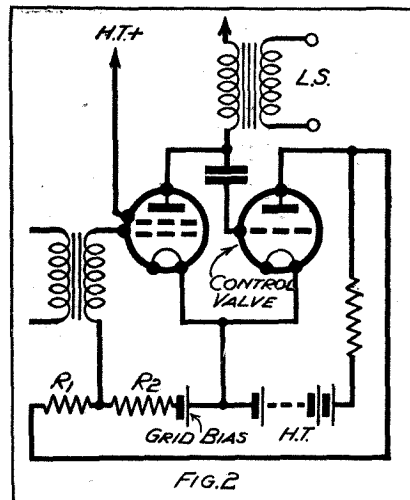
A Step Further

He applies it to the driver valve of a Class B set—a magnificent combination, as will readily be appreciated. I know he has written an article about it, and I hope that it will appear in this issue.

Anyway, even if it doesn't, it would not be fair for me to anticipate his own description of his novel and valuable circuit.

The broad principles of a bias alteration, as with volume variations,

VALVE CONTROL



Theoretically, a thermionic valve may be used as an automatic anode current compensator; but in practice the Westector is more convenient. The circuit above, however, is an interesting one for the experimenter to set up and investigate himself.

are not new. I think we must give Philips the credit for originating it.

This use of a thermionic valve and its theory can be gathered from Fig. 2.

A Similar Effect

The amount of H.T. current (it is never anything but comparatively small) which flows in the anode circuit of the control valve is governed by the voltage variations on the anode of the output valve.

When the current rises the effective grid bias on the output valve is reduced. The action is, in fact, fundamentally similar to that of the Westector circuit.

For my part, I have been trying to obtain the same effect with even simpler apparatus, and at one time I thought I had solved the problem.

But success has eluded me, and I have now nearly arrived at the conclusion that the Westector provides as simple a method as we are ever likely to obtain.

And now to turn to an entirely different matter. Hordes of correspondents have hurled criticism at my recent remarks about "stereoscopic" listening.

The "Binaural" System

But I am quite unrepentant. Despite all their arguments—and some are admittedly quite good ones—I remain unconvinced that there can be any such thing as stereoscopy in sound.

It is levelled against me that the great Bell laboratories of America have obtained wonderful results with what they are pleased to call the "Binaural" system.

But wait a minute. They used two microphones, two transmitters, two receivers and two loudspeakers. Well, if they couldn't get through something pretty good with this complete duplication of the broadcasting chain, I should have been surprised.

Yet they can only claim that observers considered two not-so-good loudspeakers on the end of this complication sounded better than one good loudspeaker!

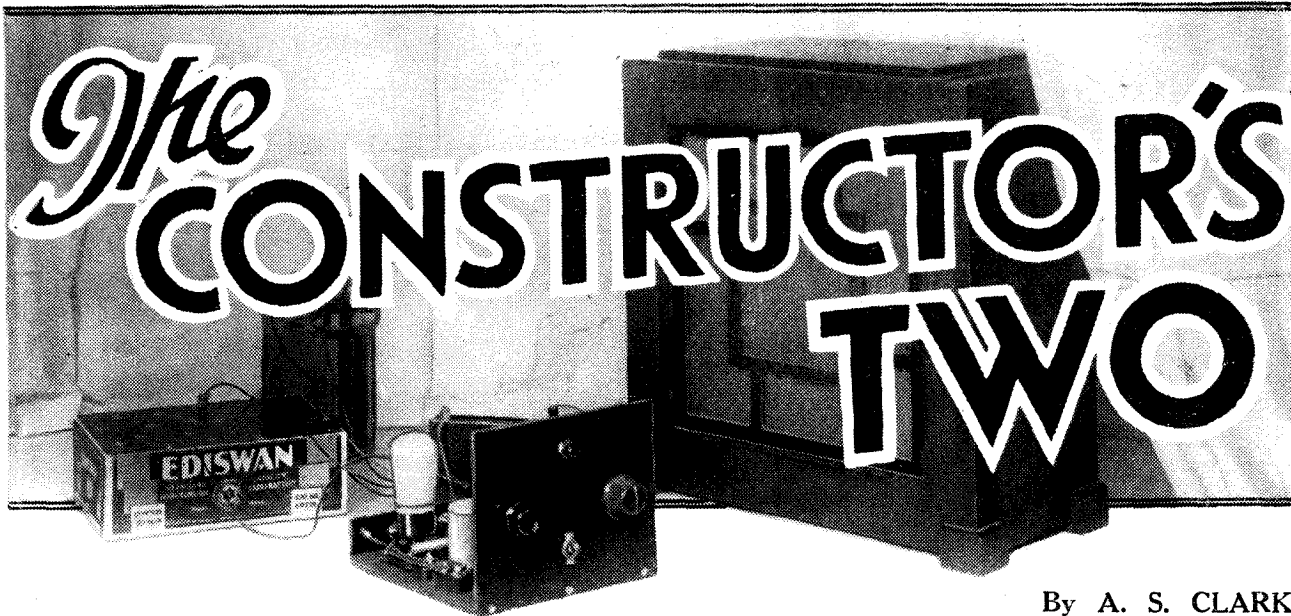
Seems a pretty thin case, to me. However, it is actually a complete red herring, and does not in any way affect the argument.

Matched Pairs

I said that to talk of "stereoscopy" when the output of an ordinary set was divided between two loudspeakers was not, to me, convincing.

And I firmly stand by that original statement. Nevertheless, I must remind you that I support the other claims made for *matched* pairs of speakers. Indeed, it is a scheme which particularly appeals to me, and I use it in my own household outfit, and have done so for ages.

But as I observed in my previous article, the success of the scheme entirely depends upon the two loudspeakers being properly balanced so as to compensate for each other's failings.



By A. S. CLARK.

CHEAP sets are "two a penny" these days. That is to say, there are any number of inexpensive designs available. But what about their efficiency?

That, unfortunately, is entirely a different matter. The design of a receiver which is both low in cost and capable of a really satisfactory performance is by no means easy. Great discrimination is needed in deciding on what to economise, what can be left out, and what items should be of the very best.

Selectivity and Strength

This preamble is intended to give the reader some idea why an iron-cored coil was chosen for "The Constructor's Two" which had inexpensiveness as one of its reasons for being called into existence. An iron-cored coil costs definitely more than an air-cored one, but efficiency was another of the foundation stones of The Constructor's Two.

With two valves, the minimum number for a generally useful receiver, one must be the detector and one an L.F. amplifier. H.F. is thus out of the question, and we immediately come up against the see-saw of selectivity and strength.

No matter what circuit arrangement we use, an increase of one means a decrease of the other. So we have to strike a compromise between the two highly desirable qualities.

Take the case of an ordinary air-cored coil. Selectivity is no use to us without a certain strength, so first of all we decide what volume we must have and then get as much selectivity as possible.

INEXPENSIVE EFFICIENCY

is the keynote throughout the design of the simple two-valve presented in the following pages. Capable of providing excellent loudspeaker strength, it has sufficient selectivity to fill a useful niche in spite of the present crowded condition of the European ether. It is pleasingly compact in design, and the construction is very fully and clearly described.

Now suppose we could increase the efficiency of that coil. What would the position be then?

There are three ways in which the extra efficiency can be used. We can still keep to our minimum volume level but have greater selectivity. Or,

we can keep the same selectivity and so make a greater input available. Or, again, we can have an increase in both volume and selectivity.

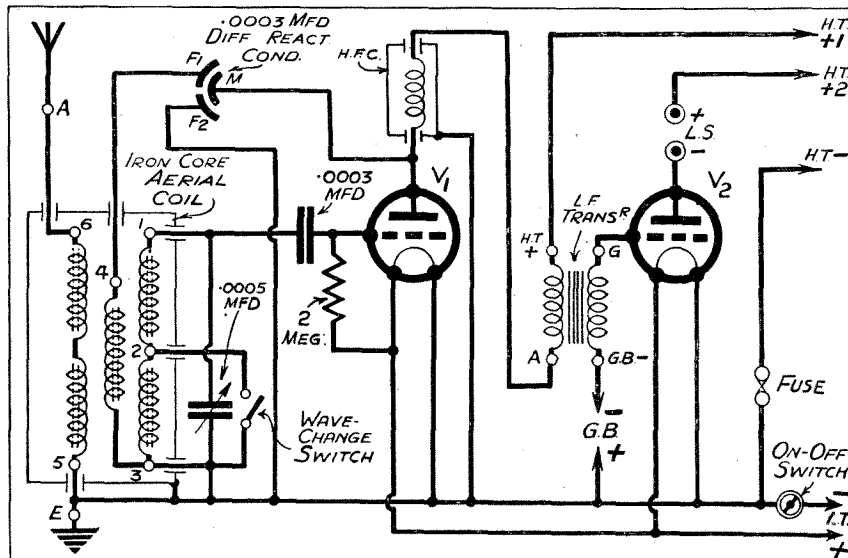
More for Your Money

Which ever we do, we shall get more out of our two valves. And if the extra efficiency does not increase the cost of our set too much, we shall raise the efficiency to cost ratio by a considerable amount, and that is the real test of an inexpensive receiver.

While on the subject, a brief explanation of why the new iron-cored coils are more efficient than those with air cores will not be out of place.

The magnetic density of iron being greater than that of air, it is possible

EMPLOYS A MODERN IRON-CORED COIL



The presence of one of the modern high-efficiency iron-cored inductances well proves that results have not been sacrificed in the cause of inexpensiveness. Saving in cost has only been effected where possible without detriment to the results obtainable.

The Constructor's Two—continued

to obtain a certain inductance with less wire when an iron core is used. Losses in the wire are thus reduced.

But with ordinary iron cores, such as those used in L.F. components, any increase of efficiency due to lower losses in the wire would be swamped by eddy current and hysteresis losses in the iron itself. These losses do not matter in the L.F. components because the frequencies are comparatively low—but the losses increase rapidly with increasing frequency.

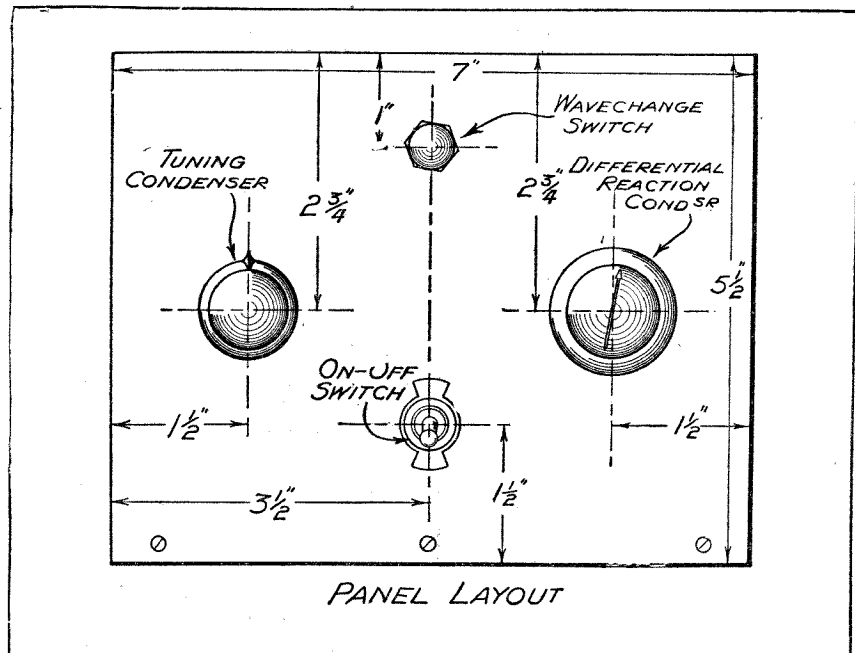
Lower Losses

By using "iron-powder" cores, one of the features of which is the insulation of the iron particles from one another, the losses due to the two causes mentioned become almost negligible, and the fullest advantage of the lowered losses in the wire may be taken.

I have dwelt at rather long length on the reason for the choice of iron-cored coils for The Constructor's Two to show the care spent on deciding where to cut costs and where not to. You must take my word for it that similar care has been lavished on the remainder of the design, for there is not space available wherein to discuss the whys and wherefores of all the components.

Looked at as a whole, the circuit is particularly simple. First of all

ONE-HOLE FIXING FOR ALL PANEL COMPONENTS



Only seven holes are needed in the panel, one each for four controls, and three for fixing to the baseboard. No difficult shaped holes for escutcheons or other items are required.

there is the aerial input circuit, directly connected to aerial and earth, and coupled to the tuned circuit. The latter has a .0005 solid dielectric condenser for tuning, this component providing a certain saving in cost.

The tuned circuit is arranged so that a section of the inductance may be shorted for medium-wave tuning, and it feeds the detector valve which works on the principle of grid-condenser-and-leak rectification.

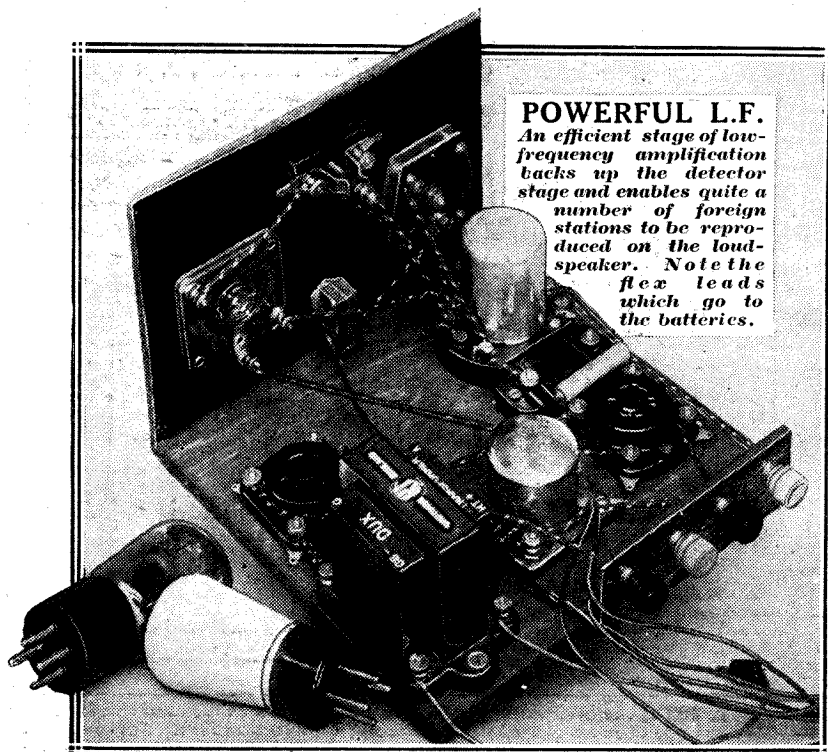
In the anode circuit of the detector is a screened H.F. choke which diverts the H.F. component of the rectified pulses to the differential condenser. This reaction control then passes them back to the filament either direct or via the reaction winding, according to its setting.

Transformer Coupling

The detector valve is coupled to the output valve by straightforward transformer coupling. Due to the simple nature of the receiver no decoupling is necessary in the detector's high-tension supply, which is provided by a separate tap from that of the output valve.

No filter is incorporated in the anode circuit of the power valve, the loudspeaker terminals being the sole items between the plate of the second valve holder and the H.T. +2 flex lead. (Flex leads connecting direct to the batteries, instead of terminals, provide a further saving in cost.)

So much for the theoretical aspects of The Constructor's Two, now we will turn to practical considerations.



The Constructor's Two—continued

The construction is just about as simple as it possibly could be.

No one can justifiably say that this claim is in any way unduly optimistic. Nor can anyone deny that the construction is such that the most inexperienced in radio construction can be sure of making a success of it.

For instance, the controls on the panel being symmetrically arranged, there is no need for reversing the dimensions from left to right when

THE VALVES WE ADVISE

Make	Detector	Power Output
Cossor	210H.F.	220P.A.
Mullard	P.M.1H.L.	P.M.2A.
Osram	H.L.2	L.P.2
Mazda	H.L.210	P.220
Marconi	H.L.2	L.P.2
Eta	B.Y.1814	B.X.604
Hivac	H.210	P.220

marking out the positions of the holes to be drilled. Also, no difficult-shaped escutcheon holes are needed, four simple single-hole-fixing components being employed.

The fixing of the baseboard components is even easier. Those on the panel are held in place by the single nuts on their fixing bushes.

See that you get the reaction condenser mounted with the moving- vanes terminal at the bottom, or else the reaction will work backwards. You will obtain an increase when the knob is turned in an anti-clockwise direction.

Mind the Points

Twelve ordinary wood-screws of the round-headed pattern serve to fix the remaining components to the baseboard. When these screws are all driven home, have a look under the baseboard to see whether any have got their points just showing. If they have, a little filing is indicated, or you may find yourself scratching the table surface at some time or the other.

One or two further wood-screws serve to hold the terminal strip in place. The grid leak requires no holding down screws, being of the type with wire ends going direct to the grid and filament positive terminals of the detector valve holder.

If a grid leak of the kind with terminals at the ends instead of lengths of wire is used, it can still be supported with the actual connecting leads.

Note how one of the fixing screws of the screened H.F. choke is chosen

as a convenient junction point for H.T.— and G.B.—. Incidentally, it is this screw which provides the earthing for the case of the choke.

A wander fuse is used at the end of the H.T.— flex, and spade tags at the end of the two L.T. leads. The remaining battery leads for G.B. and H.T. positives have ordinary wander plugs.

Clearly Marked

To aid you in wiring, the interlacing of the leads is clearly indicated in the wiring diagram. Where a lead passes underneath another one, it is shaded on either side of the wire above it.

Avoid getting the fixed and moving vanes of the tuning condenser confused, and do not omit the connection to the fixing screw nearer the panel of the iron-core aerial coil. This screw, like the one already mentioned on the H.F. choke, serves to earth the screening can of the coil.

Pull-back insulated wire was used throughout on the original receiver except for the battery leads, which are of ordinary single flex.

That covers the constructional work pretty fully. There remains to be written just a few words about the operation and accessories, and this description will be complete.

RECOMMENDED ACCESSORIES

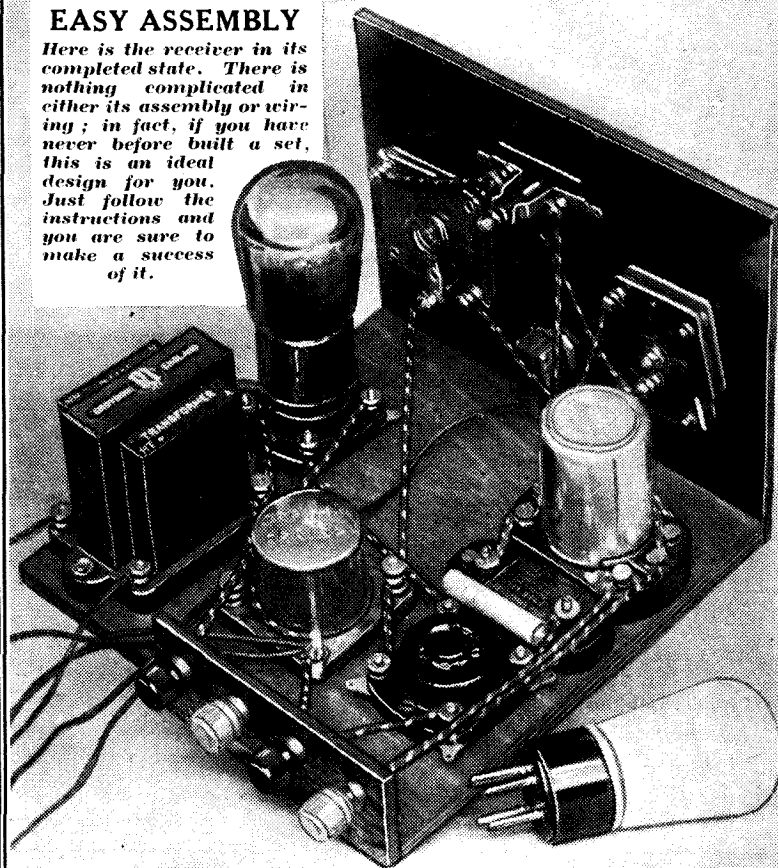
BATTERIES.—H.T. 120 volts. Ediswan, G.E.C., Marconiphone, Drydex, Ever Ready, Lissen, Siemens, Pertrix, etc.
G.B. 4½ volts. Lissen, Siemens, Ever Ready, Drydex, Ediswan, Marconiphone, Pertrix, etc.
L.T. 2 volts. Ediswan, Oldham, Block, Pertrix, Exide, Lissen, etc.
LOUDSPEAKER.—R. & A., Blue Spot, Atlas, Rola, Epoch, G. E. C., Ormond, Celestion, Marconiphone, Magnavox, Ferranti, Amphion, etc.
AERIAL AND EARTH EQUIPMENT.—Goltone "Akrite"; Electron "Superial"; Radiophone "Receptru" down-lead; Bulgin lightning switch; Graham Farish "Filt" earthing device.

The detector valve is, of course, one of the H.L. or similar types. The output valve I recommend is a small power type which will permit the set to be run quite economically off a standard capacity dry H.T. battery.

Naturally the voltage of the G.B. needed will depend upon the particular output valve used and the

EASY ASSEMBLY

Here is the receiver in its completed state. There is nothing complicated in either its assembly or wiring; in fact, if you have never before built a set, this is an ideal design for you. Just follow the instructions and you are sure to make a success of it.



The Constructor's Two—continued

H.T. voltage. With regard to the latter, use at least 120 if you can, certainly not less than 100.

Tuning you will find beautifully easy. When the wavechange switch is pulled out you will be working on medium waves, and when pushed in, on long.

The use of reaction will help you to pull in foreign stations at good strength. The actual number will depend upon how good your aerial is and how near you are to your local B.B.C. station. You should have no difficulty in receiving well at least a dozen stations in all.

Ample Selectivity

While the receiver cannot be expected to work in the swamp area of a local transmitter, it nevertheless has a sufficiently high degree of selectivity to enable it to be used within quite reasonable distances of powerful broadcasters.

Of course, local conditions will have a large bearing on the matter as on the number of stations received, but, as already mentioned, the efficiency to cost ratio is high, enabling the receiver to put up a remarkably good performance.

Using a Pick-Up

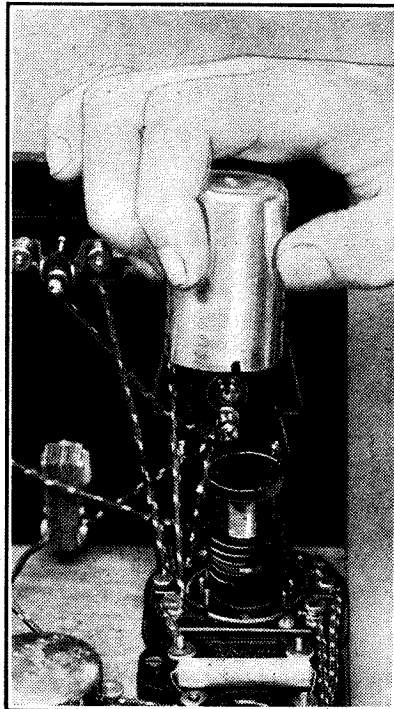
And now, in the nature of an appendix, here are details for using a pick-up with The Constructor's Two. Even with an inexpensive receiver of this type, there are many who will wish to use it for record reproduction, because a pick-up and turntable-motor are cheaper than a worth-while gramophone even these days.

Two valves are ample to provide the necessary amplification with practically any pick-up on the market. Apart from the pick-up and turntable-motor, a potentiometer volume-control

and single-pole change-over switch will be needed.

The resistance of the potentiometer really depends on the pick-up, and you should find out whether the makers

REVEALING THE COIL



One of the most important components is the coil, shown in this photograph with its screen removed. It is of the iron-cored type, and full advantage has been taken of its efficiency, both as regards selectivity and strength of reception.

recommend any particular value. But, in any case, you will not go far wrong in using a 50,000-ohm component.

The switch has to be connected in the grid circuit of the first valve, the detector, but it is important that the grid wiring should not be unnecessarily lengthened. For this reason, it

will be advisable to fix the switch on the left-hand side of the cabinet.

It may be arranged just above the grid condenser, but be careful not to place it so that the detector valve will hit it when inserted in the holder. Connect the switch with flex and then you will be able to disconnect it quickly for removing the receiver from its cabinet.

Wiring Alterations

So that the pick-up may be fitted at some time subsequent to the assembly of the receiver, the alterations to be made to the wiring, as shown in the complete wiring diagram, are given.

First of all, disconnect the lead running from the grid terminal of V_1 to the .0003-mfd. grid condenser. The grid leak may be left in place, as it will not affect pick-up results and also prevents annoying clicks when changing over from radio to record.

The following are the three new connections to make. Connect the "centre" or common terminal of the switch to the grid terminal of the detector valve holder, and one of the outer switch contacts to the now free terminal on the grid condenser.

The Volume Control

The remaining switch contact provides one of the record-input terminals, the other going to $-1\frac{1}{2}$ volts on the G.B. battery. If these two leads are more than a foot or two long it would be as well to use armoured cable for them with the casing earthed.

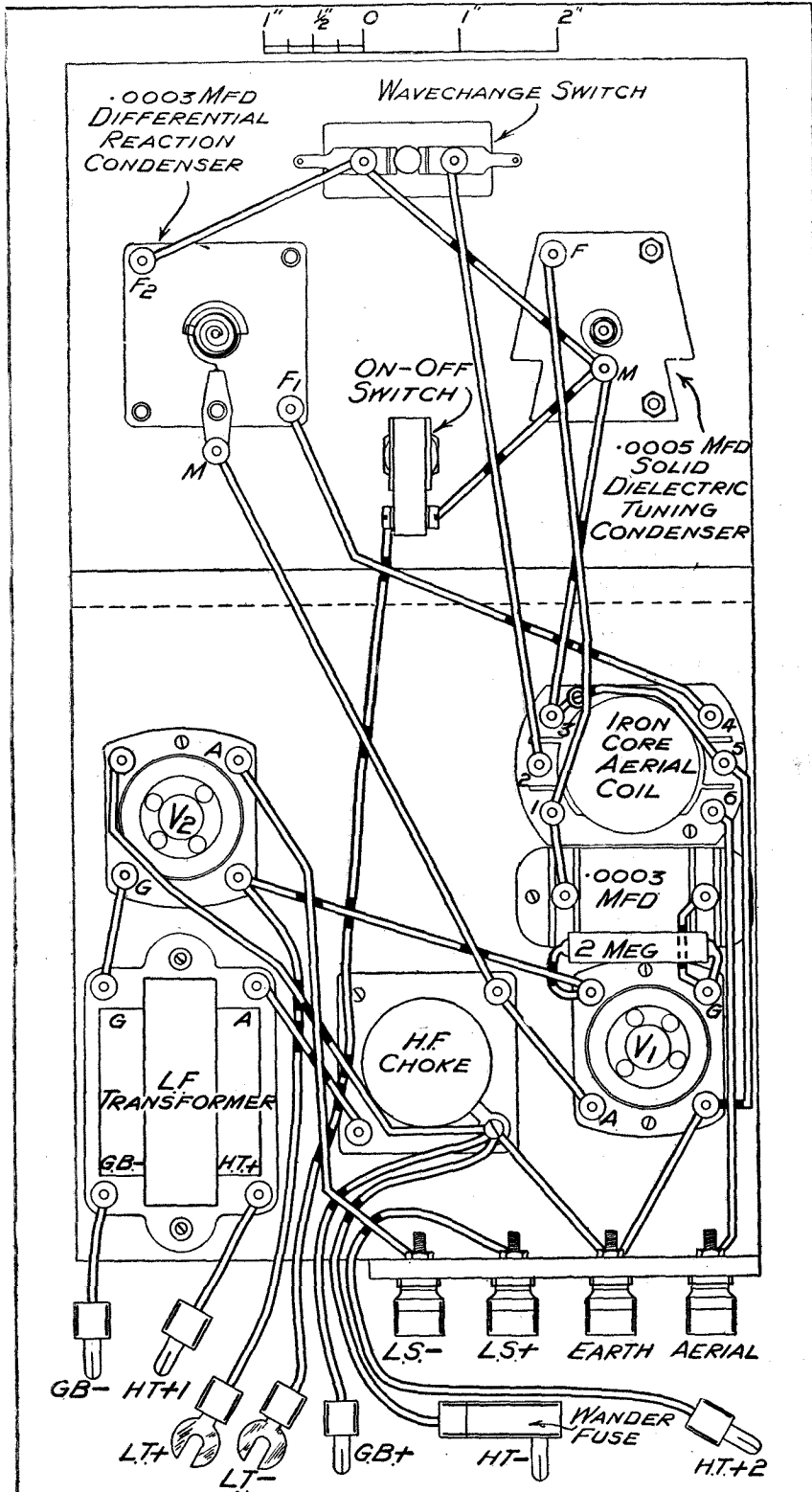
One of these leads, it does not matter which, is joined to the slider of the potentiometer. The other one goes to one of the remaining terminals of the potentiometer and to one pick-up lead. The other pick-up lead is taken to the remaining potentiometer terminal.

THE COMPONENTS EMPLOYED AND THE MAKES RECOMMENDED

Component	Make used by Designer	Alternative makes of suitable specification recommended by Designer	Component	Make used by Designer	Alternative makes of suitable specification recommended by Designer
1 iron-cored coil	Telsen W.349	—	1 Q.M.B. on-off switch	Bulgin S.80.SB.	Radiophone, Igranic
1 .0005-mfd. solid dielectric tuning condenser and knob	British Radiogram	Lissen, Telsen, Polar, Graham Farish	2 four-pin valve holders	Benjamin	Lissen, W.B., Telsen
1 .0003-mfd. solid dielectric differential reaction condenser	Graham Farish	Telsen, Bulgin, J.B.	4 terminals	"Vibroder"	—
1 .0003-mfd. fixed condenser	Dubilier type 610	T.C.C., Telsen, Lissen	1 terminal strip 4 in. × 1½ in.	Belling-Lee type R	—
1 H.F. choke	Graham Farish	Bulgin, Telsen, Wearite	4 wander plugs	Peto-Scott	—
1 L.F. transformer	H.M.S.	Varley, Lissen, Igranic, Dubilier	1 wander fuse	Clix	Igranic, Eelex
1 2-megohm grid leak with wire ends	R.I. "Dux"	—	2 accumulator spades	Belling-Lee	—
1 two-point wavechange switch	Lissen	—	1 wooden panel 7 in. × 4½ in. × 4 m/m	Eelex	Belling-Lee
	Igranic 2296/64	Bulgin, Lissen, British Radiogram, Telsen	1 baseboard 7 in. × 7 in.	Peto-Scott	—
			1 coil Pull-back wire	Radiophone	—
			Flex, screws, etc.	Peto-Scott	—

The Constructor's Two—continued

LESS THAN ONE DOZEN COMPONENTS



The connections for the small number of components are all made perfectly clear in this diagram. Note how the "above" and "below" wires are shown by shading on the wires which pass below others.

When the radiogram switch is in the position in which its centre contact is joined up to grid condenser, the receiver is set for radio reception. In the other position of the switch record reproduction is "the order of the day" and volume is controlled by the potentiometer, which is best mounted on the motor board.

On radio you will find that a sufficient range of volume controlling is obtained from the reaction condenser. The amount to which this control will have to be used to pull in the stations will depend on the efficiency of your aerial. Erect an outdoor aerial if you possibly can, but remember that largeness is not necessarily a criterion of efficiency.

A BOOK FOR THE CONSTRUCTOR
 Details of a practical publication which contains how-to-make information on sets, amplifiers, adapters, etc., and which also deals with many general aspects of radio.

A SHILLING spent on the eleventh edition of the Chronicle Wireless Annual is a shilling well spent.

No fewer than eleven complete receivers and radiograms are fully described with photographs and wiring diagrams. And they range from one-to six-stage designs.

There are also instructions for assembling various amplifier and adaptor units; and the making of a special remote control and trickle charger is dealt with from the aspect of those who like to build things from the very beginning.

Television as Well

But the value of this publication does not end with the constructional items, for there are numerous articles on general subjects connected with radio and television. These make the "Chronicle" of interest to listeners, as distinct from constructors, as well.

The contributors include many well-known radio men who are highly qualified and experts in their particular branches of radio. Thus, from cover to cover, the information is really up to date, including details of the latest developments that have taken place in the radio world.

A. S. C.



As was only to be expected, the coming of the darker days has resulted in an all-round improvement in long-distance reception. Programmes are now to be found at unfamiliar dial-readings, and every time one explores the ether new stations appear or old friends drop in again after long absence.

Before these interesting visitors to our aerials claim all our attention, let us pay tribute to the reception conditions of the past few months.

Back in the spring it was said that owing to the high power, now employed by a large proportion of Europe's broadcasting stations, British sets would find plenty of alternative programmes throughout the summer. It proved to be true, and, moreover, we have had them consistently in broad daylight.

Still more remarkable has been the fact that right throughout the year it has sometimes been possible to tune-in

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

American (and even South American) programmes, on quite ordinary sets, on medium waves.

Scores of readers who tried this in the small hours must have been amazed at the strength and ease of reception of these transatlantics, on favourable nights.

Surely the summer of 1933 has killed the idea that long-distance reception on simple sets is a pastime for autumn and winter only?

The good European programmes that are now to be found in profusion are only a foretaste of the rich fare to be provided, for many new stations are testing, or will shortly take the air.

On long waves we have Radio Kootwyk, Holland, which is taking

over the duties of the old Huizen transmitter, on 1,875 metres. The strength and quality of this station, right at the top of the dial, are superb.

Another first-class long-waver to tune for is the new Kalundborg. Radio Paris and Luxembourg are so outstandingly good that one could hardly expect to find them rivalled, but apparently Kalundborg is aiming to achieve an equal popularity, for his strength has been enormous, and the quality all that could be desired.

Tune for him on about 1,153 metres, just below Luxembourg.

On medium waves half Europe seems to be "on tap," as soon as one switches the set on. Near the top of the dial the new Vienna and Budapest stations vie with Munich and Brussels No. 1 for a hearing, and a little lower Prague, Langenberg, Lyons, and Beromünster are all to be heard at excellent strength.

Lower down there are so many good alternatives that it seems invidious to name but a few of them, yet a special pat on the back must be bestowed on Poste Parisien (328.2 metres), and on his neighbour Breslau (325 metres).

On the lower dial-readings, also, there is an amazing variety to choose from, Heilsberg (276.5 metres), Trieste (247.7 metres), and Nürnberg (239 metres) being at present the star turns in this section of the waveband.

A highly commendable trend in radio catalogues is to provide a good deal of general-interest information as well as details of the firm's products. Instead of merely listing the items available, details of their use, both from theoretical and practical aspects, are included.

A good illustration is provided by the "Multitone Guide to Class B." It is a most valuable booklet to any constructor interested in this economical form of output.

The vexed question of what ratio driver transformer to use with the various valves available is cleared up in a concise table, and the whole subject is given wide treatment.

Copies may, of course, be obtained on application to the Multitone Electric Co., Ltd., at 95-98, White Lion Street, Islington, London, N.1.

Another Example

Yet another instance of this pleasing elaboration of sales literature is provided by a work which is fittingly

POINTS FOR PURCHASERS
Interesting details from manufacturers about recent trade activities.

dedicated to "every radio constructor, professional or amateur." It is entitled "The Book of Igranic," so there is no need to tell you about the quality of the wares it concerns.

But its quality as a compilation is such that it must be seen to be fully appreciated. As in the other instance, copies may be obtained on application to the firm concerned.

Inexpensive M.C. Speakers

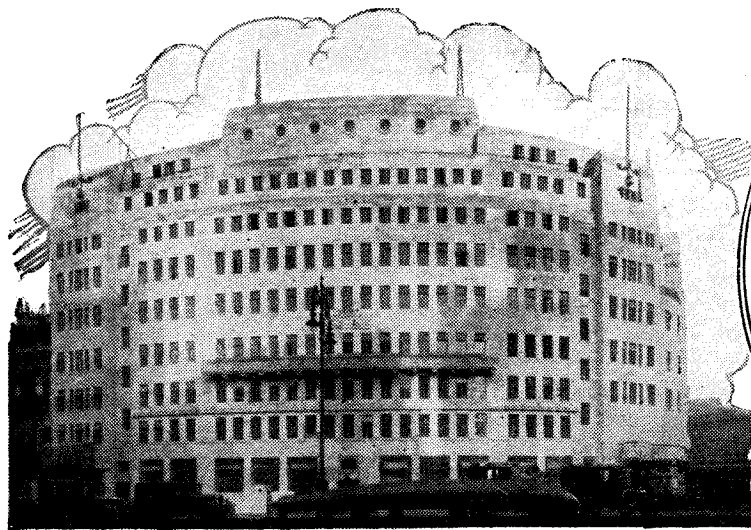
Tumbling prices are as sure an indication as any that radio manufacturers are forging ahead in both design and production methods. A short while ago anyone seeing a moving-coil speaker advertised for 15s. would immediately have assumed there was a misprint in the price.

But to-day, for this small outlay, a sensitive instrument giving first-class quality may be obtained from Messrs. Peto-Scott, Ltd. An input transformer is included, and permanent magnet and mains models are available all at the same very moderate price.

A New Scheme

Elsewhere in this number there are details concerning a new scheme for obtaining quiescent H.T. current with ordinary power or pentode valves. The "magic" item in the system is a Westector, one form of the versatile Westinghouse metal rectifier.

Those whose fancies are tickled by the arrangement and who would like to have full details of suitable Westectors, and also other metal rectifiers, would do well to get a copy of the "All-Metal Way 1934" from The Westinghouse Brake and Saxby Signal Co., Ltd., 82, York Road, King's Cross, London, N.1. It can be had for the asking.



B.B.C. NEWS

Re-establishing the Programme Committee—Improving the News Bulletins—The Return of Henry Hall—Mr. Dinuciddie Visits Balmoral.

By Our
Special Correspondent

Programme Board Restored

AFTER an interval of several years, the B.B.C. has re-established its Programme Committee, consisting of the heads of the various Programme Departments now under the Chairmanship of Colonel Dawnay. It has always seemed to me strange that the B.B.C. should get on without a Programme Committee, providing an opportunity for a weekly exchange and correlation of views and plans. This restoration will, I believe, lead to more satisfactory programmes before long.

Mr. Churchill Wins

The vague announcement that the B.B.C. will include Mr. Churchill in a fresh series on India when the joint committee had completed its work means more than appeared on the surface. It means virtually a victory for Mr. Churchill in his long drawn-out campaign to develop his arguments and policy at the microphone.

Already, however, a number of other political leaders, who regard themselves as of the same independent variety, are trying to use the concessions of Mr. Churchill as a working precedent. Altogether the B.B.C. will be in for a lively time on this political broadcasting. They would be well advised to remember that they can easily overdo the proportion of politics in the programmes.

Christian Science

Although no announcement has been made, I understand that the B.B.C. propose to admit Sunday Talks on Christian Science in the New Year. This again is the outcome of a long battle for free speech. It is believed that Christian Science will not be dealt with as a specific religion, and therefore its religious services will not

be broadcast. On the other hand, its specific message and its claims will be elaborated and discussed in some detail.

Dramatising News

The B.B.C. plan for dramatising the News Bulletins continues to be worked out. Mr. Lionel Fielden, formerly of the Talks Department and now Director of News, has as his objective a new technique which he believes will make the Broadcast News Bulletins not only of much more general interest, but also much more attractive in the entertainment sense. I confess to some doubt as to the wisdom of dramatising news.

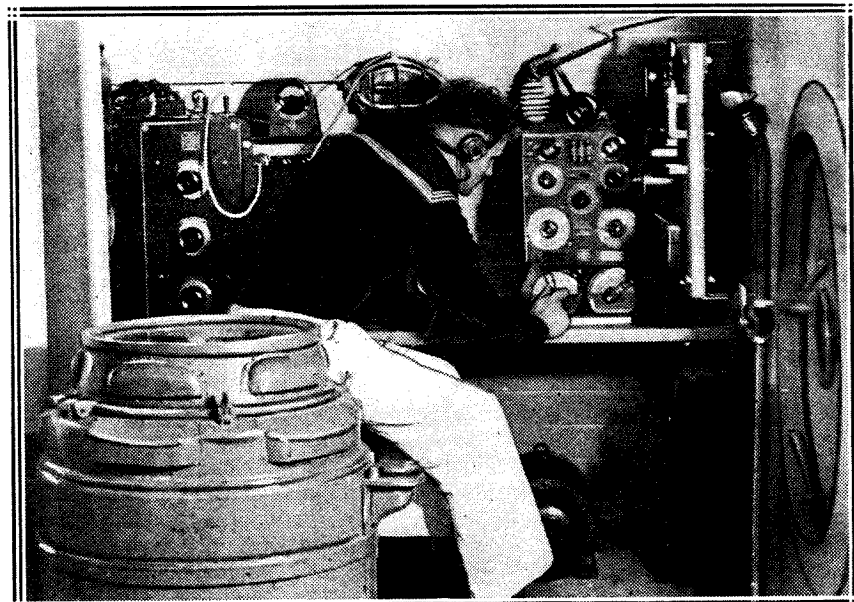
The Armistice Day Programme

There has been a movement in the

B.B.C. for some time past to discontinue the special observance of Armistice Day, on the ground that people are either insufficiently interested in or would rather not be reminded of 1914-1918. The decision for the moment, however, is to carry on as before. So this year Armistice Day will be set aside for special programmes.

There will be the relay from the Cenotaph in the morning, followed by the special service. Serious music will occupy the afternoon, and in the first part of the main evening period there will be a relay of the British Legion Remembrance Festival at the Albert Hall. Present plans are to conclude the day with a dramatic but factual representation of the chief events in the past fifteen years.

SEEN AT THE GERMAN RADIO SHOW



A full-size replica of a submarine conning tower, complete with radio gear, was among the exhibits in the historical section of the German Radio Exhibition in Berlin.

Broadcasting Gossip of the Month

Vernon Bartlett's Future

Mr. Vernon Bartlett, now so much a part of the B.B.C. Programmes, will continue his present scale of contributions during the coming season. I understand that his contract has two years to run, unless terminated meanwhile by mutual agreement. I have been sorry to hear of some friction between Mr. Bartlett and the B.B.C. over comparatively minor matters. This friction should not be allowed to interfere with the very active work which Mr. Bartlett is doing at the microphone.

Mrs. Hamilton's Adventures

Mrs. Agnes Hamilton, the Woman Governor of the B.B.C., has been spending an exciting summer motoring

Company, to whom Henry was introduced, handed over the building to him. Of course, Henry visited the Cotton Club and received a surprising ovation from the votaries of Harlem. We have already had the first fruits of Mr. Hall's expedition, and very succulent they were too. I prophesy that the dance music programmes will benefit for months to come. It was high time for a B.B.C. Conductor to go and see how things are done elsewhere. What about Captain O'Donnell—I feel somehow that a world tour of inspection would be right up his street just now.

Motspur Park Problems

The elaborate and up-to-date B.B.C. sports grounds at Motspur Park are

a large empty room in Number 16 Portland Place which could be easily transformed into a staff gymnasium or exercise room. This is a point which should claim the attention of the Board of Governors, who are certainly expected by the staff to look after their comforts and well being.

Mr. Dinwiddie and the King

His Majesty's invitation to the Rev. Melville Dinwiddie, the newly appointed B.B.C. Director for Scotland, to visit him at Balmoral was significant not only of the King's special interest in Scotland, but of his abiding interest in broadcasting generally. It is understood that His Majesty keeps *au fait* with all the important aspects of broadcasting development, and that on occasions like Mr. Dinwiddie's visit usually astonishes his auditors by the keenness of his questioning. There could not have been a happier augury for Mr. Dinwiddie's accession to office.

B.B.C. Staff Pay

There is much discussion these days at Broadcasting House on the vexed subject of staff pay. While conditions of employment on the whole leave little to be desired and compare favourably with conditions in business offices, there is a feeling that salaries in the middle grade should be equalised and anomalies ironed out. The B.B.C. has tried to keep staff salaries secret, and has succeeded so far as Parliament and the public are concerned. This is probably justifiable, because no good purpose could be served by general ventilation of these figures.

So far as the building itself is concerned, however, human nature being what it is, secrecy is not only impossible but fatuous. And when there are glaring inequalities for roughly the same services discontent is inevitable. If the new organisation can do something to clear up this grievance it will be a very good thing for broadcasting.

Inspiration to Dramatists?

The Radio Play Festival will be running its twelve-weeks' course when this issue is in your hands.

There has been much controversy as to the suitability, or otherwise, of the B.B.C.'s selection of plays, and the Corporation has announced that the series is not so much a celebration as a survey of past achievement.

If budding radio dramatists are thus inspired to greater efforts, much good will have been done.

RADIO CONTROL FOR RACING CARS



An interesting experiment was recently carried out at Brooklands track. Three cars were fitted with radio receivers so that instructions could be sent to them from the control pit. The transmitter employed was designed to work on a short wave-length.

in the Balkans. What a pity it is that the B.B.C. is so reluctant to let its own people tell their adventures at the microphone. I am sure that Mrs. Hamilton's story would be most interesting, but we shall not hear it from Broadcasting House.

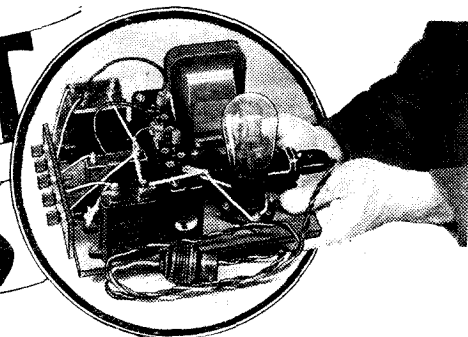
Henry Hall Back

I hear that Henry Hall was lionised in New York. Vice-President Frank E. Mason, of the National Broadcasting

not used nearly enough. In the long summer evenings and at week-ends a certain number of the staff manage to get away in time to disport themselves, but for the most part the facilities are not used as intended. The B.B.C. should adjust the hours of its staff in order to put this matter right; alternatively, a gymnasium should be provided near Broadcasting House.

The building there, of course, is already overcrowded, but I have seen

A MAINS UNIT for CLASS B SETS



THERE are many battery set owners who, deriving their H.T. from the electric light supply, have decided that they have reached finality in the way of receiver design until such time as they can afford to build an all-mains instrument.

This feeling of finality is even more pronounced where the mains are D.C., for it has long been felt that unless one has A.C. it is more or less a waste of time to change from battery to all-mains, and so the battery set remains intact.

It Can Be Done

We are not going to discourse on the merits and demerits of D.C. and A.C. sets, whether the former are worth while, and so forth, but we are going to try to point out the fallacy of the "can't-get-any-farther" attitude as taken up by battery-cum-mains-H.T. set owners.

Many of them are going on with their three- and four-valvers with ordinary output valves, or small pentodes, and the utmost power they are getting from their sets before overloading occurs is some 300-500 milliwatts. On occasion a large pentode may be employed providing an output of perhaps 1,000 milliwatts.

If you ask why the power output is so small, although mains H.T. is used, the reply is usually to the effect that without going "all-mains," no more power can be obtained. That is quite wrong.

Increased Output

During the last few months much movement has been made in the valve world, and following on Q.P.P., the positive-grid drive method of push-push was introduced—Class B.

Primarily intended for battery H.T. users, this form of amplification allows an output peak power of up to 2,500 milliwatts with certain economies of anode current that do not concern us here; for the very simple reason that instead of battery H.T. we are to discuss the use of mains H.T. with Class B.

What does concern us is the high

The problem of providing a well regulated H.T. supply for Class B receivers from the mains has always been very acute. Our distinguished contributor, Mr. Victor King, has now produced a design which steps into the breach, and which will enable readers with D.C. supplies to reap the benefit of mains H.T. for this type of set.

power obtainable with little trouble, and with economy. Any three- or four-valve (one or two L.F. stages) battery set can easily be converted to Class B, either by reconstruction of the low-frequency side, or by the use

of an adaptor such as that described elsewhere in these pages.

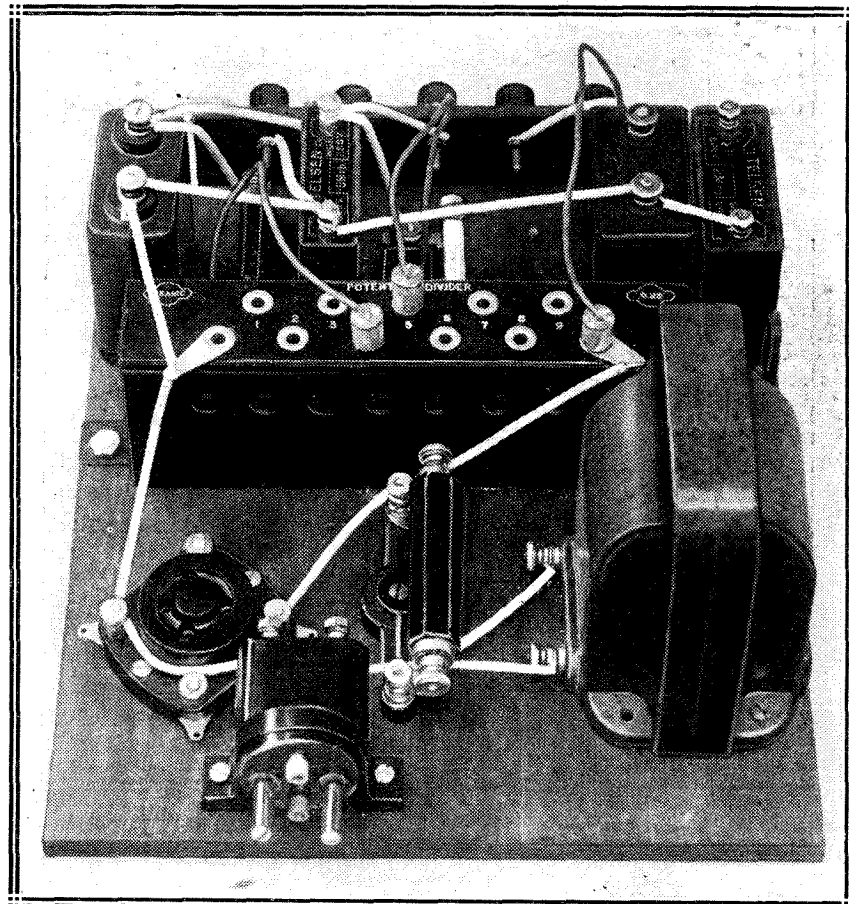
The main point is that the conversion is not at all difficult, and the set owner who has an electricity supply can run it very economically from a mains H.T. unit.

A Special Circuit

Here, however, he must be careful, for "any" H.T. unit will not do—it should be a specially designed type to meet the peculiar requirements of Class B amplification.

The reason is this. In the case of an ordinary power valve the anode

DESIGNED FOR D.C. SUPPLIES



The few components required for the unit are accommodated on a baseboard, 8 in. by 9 in. The neon stabiliser occupies the holder to the left, and the potential divider, by which the voltage of the intermediate tapplings can be varied, can be seen in the middle of the unit.

A Mains Unit for Class B Sets—continued

current remains sensibly constant, rising and decreasing at L.F. above and below a certain mean. This mean is in the nature of 15 milliamps. or more where a moderately large battery valve is concerned, and where the valve is properly biased and not overloaded the rise and fall round the mean are equal, resulting in a steady drain from the H.T. unit of 15 or so milliamps.

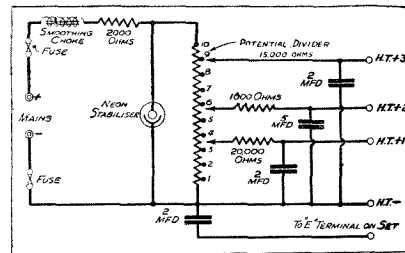
Where Class B is concerned things are very different. A Class B valve consists of two complete valves (though the filament may be common to both) in one glass envelope. These valves

are connected in push-pull, and, moreover, are so arranged, either by external applied grid voltage, or by the characteristics of the valves themselves, that they are statically at the anode bend points in their curves.

Explaining "Positive Drive"

Thus, when an L.F. "signal" reaches one of the valves the negative grid impulses will have little effect on the anode current, merely bringing the bias point below the anode bend. The positive half-cycles, however, make the grid positive, and the anode current rises.

A SIMPLE CIRCUIT



The circuit is the acme of simplicity. An inspection of this diagram will reveal how the various voltages are obtained.

This state of affairs occurs alternately with each section of the Class B valve. When one is supplied with a positive cycle the other receives a negative impulse, and vice versa. The result in the anode circuits is alternately rising anode currents above a low minimum static value.

Thus, the anode current supplied to the valve as a whole is always changing in varying amounts above a certain minimum. The result is therefore cumulative, the current being pushed up by the push-push action of the valve and never allowed to drop below the minimum or static current level which in an ordinary valve would be the mean about which L.F. current fluctuations would occur.

Large Current Variations

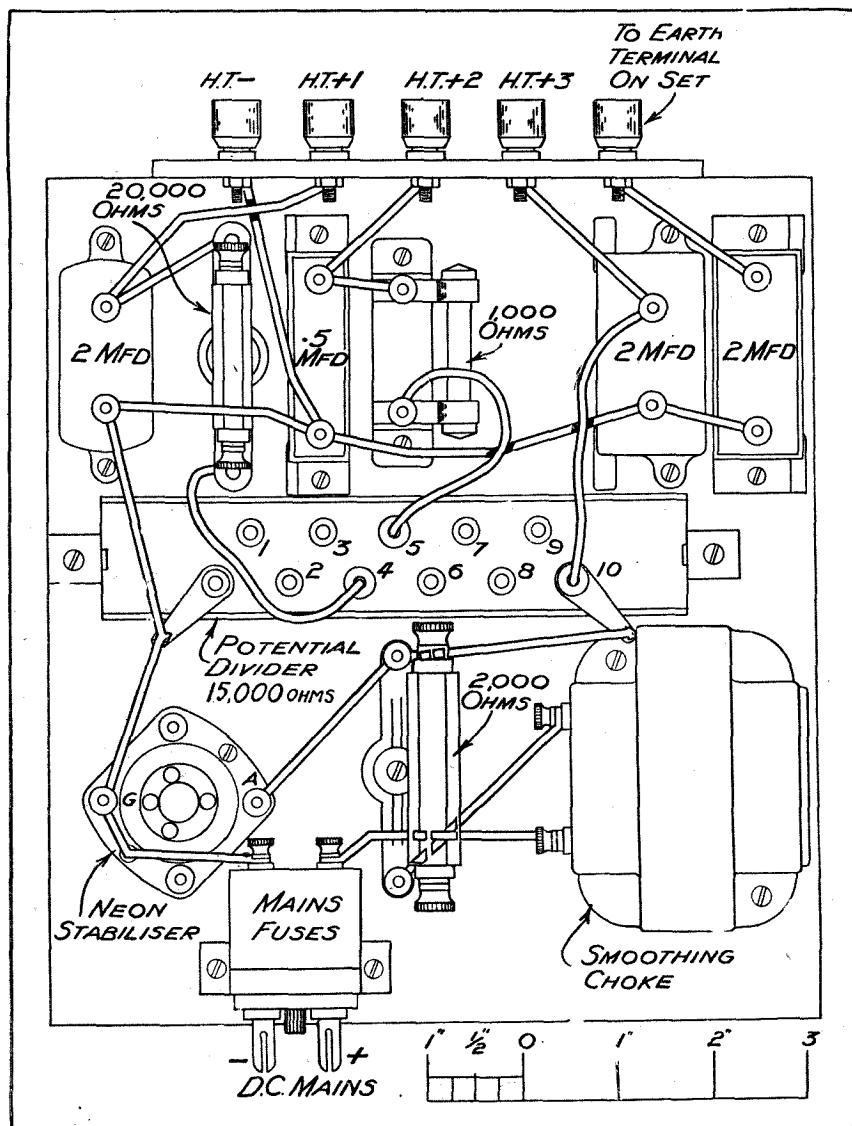
Also, as the B valve is allowed to run into grid current the anode current rises to unusual amounts, it being not out of the way on full load for it to reach 50 or more milliamps. This rise takes place on peak "signals" from a minimum anode current of some 2-3 milliamps., which is all that is taken by the valve in its quiescent state.

Thus, as is easily shown by the kicking upwards of a milliammeter in the Class B anode-feed circuit, the mains unit has to deal with a current supply varying momentarily from 2 or 3 milliamps. to some 50 or more, not taking into account the steady current required by other valves in the set.

At first sight this supply does not seem difficult to attain, for a good 60-milliamp. H.T. unit for A.C. and an ordinary "large" unit for D.C. should be able to provide the current.

That is true until it is remembered that however good the A.C. rectifier regulation is, and however unlimited the milliamp. supply of D.C. mains, the question of voltage drop due to current

WIRE UP FROM THIS DIAGRAM



After fixing the components to the baseboard in the positions shown, the wiring should be commenced. A point worth mentioning is that where two wires run close together and have a big difference of potential between them, they should be kept well apart. Although the insulating properties of the sleeving should be sufficient protection against shorts, it is as well to take this simple precaution.

A Mains Unit for Class B Sets—continued

THESE ARE THE COMPONENTS REQUIRED

Component.	Make used by Designer.	Alternative makes of suitable specification recommended by Designer.
1 Smoothing choke	Lissen L.N.5301	—
1 Power resistance (for value, see text)	Graham Farish	Ferranti
1 20,000-ohm resistance and horizontal holder	Graham Farish	Dubilier
1 1,000-ohm resistance and holder	Dubilier 1 watt and Dumetohm holder	Graham Farish
1 15,000-ohm potential divider 2246/5	Igranic	—
1 2-mfd. fixed condenser	Telsen W.226	T.C.C., Igranic, Dubilier
1 2-mfd. do.	Dubilier type B.B.	Telsen, T.C.C., Igranic
1 2-mfd. do.	T.C.C. type 50	Dubilier, Igranic, Telsen
1 5-mfd. do.	Telsen W.228	T.C.C., Dubilier
1 Four-pin valve holder	Benjamin "Vibrolder"	W.B.
1 Combined mains fuse and plug	Bulgin F.15	—
5 Terminals	Belling-Lee type R	Clix, Bulgin, Goltone
3 Wander plugs	Clix	—
1 Wooden baseboard, 9 in. by 8 in. (see text)	—	—
1 Ebonite strip, 5½ in. by 1½ in.	Peto-Scott	—
1 Yard insulated sleeving	Goltone	—
2 Yards 18-gauge tinned copper wire	Goltone	—
Flex, screws, etc.	Peto-Scott	—
1 Cossor S/130 neon tube	—	—

mains and is easily built in a very short time. The A.C. type would be very similar; the addition of a rectifier being the only alteration required.

As can be seen in the diagrams and photographs, the mains input goes through a plug and socket and a couple of fuses to the smoothing system. From there it is fed to the potential divider, across which is connected the neon stabiliser, and thence to the various tappings and decoupling arrangements and the output terminals.

A limiting resistance of 2,000 ohms is connected in series with the positive side, and across positive and negative is connected the stabilising valve. Three H.T. + taps are provided, H.T. + 3 being maximum and normally plugged into the socket marked 10 on the potential divider, while H.T. + 2 and H.T. + 1 are intended

(Please turn to page 51)

increase in the smoothing system must be considered.

To vary the current through a 400-ohm choke (quite a normal resistance value) from 3 to 50 milliamps. is going to have a tremendous effect on the voltage drop in choke. In the case of the figures mentioned, the variation would be from some 1.2 to 20 volts.

Voltage Regulation

The voltage fluctuation would, of course, be applied not only to the Class B stage but to the rest of the set—a bad state of affairs. Obviously it is essential for good results to have better voltage regulation than this, and that is why a special Class B mains unit is required.

The necessary difference between an ordinary mains unit and the Class B variety rests in the voltage regulating device, or stabiliser, which is incorporated in the latter type.

This enables the same drain to be taken from the mains no matter what the requirements of the receiver. Thus, when the receiver current drops to a mere few milliamps. the stabiliser will "pass more" current, due to a tendency for the potential to rise, and the current it passes will rise until the potential is normal again.

Differential Leakage

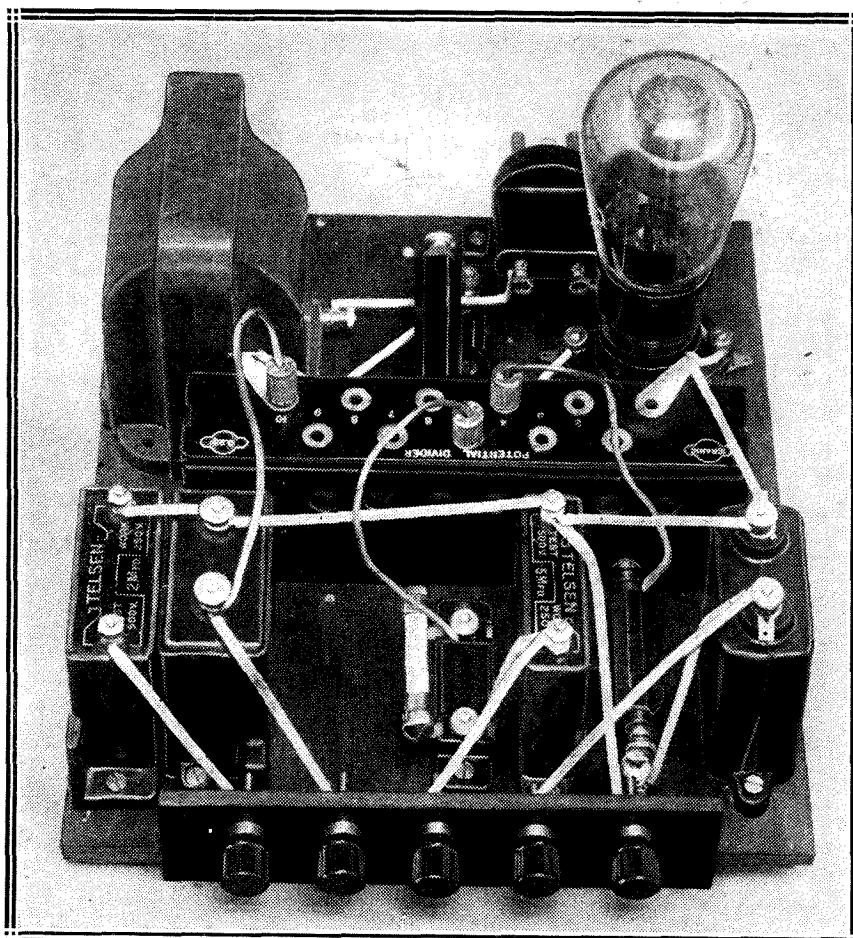
This normal potential is decided upon when the unit is built and the passage of current is governed by the series resistance in the unit together with the stabiliser, resulting in a differential leakage system that controls the voltage of the unit within remarkably close limits.

As the demands of the set increase so the current passed by the stabiliser

will decrease, the proportion being maintained to keep the output voltage regular.

The unit we illustrate is for D.C.

THE OUTPUT IS STABILISED BY A NEON LAMP



Besides the main H.T. tapping, which gives the full output, there are two intermediate points. These are suitable for such purposes as supplying the screen voltages of S.G. valves, or any stage in the set which requires a comparatively low potential. The terminal on the extreme left connects to the earth terminal on the set.

AUTOMATIC QUIESCENCE CONTROL

Class B amplification is a method of economising in high-tension consumption, but here is a method for economy in the current required by Class B itself.

By C. ROBINSON.

In most Class B sets the driver valve takes a greater anode current than any of the other valves when no signal is being received. This also is the case when fairly weak stations are tuned in.

Desirable Arrangement

It is, of course, essential that the driver valve be a small-power valve capable of giving sufficient power to the Class B valve without overloading on loud signals.

A circuitual arrangement which will actually vary the characteristics and power-handling capacity of the driver valve in accordance with the magnitude of the signal is very desirable on the score of increased H.T. economy.

A W.4 Westector can be arranged to have this effect, and the connections are shown in the diagram.

Opposition Bias

The negative grid-bias voltage applied to the driver valve is much higher than the usual practice, approximately double the grid-bias voltage normally required being satisfactory.

This reduces the anode current of the driver valve to a very low value, that is, $\frac{1}{2}$ to 1 milliamp., when no signal is being received.

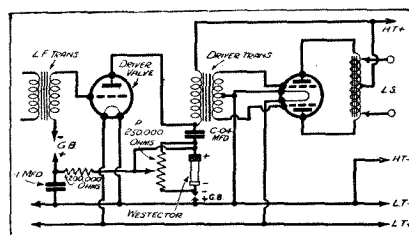
When a station is tuned an A.C. voltage is developed between the anode of the driver valve and H.T. —

A portion of this A.C. voltage is applied to the potentiometer P through the condenser C. Therefore, a rectified D.C. voltage is developed across that part of the potentiometer P, which is shunted by the Westector, the slider of the potentiometer which is connected to positive of the Westector being positive.

Any desired part of the A.C. voltage across P can be rectified and applied in opposition to the grid-bias voltage already provided for the driver valve.

Therefore when a large signal is

THE SUGGESTED CIRCUIT



By means of a Westector the advantages of quiescent anode control are rendered possible in connection with the driver valve. The connections are given in this diagram.

received the positive voltage applied by the Westector in opposition to the standing driver negative grid bias is increased.

This has the effect of reducing the driver valve negative bias, so permitting the driver to handle a larger

signal without distortion, but increasing the anode current to a certain extent.

In practice, using a Cossor 220P. as driver, the standing anode current with 12 volts negative bias was 1 milliamp. When receiving loud signals the anode current increased at times to 10–12 milliamps. On average passages of music it fluctuated from 2–4 milliamps.

The negative grid bias should be set to about double the normal bias recommended by the makers. This is suitable for most valves, but in some cases it might be found desirable to use a slightly lower voltage.

The slider of the potentiometer P should be turned as far towards the end of the resistance element connected to G.B. — as is possible without distortion when loud signals are being received.

In return for the cost of the few components required for the control, a quite considerable H.T. economy is effected. This is particularly the case when only low volume is required.

Incidental Advantage

It would appear that the addition of this control device might reduce high-note response to some extent.

Aurally no high-note loss can be noticed in practice, but there is no doubt that a certain reduction is effected.

This is of little importance, and in some ways might be considered an advantage, as normally a tone-correction device is almost invariably provided in a Class B set.

Recent developments in wireless technique have given us A.T.B. (automatic tone balance) and A.V.C. (automatic volume control). We now have an additional term, A.Q.C., or automatic quiescence control.

THE TIME ON YOUR SET
 A simple little fitting which will add to the appearance and convenience of your set.

BOTH the long-distance listener, and those who mostly confine their listening to the local programmes, will find it useful to have a clock on their sets. If the receiver is an A.C. mains one, there are a number of mains clocks available.

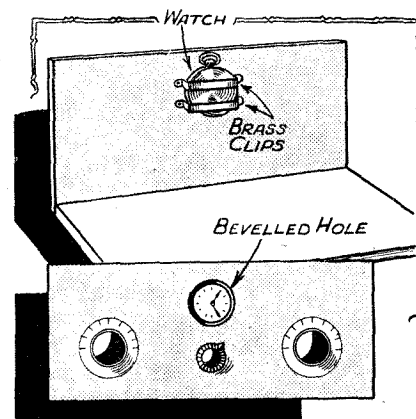
But for an ordinary battery set a watch, fitted in the following manner, is both attractive and convenient.

It can easily be removed for winding and adjustment.

Fixed With Clips

On a clear part of the panel, cut a round hole the size of the watch glass. The appearance is enhanced if the front side of this hole has the edges bevelled.

Two brass clips, one to support the watch and the other to hold it in place, are arranged as in the sketch. Note that the lower brass clip must be smaller than the diameter of the watch, so as to prevent the latter from dropping right through. The upper clip must be a little wider than the watch case or it will be impossible to remove the watch for winding.



Showing how simply a watch may be added to the panel of an ordinary battery receiver. It can easily be removed for winding and adjustment.



WHY, I wonder, do the European wavelength allotments not clear up the messy stations which are supposed to be insignificant in range and are therefore placed within less than 9 kilocycles of decent stations?

Why—the most glaring case—should Eiffel Tower and Warsaw be allowed within 5 kilocycles of each other? Is it a case of stealthy increase of power, or did some fool imagine that Warsaw's waves could be kept within the frontiers of Poland?

Some Examples

Lahti and Kaunas are also treated as if they never reached Western Europe. Ljubljana, often a very good station, has Freiberg-im-Breisgau's signals only 5 kilocycles off. Berlin, Rabat and Athlone are all too close. Hamburg and Radio L.L. are "local" stations, but ones which we hear, yet they are only 4 kilocycles apart. Algiers and Stuttgart constitute a flagrant example because both stations are capable of coming over excellently in many parts of the country. Then there is Turin and Rennes, Lille and Moravská-Ostrava, Trieste and Juanles-Pins, Nürnberg and Radio Beziers, Cork and Fécamp.

Even if, in these cases, one or other station drowns out the other, the winner is left with a distorted programme and a constant whistle. The vanquished station is never too weak to whistle. One can improve selectivity to mitigate the trouble or even remove it, but if stations are closer than 9 kilocycles one cannot get proper quality, obviously.

Most of the sets in the country cannot effectively get programme value out of many stations 9 kilocycles apart. How desirable, then, is it that the lesser stations should be put in the dustbin.

Now is the time to squash them or separate them before they get ambitious and reach out greedy hands for more kilowatts.

This month Mr. John Scott-Taggart discourses as usual on a bewilderingly wide range of topics. A strong criticism of wavelength "planners"—In defence of the grid-leak retailer—Raising the hopes of the exiled Briton—are component parts of a miscellany which includes many other informative and provocative items.

I have no great faith in the new broadcasting "plan" to come into force next year. Much fewer and much bigger stations are needed and separated farther apart. Another point which makes this desirable is that although broadcast transmitters may be nine kilocycles apart, their range of transmitted frequencies may reach twelve thousand cycles in some cases!

At present set designers have the job of producing "quality" cum selectivity, but there is a theoretical limit imposed by the separation of the

stations. I cannot help feeling that no national broadcasting concern is really anxious for its clients and licensees to listen to foreign programmes. As long as their own local programmes are loudly received with little or no interference, they have no vital interests at these conventions when "plans" are hatched between junketings.

I have the privilege of publishing the photo of the youngest reader of my articles. Dorothy Thompson of Wootton, who is eighteen months old. She posed herself, so the proud father says. The photo looks well whichever way up it is put, so it does not matter how the printer arranges it.

A reader, H. J., of Carshalton-on-the-Hill, Surrey, has written to me stating that I have in the past underestimated the saving effected by making one's coils at home. There is no doubt a strong general feeling against the coil makers and against designers who, by changing designs, help them to earn what H. J. regards as a dishonest penny.

"Exorbitant Profits"

"The whole history of wireless, unfortunately, is a tale of exorbitant profits for both manufacturer and dealer," says H. J. I have not had first-hand experience of the whole history of wireless, but in my twenty years of it there have been more bankruptcies and company liquidations than in any industry I know of. Even in the boomiest period of radio, this applied.

From My Armchair—continued

Who is right—H. J. or the Official Receiver? I take no sides, but I doubt if wireless is much different from any other business as regards the middleman's profits. Where I happen to be writing this, they are selling mackerel to-day at eightpence per hundred. To-morrow, in London, the fishmongers will be selling them at 1d. or 2d. each! And if you buy your best girl a wrist-watch, the jeweller will probably pocket half the price himself. But if you bought her a grid-leak (far more appropriate in

of you has told them how damned silly this is. Increase the H.T., add a few more volts G.B., and what an improvement they would notice!"

"Taken Years to Reach"

I reproduce this in full because I think there is something in it. As a matter of fact, the present H.T. voltage advised as a minimum—120 volts—has taken years to reach. A mere 75 volts was quite customary at one time and the present great popularity of H.T. batteries of less than 100 volts is some evidence of a continued preference for keeping the last valve starved.

Unfortunately H.T. batteries cost a good deal of money (although much cheaper than they were), and most of the mains units on the market give unsatisfactorily low H.T. voltages.

The amount of volume desired governs the amount of H.T. used. Personally, I should always prefer on any battery set to put 150 volts on the anode of the output valve, but I never use more than 120 volts in design work or demonstrations. For normal room requirements this satisfies most people.

* * *

This is to acknowledge letters from F. C. S. M., of Assuan Dam, Upper Egypt; B. H. R., of Bulfontein, South Africa, and E. W. W., of Jos, Northern Nigeria, and others who complain bitterly that the British radio journals do not cater enough for the far-flung components of what used to be called the British Empire.

Static Interference

This is true. These people, to whom wireless means more than casual entertainment, want stronger links forging with the Mother Country. The new Empire station will do something—although, in my opinion, not as much as is expected.

Unfortunately, atmospherics and fading are the twin curses of radio in the climes that are clamouring for better radio.

An efficient short-wave receiver which can exorcise these grizzly bug-bears (or whatever one does to bug-bears to get rid of them) has not yet been designed, and any advice to build their own broadcasting stations would hardly be appreciated.

High-power local stations are a cure for atmospherics in Great Britain (if one lives near to the B.B.C.), but how

fierce the competition with Nature when it's raw, would be in tropical countries, requires first-hand experience.

If readers outside Great Britain will tell me their needs, their failures, or their successes, and their experiences generally, I will tackle the question of a special Imperial receiver.

Although I only announce a fraction of my experimental activities, I have numerous research irons in the fire ready to be taken out and hammered into shape as the public demands or the ether requires.

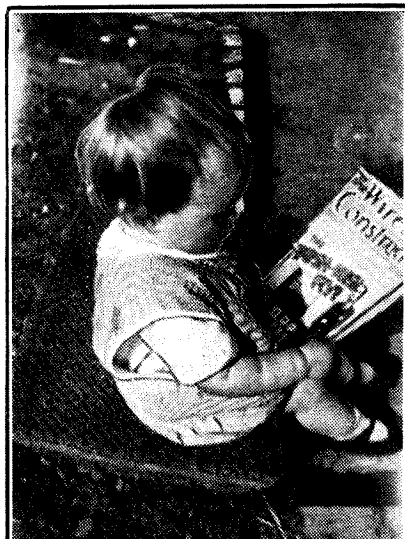
On Earthing Aerials

I have had several hearty congratulations from fellow sinners on not earthing my aerial when I go to bed. It is not anything to be complimented on, really.

Previous experience has taught me that pride often comes before a shock. My advice is: Buy a large switch and fit it *outside* the house on an insulated pole, arranging matters so that aerial and earth of your receiver are completely disconnected. Fiddling little switches inside the room are no good. The lightning will simply laugh at you—and spring at you.

What you need is something that will make you put on your shoes, leave the warmth of your fire, put on an overcoat, open your umbrella (no,

S.T.'s YOUNGEST READER



Aged 18 months, this young lady posed this photo herself. She little knows that some day she may become a wireless widow and curse the name of S.T.

these hard times!), the wireless retailer would emphatically not put the same discount in his till.

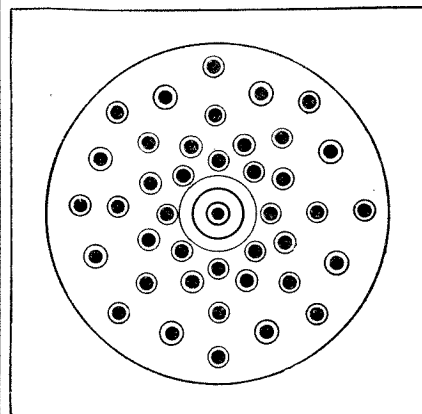
My correspondent H. J. adds a P.S. to his complaining letter: "I doubt if you will be allowed to take up the matter in THE WIRELESS CONSTRUCTOR; it might offend their advertisers." Dear, dear!

More H.T. Desirable

I have had a very interesting and closely reasoned letter from C. M. of Fleet. He says, *inter alia*, "I believe you people have done an immense amount of harm to the home construction movement by not insisting on a higher value of H.T. than is generally used.

Many of my friends have built sets and think it quite in order to run them off 100-volt dry batteries because none

THE NEW VALVE



S.T. kindly supplies this illustration of the valve holder for the triplex-quadradebio-octavo-duodecitrade. He recommends that the holder be of the anti-microphonic type.

better leave that behind—lightning would prefer one umbrella to fifty lightning arresters), and go out into the garden or backyard in the pouring rain or icy wind.

From My Armchair—continued

This must be done *whenever the set is not in use*. No good doing it just when you put the cat out (of course, if you can train the cat to do it, so much the better!).

If you are listening and atmospheric get too strong, you must certainly go out and short the aerial. You will probably be struck by lightning while you do it, but you will have died for a principle.

My Own Preference

I personally prefer the warm comfort of a fireside armchair to the cold comfort of a really properly arranged earthing switch. But, then, I have a philosophy of life based on statistics and the law of averages. If the chances are forty million to one against disaster, it is worth taking a risk.

The chances of my aerial being struck by lightning are no greater than of my catching *beri-beri* or psittacosis.

On top of all that is a fact I have unfairly kept concealed. I have had one dose of lightning. Another is not due for forty million years. In the interim I shall sit tight.

However, I see that Ripley ("Believe it or Not") has disproved the old wives' tale that lightning never strikes twice in the same place. A man in Kansas was killed by lightning: the coffin on the way to the funeral was struck by lightning, and his tombstone was shattered seven times by lightning.

On second thoughts, I think I'll go and earth my aerial.

Practical Hints Please

Reverting to a possible Imperial receiver, I should like colonial readers to supply any practical hints about components in view of climatic, zoological and peculiarly native requirements.

Don't write afterwards and say: "Anyone in these parts could have told you that an ebonite panel would not last a week; the *yula-yula* worm will eat a whole panel in one night." Or "Why recommend a dry H.T. battery when you must know that the native servants tear them to pieces at sight, eating the bitumen and using the carbon rods as pencils."

I am sure the *stingah* beetle of Southern Rhodesia attacks the ball-bearings of variable condensers, and that cobras have a partiality for S.G. chokes. The rubber planters of Malaya may put me off aluminium screens

because they will corrode in the rainy season, and will warn me off accumulators because they cannot stop their *ayahs* from taking sips of the acid at tiffin.

A Reader's Regrets

Just a note of thanks to F. Talbot, of Fulham. He writes ruefully: "I cannot offer you a bed and an invitation to stop for the week-end or even

IS IT A PROMISE?

"If readers outside Great Britain will tell me their needs, their failures, or their successes, and their experiences generally, I will tackle the question of a special Imperial receiver."

a cigar, because I happen to be a schoolboy of 15."

Never mind, my boy. Youth is one of the ills that is cured automatically by the passage of time.

I am always glad to hear from youthful constructors, especially from such competent ones as young Talbot. Incidentally, he is one of those who congratulates me on not using an aerial-earthing switch.

tongue. *If you do not get a shock you may take it that your H.T. is dud.*

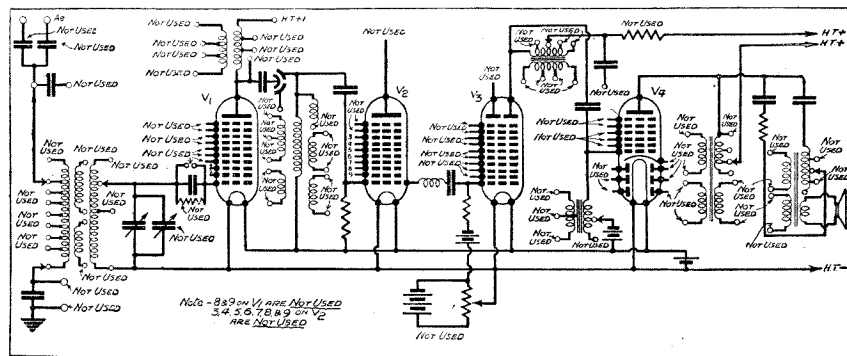
It has occurred to me that readers of these notes may care to have a few hints from my own authoritative—if leaky—pen. So here we go:—

1. Many readers do not possess hydrometers for testing the specific gravity of the sulphuric acid in their accumulators. This need not prevent you from testing the battery. A spoonful of the electrolyte will soon reveal if things are as they should be. Unless you experience a bitter taste in the mouth, you can assume that the battery is run down. This test should not be carried out too often or you yourself may feel run-down.

Mains Testing

2. If you possess a D.C. voltmeter, but not an A.C. type, you may find it difficult to test out for a dis. in a mains unit or A.C. receiver. The enterprising experimenter need not be deterred by this. A good plan is to take the mains unit or receiver into the bath-room and connect it to earth and to the mains. Then fill the bath with water, undress, and lie full length in the water. Reach out a wet hand and touch all the terminals (or as many as you can) within reach. If nothing happens you will have the

WILL IT COME TO THIS?



S.T. gets satirical about modern valves, components and circuits. Here is his idea of the future circuit, if the present tendency continues.

As he is only 15, he has plenty of time to get struck by lightning.

The wireless expert to a daily newspaper advises his flock of dupes as follows:

If you are in doubt as to the voltage of your high-tension battery and do not possess a voltmeter, a good rough-and-ready test is to connect two wires across the maximum voltage of the battery and lay the bared ends on the

satisfaction of knowing the set is dis. If the set is O.K. you will not even know about it.

3. Lightning arresters are sometimes found to be out of order, and in the absence of suitable testing apparatus it is difficult to know whether the fault is actually in the arrester or not. The following hint may prove useful: Soak the earth outside your window with a solution of salt on a

(Please turn to page 52)

CONSTRUCTING METAL CHASSIS

Many constructors are inclined to the opinion that the metal chassis receiver is exclusively the commercial manufacturers' province. That such is not the case is amply demonstrated by this eminently practical article which describes how really simple a matter it is.

By J. R. WHEATLEY

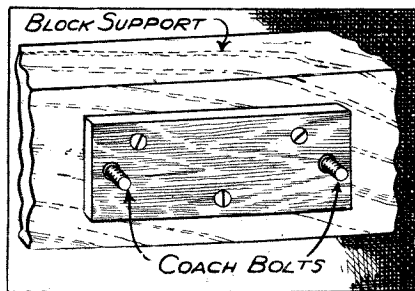
THE construction of a metal chassis may at first sight seem to the home constructor a formidable task. This, in nine out of ten cases, is due to the constructor having seen the chassis only in its final form and never in the initial constructional stages.

There are various metals suitable for chassis construction from an electrical point of view—brass, aluminium, copper, iron, and steel are all suitable, but from a mechanical point of view certain metals have to be ruled out, for they are either difficult to handle with simple tools or when worked into a chassis are lacking in rigidity. Then, again, there is the question of cost.

Different Gauges

Metal is sold in various gauges, and it does not follow that 18-gauge in one metal has an equivalent thickness to a similar gauge in another metal; this point should be borne in mind when ordering metal.

A HOME-MADE VICE



After fitting the first of the two hardwood blocks with coach bolts, it is securely screwed to a convenient support.

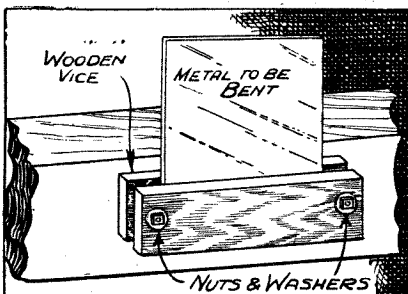
Sheet steel is really an excellent material for most chassis, but unfortunately it is outside the scope of the home constructor to work in this material unless he has fairly elaborate bending plant and tools for cutting large diameter holes. This also applies to sheet brass and, to a certain extent, copper.

It is fairly safe to say that the easiest and probably the most satisfactory metal for the home constructor to use is aluminium, for even with the fairly heavy gauges that are needed for large chassis, a really

professional job can be turned out with a little care.

Before purchasing the material for a chassis it is advisable to carry out certain experiments with small pieces of aluminium of a similar gauge to that which it is intended to use.

READY FOR BENDING



By slipping the second block over the coach bolts a satisfactory vice is formed wherein the metal is clamped by tightening the nuts.

The real secret in making a chassis to an exact measurement is to allow sufficient material for the bends, and, secondly, to construct a simple form of bending tackle in the nature of a special vice.

This special bending tackle consists of two pieces of hard wood, i.e. oak, beech, or mahogany, 16 in. by 4 in. by 1 in. thick—the above measurements are on the assumption that the greatest width of metal to be bent will be 12 in. to 13 in.

Held by Bolts

The two blocks of wood are drilled as shown in the diagrams, and two 3 in. by $\frac{3}{8}$ in. coach bolts driven through from one side so that the square section of the bolt under the head becomes embedded in the wood. Now screw the block with the bolts in place to the end of a solid support, such as the edge of the kitchen table, the top of a bench, or even to a large plank which can be wedged between a door frame, so as to make a solid member on which to work.

If the second block is now slipped over the first block and washers and nuts placed in position, a piece of metal can be held quite firmly between the two blocks by tightening the nuts.

An accurate length strip of aluminium, 4 in. or so long, should be taken, and after marking the strip at one end, clamp between the two blocks, bend over with the hands, and then hammer with a mallet or a block of wood so as to form a right angle. Do not, however, hammer excessively, for this will only stretch the metal.

How Much to Allow

Now remove the angle piece and measure carefully; by this simple test it will be possible to decide just how much must be left to allow for the bend when measuring up and marking the metal for the chassis.

Where a chassis is to have more than two sides it is advisable to make the third and fourth sides in the form of plates with a bend-over piece of $\frac{1}{2}$ in. or so for bolting on to the main chassis.

Having carried out this preliminary work, the metal for the chassis should be obtained cut dead to the required size and the chassis bent to the specified dimensions.

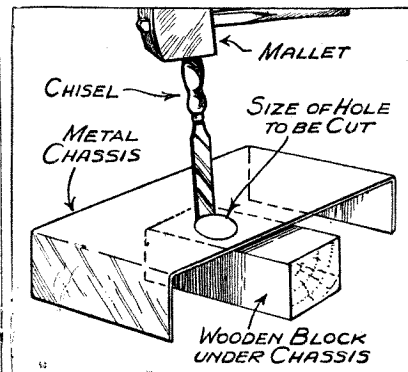
Another problem in the construction of chassis is the "drilling" of large holes; small holes are quite easily made by ordinary means, but larger holes for the valve holders, condenser escutcheons, etc., are more difficult.

Cutting Holes

The correct tools for these operations are rather expensive and entirely unnecessary providing that care is taken. Wood chisels of various sizes may be obtained from sixpence each, and these are used with a block of hard wood placed on the reverse side of the chassis.

For circular holes a small chisel should be employed, and then the final finishing off carried out by means of a coarse file. A sharp penknife will soon remove any burrs that are left.

CHEAP AND SATISFACTORY



Although expensive special tools are often advocated for the job, there is nothing better than a sixpenny wood-chisel for cutting apertures in aluminium.

HOW TO MAKE A CLASS B AMPLIFIER



MOST battery receivers can easily be converted to Class B amplification if the owners will only take the trouble, but sometimes the idea of altering the components, and possibly the layout, of a set to try a new system does not appeal, and so Class B remains untried.

Those who are dubious about converting their sets to accommodate Class B amplification can hardly be blamed, for it is a completely new development, and as such must of necessity be gradual in its adoption.

Instantaneous Conversion

Its use is growing steadily as it is realised more and more generally how advantageous it is in the provision of economical power, and it is with the idea of assisting set-owners to try Class B rapidly and easily that we have designed a special plug-in adaptor that enables practically any battery receiver to be converted to Class B instantaneously.

Most of our readers are familiar with the various types of short-wave adaptors that enable the high frequencies to be received on an ordinary broadcast set with no internal alterations. The Class B adaptor is designed on the same principle—it is plugged into one of the valve holders in the set and the conversion is complete.

No Extra Batteries

It does not matter if the receiver has one or two stages of L.F., the adaptor can be attached quite easily, by plugging the four-pin adaptor plug into the first L.F. valve holder, placing a suitable valve in the adaptor, and attaching the loudspeaker to the adaptor output terminals.

The whole of the battery power needed by the adaptor is supplied through the four-pin plug which is inserted in the power valve holder of the set.

This plug is so arranged that L.T. leads can be taken from the L.T. pins to the Class B adaptor, while the anode pin is separated from its socket, so

In the past battery set users have had their power output limited to a mere 500 milliwatts or so. With the addition of this simple unit, however, working on the Class B principle, readers can now obtain the power output of a mains outfit. Running costs are not increased by adding the amplifier to your set.

that between the anode of the power valve and the anode feed to it in the set (the anode socket of the fixed valve holder into which the adaptor plug fits) can be inserted the Class B driver transformer primary.

How this is arranged is clearly shown in the theoretical diagram, which depicts a semi-pictorial sketch of the adaptor plug with its terminals and pins.

Care must be taken, of course, that the adaptor is correctly wired up, for it is essential that the positive and negative low-tension leads are con-

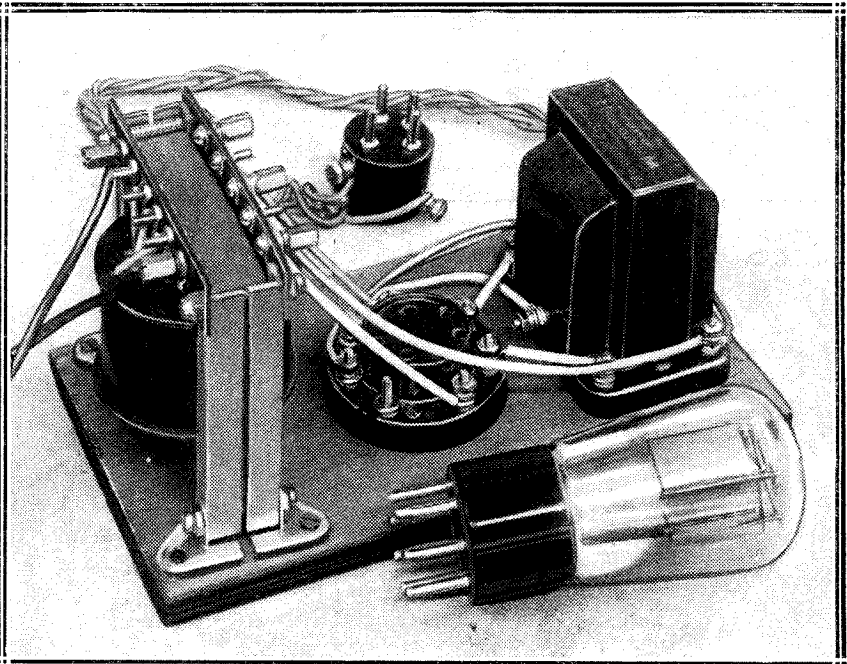
nected to the correct pins of the adaptor. To ensure this the L.T. wiring of the set must be traced and the negative side of the adaptor must correspond with the negative side of the valve holder into which it plugs.

As illustrated, the adaptor in our model of the Class B unit is wired to suit a certain set on which tests were carried out, and the relation of L.T. — to the anode pin of our adaptor plug may not be correct for all other cases. This point must be settled before the adaptor is put into operation, for it is essential that the correct L.T. connections be made to the Class B unit.

Importance of Matching

The actual construction of the unit is merely the screwing of three components on a piece of plywood, and the wiring of a few terminal points together. The required parts are listed and the makes specified should be

IT PUTS PUNCH INTO YOUR PROGRAMMES



Capable of an audio output of between one and two watts, this adaptor can be added to your existing receiver without any alterations whatever. It just plugs into the output stage valve holder—that's all.

How to Make a Class B Amplifier—continued

adhered to, with the type of Class B valve specified below.

Should other makes of valve or transformers be desired, care must be taken that the correct matching be obtained.

One cannot indiscriminately ring the changes between the Class B valve, the driver transformer and the output choke. All three, and the driver valve, too, must work together as a team, or failure to obtain full satisfaction will result.

valves are used it may be best, unless the set is well decoupled, to cut out the last stage.

There may be one or two alterations to the set in this latter event, as there will be where an output filter is used.

Taking the latter case first, it will be necessary to short-circuit the choke with a piece of wire so that the H.T. goes direct on to the anode terminal of the valve holder. Then when the adaptor is fitted, H.T. will feed to the driver valve through the driver transformer, and also to the Class B valve via the output choke.

THE FEW PARTS REQUIRED

Component	Make used by Designer	Alternative makes of suitable specification recommended by Designer
1 Class B driver transformer	British Radiogram No. 60	R.I., Telsen, Varley, Benjamin, Wearite
1 Class B output choke	Wearite	British Radiogram, R.I., Telsen, Wearite, Varley, Benjamin
1 seven-pin valve holder	W.B.	Benjamin, Graham Farish, Telsen, Wearite
1 special split anode adaptor	Bulgin type A.50	—
1 baseboard 7 in. x 4 in.	Peto-Scott	—
1 yard insulated sleeving	Goltone	—
1 yard 18-gauge tinned copper wire	Goltone	—
Flex, screws, etc.	Peto-Scott	—

VALVE:
Class B valve: Cosorr 240 B.

The driver valve is of the small-power type, and it is extremely likely that the output valve of the receiver with which the unit is to be used will be suitable. If not, a new valve will be required.

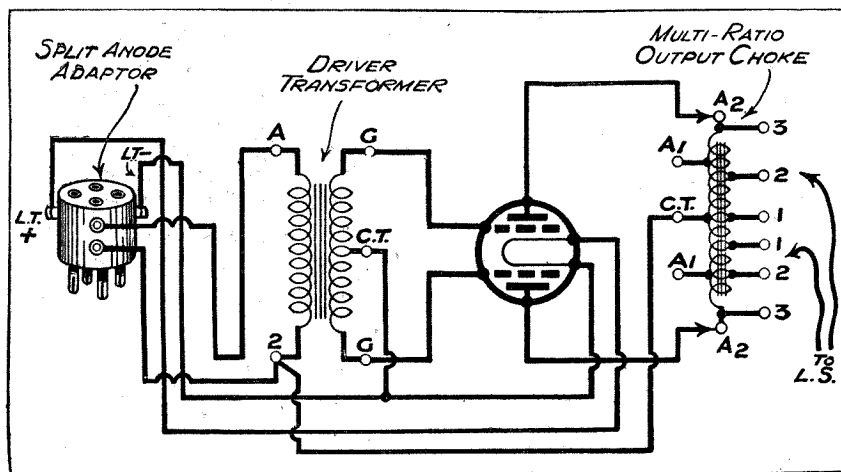
Avoiding Instability

It is placed in the four-pin adaptor plug, which in turn plugs into the last L.F. stage of the set. Where two L.F.

Class B unit, and its removal will break the H.T. feed to the valve in the set.

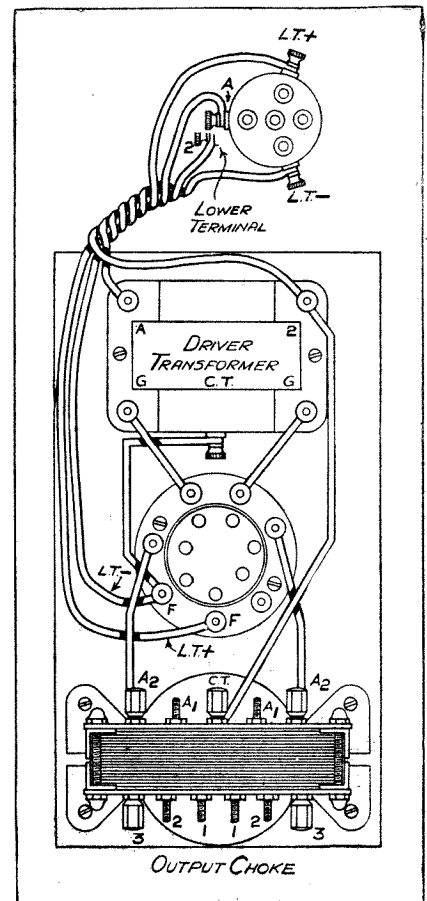
In the case of a two L.F. stage set where instability follows the addition of the adaptor, disconnect the anode terminal of the first L.F. valve, making sure that such disconnection does not effect previous circuits at all, and take a lead direct from it to the H.T. maximum terminal on the set.

HOW IT LOOKS IN THEORY



From this diagram you will see that the power stage in your set now becomes the driver for the Class B valve. There are no additional H.T. tappings to worry about either, the supply for the Class B valve being obtained from the driver stage.

FOR WIRING UP



The wiring is particularly easy to carry out. An hour or so should see the whole unit completed.

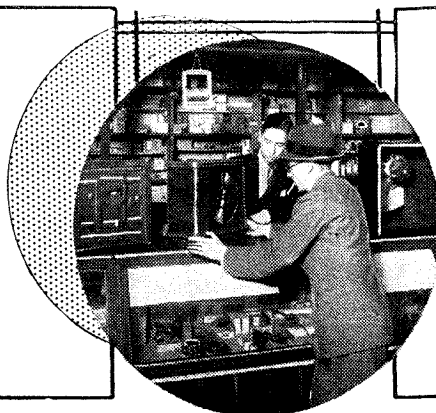
Withdraw the output valve, and place the adaptor plug in the last L.F. valve holder, placing the driver valve in the top end of the plug. As before, the loudspeaker is removed from the set and connected to the output choke on the Class B unit. There is no need, however, to alter the wiring of the output stage of the set, since this is cut right out.

Bias Requirements

The bias adjustment of the stage into which the adaptor plugs must be reconsidered, and some 4.5 volts applied. No bias is required for the Class B valve unless it is decided to use the Marconi or Osram B.21, when special arrangements for bias would have to be made in the design of the unit.

The speaker should be attached to the various terminals of the output choke, the ratios being varied until the best results are obtained.

AS WE FIND THEM



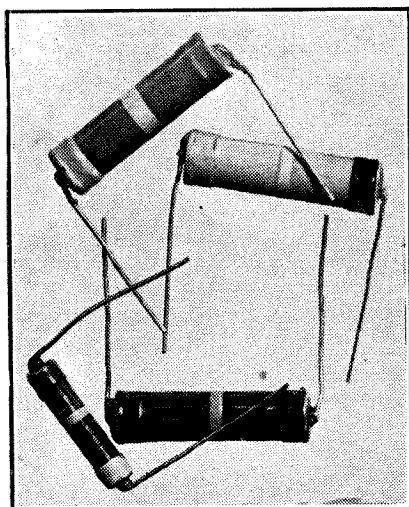
NEW APPARATUS TESTED

Telsen Resistors

THE wire-end component has several constructional advantages. For example, it is convenient. You simply join its ends to its respective terminals in the same way as you would connect up the self-same terminals with a piece of wire.

Moreover, such a component requires but little space, and can be

EASY TO WIRE UP



Telsen wire-end resistances are available in a wide variety of values and power ratings.

accommodated without difficulty in sets where space-saving is a vital consideration.

We are, therefore, not surprised to learn that such an enterprising firm as Telsen are marketing a comprehensive range of tubular condensers and resistors of the wire-end type.

The resistors are available in a wide variety of ratings extending from 250 to 500,000 ohms in the $\frac{1}{2}$ - to 1-watt types, and 250 to 100,000 ohms in the 2-watt types.

Resistances with power ratings up to 6 watts can be supplied on request.

We have conducted exhaustive tests on these Telsen resistors, and have found them to carry out their duties

Interesting reviews of newly introduced apparatus submitted by radio manufacturers and traders for examination and test in "The Wireless Constructor" laboratories.

in a highly satisfactory manner. In use they are singularly free from noise, and preserve an unvarying value under all normal operating conditions.

The wire-end condensers bear a similarity to the resistors, their small physical dimensions making them particularly convenient to use. The capacities available range from .0001 mfd. to .1 mfd., the lower values being priced at 1s. and the .1-mfd. type at 1s. 6d.

It is interesting to note that all of these condensers are tested up to 1,500 volts.

As in the case of the resistors, our tests have proved them to be thoroughly reliable, and to conform accurately to the manufacturer's specification. The makers are The Telsen Electric Co., Aston, Birmingham.

R.I. Chokes

As makers of high-grade L.F. transformers and chokes, the firm of R.I., Ltd., have long been in the front rank.

In our last issue we dealt with the "Audirad" choke, that ingenious combination of H.F. and L.F. choking systems in one compact unit. Since then we have had the opportunity of testing the D.Y.50 type choke made by this firm.

This component has an inductance of 45 henries at zero D.C. and 40 henries at 30 milliamps. Its D.C. resistance is 1,100 ohms, and the maximum current 50 milliamperes.

The D.Y.50 can be employed for smoothing or output filter purposes, and is provided with a centre-tapping on the winding. It is a first-class choke, and sells at the very moderate figure of 14s. 6d.

The makers are Radio Instruments, Ltd., Purley Way, Croydon, Surrey.

Goltone Components

Messrs. Ward & Goldstone have sent us two of their latest products for test.

The first of these is a low-loss "stand-off" insulator retailing at 9d. This is a particularly neat device which can be used for anchoring the aerial lead-in (or, in fact, any conducting wire) in those cases where there is any likelihood of accidental contact with an earthed object.

Only two screws are required for fixing, and the surface corrugations prevent any possibility of leakage, even under the most adverse weather conditions.

The second component is a high-quality mains H.F. choke. Designed for insertion in the mains leads to the set, the Goltone P.H.F. heavy-duty choke will carry a current of .35 amp., and its exceptionally low D.C. resistance of 17.5 ohms enables it to be

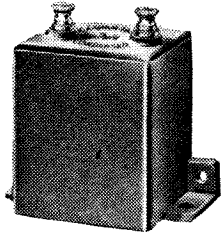
FOR SMOOTHING



This R.I. choke has an inductance of 40 henries at 30 milliamps, and will handle currents up to 50 milliamperes.

As We Find Them—continued

placed in H.T. leads with a minimum of voltage loss. The inductance is, approximately 8,500 mics., and it is a component that will be found specially valuable in connection with interference suppression due to stray H.F. impulses in the mains wiring.



H.F. or L.F.
The Graham Farish Mansbridge type fixed condensers are constructed non-inductively and are suitable for H.F. as well as L.F. circuits.

The price of the Goltone choke is 7s. 6d., and it is suitable for either baseboard or chassis mounting.

The makers are Ward & Goldstone, Ltd., Frederick Road, Manchester.

Graham Farish Components

Messrs. Graham Farish have made a number of notable additions to their already extensive component range for the 1933-34 season.

We have had the opportunity of submitting various sample components to laboratory tests, and we are able to say that the Graham Farish standard of efficiency is of a very high order indeed.

We would mention specially the new "Zelos" ganged condensers. These are available in two, three, and four-ganged types, each section being provided with an independent low-minimum trimmer of somewhat higher maximum capacity than is usual with this type of condenser.

The condenser sections are screened from each other and from external circuits to ensure perfect freedom from stray coupling effects—an essential factor in the modern high magnification receiver.

Moreover, the mechanical construction is extremely robust, hence the likelihood of capacity changes occurring after long periods of use is exceedingly remote.

Transformers for Class B

Another component in the Graham Farish range is a driver transformer for Class B circuits. Available in three ratios, viz. 1-1, 1·2-1, and 1·5-1, this instrument has a silicon iron core of substantial size, a feature which enables the primary inductance to be adequately maintained under the most

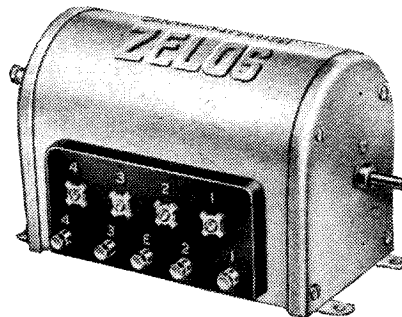
arduous conditions met with in practice. A low D.C. resistance is very necessary in the case of a Class B driver transformer, and the voltage drop across the secondary winding must be kept down to an absolute minimum.

In the Graham Farish Class B transformer the windings are of heavy gauge wire so that the voltage drop during normal operation is negligible.

There is also a "straight" transformer called the "Pip," which sells at the remarkably low figure of 6s. 6d. The "Pip" is a real value-for-money component, and gives surprisingly good results. It is available in ratios of 1·3 and 1·5 and, like the Class B transformer, has a silicon-iron core.

Both of these instruments are attractively housed in a casing of red moulded bakelite, and the terminal connections are clearly marked.

COMPLETELY SCREENED



This four-gang Zelos variable condenser has screening between the individual sections and independent trimmers.

A Well-Designed Valve Holder

The introduction of the Class B valve has created a demand for seven-pin valve holders. The Graham Farish version is obviously the result of much hard thinking combined with practical experience.

The moulding is rectangular in shape and is provided with screw terminals as well as soldering tags. A special feature is the fact that several wires can be easily connected to one terminal. This is a definite advantage from the home-constructor's standpoint, especially since the terminals are designed to handle wires up to $\frac{1}{16}$ inch in diameter. The actual valve-pin contacts are of phosphor-bronze, and there should be no trouble due to poor connection with this valve holder.

Non-Inductive Condensers

Large fixed condensers of the Mansbridge type are now available from the Graham Farish factory. The standard values range from .1 mfd. to 2 mfd. The insulation is extremely high, being 5,000 megohms per microfarad, and this, in conjunction with a power factor as low as .3, ensures a high standard of efficiency.

The non-inductive construction renders these condensers suitable for high-frequency as well as low-frequency circuits. A condenser of the inductive type is, of course, quite ineffective for by-passing high-frequency currents, and it is essential that all decoupling capacities used for H.F. work should possess a negligible inductance. The components we have dealt with are only a very small proportion of the comprehensive range offered by this firm.

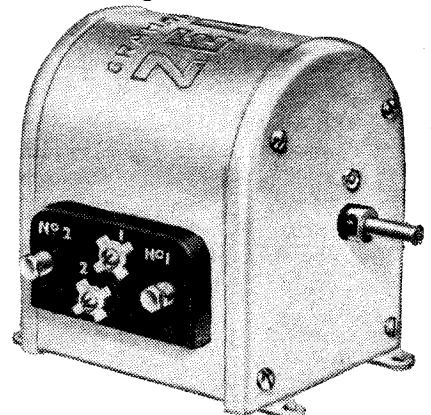
Screened H.F. Chokes

There are, for example, two excellent screened H.F. chokes. One of these incorporates a binocular winding and is particularly suited to parallel-feed H.F. circuits where high inductance and low distributed capacity are of vital importance.

This choke will function satisfactorily over a waveband extending from 12-2,000 metres and has an inductance of 220,000 microhenries.

The single screened choke is designed to operate over the normal broadcast wavebands and works very well indeed as a reaction choke. Both of these chokes functioned admirably in our test circuit. Each of them is provided with an earthing clip to the screen.

A QUALITY JOB



The two-gang Zelos condenser is of similar construction to the four-gang. The trimmers in both cases are of low-minimum and high-maximum capacity.



A PRACTICAL MAN'S CORNER

By R. W. HALLOWS, M.A.

For Escutcheon Mounting

IN the old days the mounting of a variable condenser and its dial was the simplest of operations. You drilled a $\frac{3}{8}$ -in. hole through the panel, passed the spindle bush through this and clamped tight with the fixing nut. You then fitted the dial on to the end of the spindle.

Nowadays most variable condensers have built-in slow-motion mechanism

A HANDY TOOL

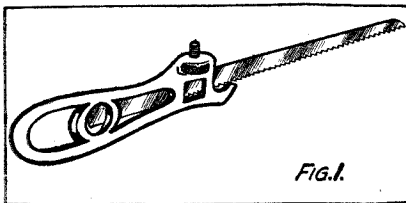


Fig. 1.

This little saw is ideal for cutting holes for the escutcheons of tuning condensers. It is a very useful tool to possess.

and their dials are placed, not in front of the panel, but behind it. Drilling the hole for the spindle and its bush is as easy as ever it was; but cutting out the window for the escutcheon is a business that some constructors find rather difficult.

A handy tool for doing this work is illustrated in Fig. 1. This is known as a pad-saw and it consists of a detachable tapered blade clamped into a skeleton metal handle. A convenient sized saw is one with a blade 10 or 11 in. long over all. This means that about 6 in. of the tapered part protrudes beyond the clamp.

How It Is Used

When you have an escutcheon to fit, here is the best way of going to work. As shown in Fig. 2, mark out on the panel the hole that is to be cut, using for the purpose the template supplied by the condenser

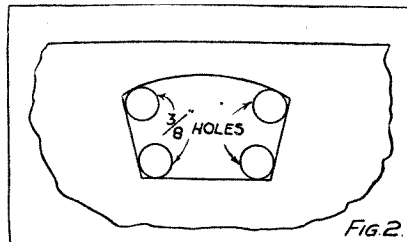
Do you find it troublesome cutting the holes for the escutcheons of tuning condensers? Or perhaps you have a panel that has warped badly, or some other little difficulty for which you cannot find a solution. These and other workshop problems are the subject of this month's article written specially for the radio handy-man.

manufacturer. With a $\frac{3}{8}$ -in. drill make a hole at each corner.

Then with the pad-saw cut along the guide lines that you have drawn. The work can then be trimmed up cleanly with a file.

Pad-saw blades are made for cutting wood, but if you want to use the tool for working ebonite or metal you can easily contrive a suitable blade by grinding one end of the back of a hacksaw blade so as to form a tapered point. Should you not possess

READY FOR THE SAW



Before using the saw a hole should be drilled in each corner of the area marked out for the escutcheon.

an emery wheel of your own, you can get the job done for you at any cycle or motor repair shop for a few pence.

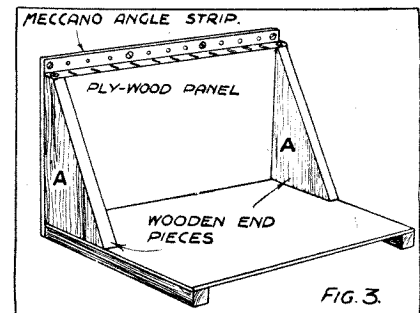
A Plywood Panel Trouble

The thin plywood panels of which so much use is made nowadays has many advantages and only one serious drawback, which is that they

will warp. I am not saying that they always do so, but I have come across a good many that did, and nothing is more annoying than to have the appearance of a set ruined in a week or two by its panel developing a permanent wave.

The liability to warp is largely due to the fact that in many modern sets the panel is supported only by its attachment to the front edge of the baseboard and to the battens underneath the latter if the sub-base method of construction is used. Sometimes small light supporting brackets are used, but the panel is not sufficiently stiffened and it is free to warp more or less as it lists under the influence of sunlight or of damp.

REALLY RIGID



A Meccano strip fitted along the top of the panel will prevent any tendency to warping.

Stiffening It Up

Fig. 3 shows a method of stiffening a plywood panel which I have found most effective. Instead of brackets use wooden end pieces—A, A in Fig. 3. These are cut out in the shape of right-angled triangles and subsequently the apex of each is removed so as to make a "flat" half-an-inch in width upon which rests the horizontal part of a length of Meccano angle strip.

Useful Hints for the Handyman

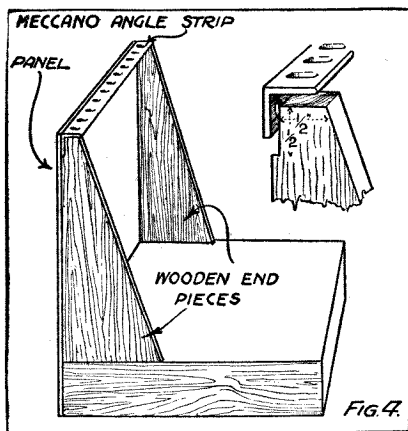
The strip is fixed to the tops of the end pieces by means of screws, and bolts are used to attach it firmly to the top edge of the panel. A moment's consideration will show that a panel treated in this way can hardly fail to retain its shape since it is firmly anchored along all four edges.

An Alternative Method

An alternative method of fitting the top stiffener of Meccano angle strip is illustrated in Fig. 4. Here the flats at the tops of the end pieces come to within one-sixteenth of an inch of the top of the panel, and the first half-inch of the straight side of each end-piece is cut away so as to allow the Meccano strip to lie between it and the inner surface of the panel.

This method will be found useful where components mounted on the panel come within a short distance of its top. If that shown in Fig. 3 is used, the useful height of the back of the panel is reduced by half an inch, whereas the Fig. 4 method leaves the full height available.

WHERE SPACE IS LIMITED



Where panel space is valuable, this method of fixing the Meccano strip may be preferred.

Which ever method is employed, use plenty of screws for fixing the panel to the baseboard, the vertical battens and the vertical edge of the Meccano strip.

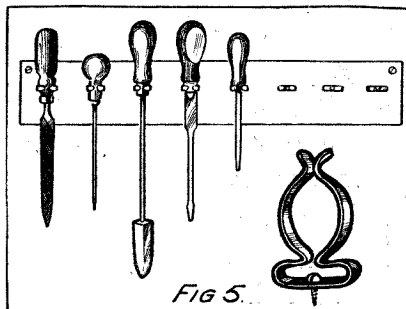
Tidiness Pays

There are two arguments in favour of having a tidy workshop. The first is that if you are tidy you always know where to find any tool that you may want—you don't have to look

for your countersink underneath a layer of junk.

This argument will probably not make any very strong appeal to the majority of men, who usually answer it by saying, "My bench may look

ARRANGED IN CLIPS



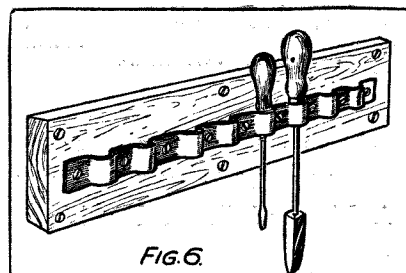
Individual clips for each tool certainly look very neat, and they are quite inexpensive to buy.

untidy, but I know exactly how to put my hand on anything that I want." And, generally speaking, this is more or less true. A second and much more cogent argument is that if you put your tools away neatly after use, and do not leave them knocking about, they do not run the risk of being damaged.

Most of us, I expect, have learnt by experience how easily a "bite" can be taken out of the blade of a good chisel if other tools find their way on top of it. A similar lack of method results in the breakage of small files, the bending of saw blades, and many other casualties which require either time or money, or both, for their repair.

The best methods of ensuring that your tools are kept out of harm's way is to make a rack for them—and to discipline yourself into using it. There are many ways of making tool racks. One of the most convenient is illus-

MADE FROM A STRAP



If you have an old leather strap, a very convenient tool rack can be made as shown here.

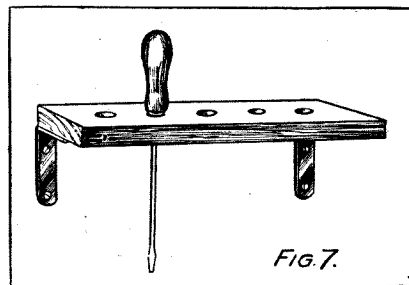
trated in Fig. 5. A number of spring clips of various sizes are screwed to a piece of $\frac{3}{4}$ -in. board, which is fixed by screws to the wall of the workshop.

The spring clips are obtainable at most big tool shops and their cost is surprisingly small. They are available in a large variety of sizes suitable for holding tools from the smallest file to the largest soldering iron or screw-driver. The construction of a rack on the lines illustrated in Fig. 5 can be undertaken in an odd spare hour, and it will well repay the trouble and expense.

Clipless Tool Racks

If you cannot obtain the spring clips, or do not see the force of spending money upon them, clipless tool racks can be contrived quite easily. You are sure, for instance, to have about the house an old leather or webbing strap.

A SIMPLE SCHEME



With the aid of a pair of brackets and a piece of wood, still another design can be made.

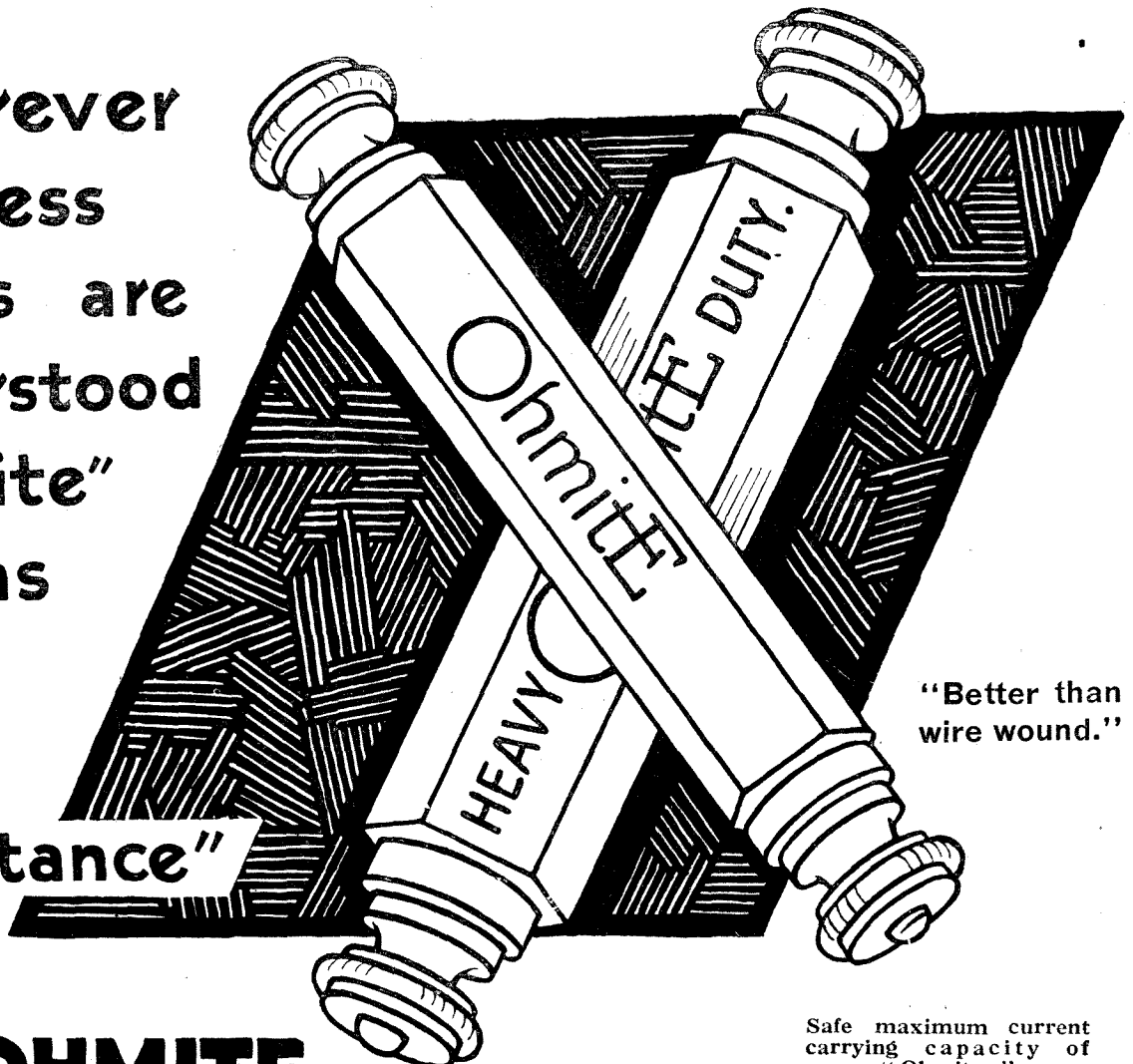
Cut off the buckle and the point. Fix one end of the strap with a wood-screw either directly to the wall, or to a piece of board about 4 in. in width, as shown at Fig. 6. Then with other wood-screws make small pockets in the strap, each just large enough to take the tool for which it is intended.

With Board and Brackets

Those who do not care about the strap-and-pocket method may prefer the tool rack made from a piece of $\frac{1}{2}$ -in. board about 3 in. in width, which is fixed to the wall of the workshop by means of small angle brackets.

This is illustrated in Fig. 7 and its construction is simplicity itself. Cut out a piece of board of the width mentioned and of any required length, and with the brace make in it holes of diameters suitable for the tools which the rack is going to contain.

Wherever
wireless
terms are
understood
"Ohmite"
means
"The
Best
Resistance"



"Better than wire wound."

OHMITE RESISTANCES

The most popular and efficient type of fixed resistance for all general purposes. "Better than wire wound." All values, 50 ohms to 5 megohms.

HEAVY DUTY TYPE 2/3

1/6

GRAHAM FARISH PRODUCTS



Safe maximum current carrying capacity of "Ohmites."

100° F Temperature Rise			
Ohms.	Milliamps.	Ohms.	Milliamps.
1,000	40	20,000	8
2,000	35	30,000	6-75
3,000	29	40,000	6
4,000	24	50,000	5-5
5,000	20-25	60,000	5
10,000	12	80,000	4-24
Other values pro rata		100,000	3-5

Safe maximum current carrying capacity of "Ohmites" Heavy Duty Type.

100° F Temperature Rise			
Ohms.	Milliamps.	Ohms.	Milliamps.
1,000	80	20,000	16
2,000	70	30,000	13-5
3,000	58	40,000	12
4,000	48	50,000	11
5,000	40-5	60,000	10
10,000	24	80,000	8-43
Other values pro rata		100,000	7

Ensure a safe and efficient Aerial and Earth. The new AEROFICIENT KIT provides all you need. Complete 6/6
Send a postcard for our new Catalogue, which describes all our products.

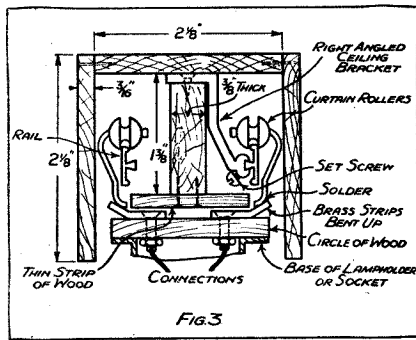


A SLIDING MAINS CONNECTOR

You can make this useful workshop fitting for half-a-crown.

You may have all kinds of things you would like to connect to the mains but cannot, because you have no plug near enough. With the apparatus I am about to describe, all these troubles will vanish.

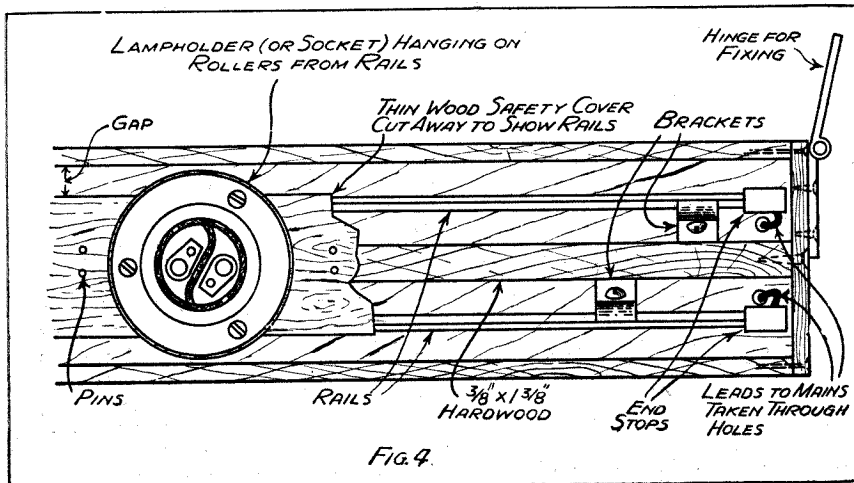
Practically all the parts can be obtained from your local Woolworth stores. They consist of two lengths of curtain rail (make VAB) section as A in Fig. 2; any length can be obtained, but 30 in. is the best size for an average bench.



DIMENSIONAL DATA

This end-on section shows clearly how the "carrier" runs on the curtain rails. Construction is commenced by marking on a strip of wood the dimensions of Fig. 1, while further leading measurements are given below in Fig. 4.

- 6 right-angle ceiling fixing pieces.
- 2 curtain rail end stops.
- 1 pair curtain rollers (as Fig. 2 (B)), for each holder required.
- 1 strip of hard wood, 31 in. \times 1 3/8 in. \times 3/8 in. approx.
- 3 strips of hard wood, 31 in. \times 2 1/8 in. \times 3/16 in., and 2 strips 2 1/2 in. \times 2 1/8 in. \times 3/16 in.



1 strip of very thin wood, 31 in. \times 1 1/2 in. \times 1/16 in.

6 1/2 in. No. 4 wood screws.
 1 piece of 3-ply, about 6 in. square, as many holders and plugs as required, and a few pieces of brass, 1/4 in. wide. The actual construction may be commenced by taking the 3/8" strip of wood and marking on it the positions of the brackets, as Fig. 1. These must be cut out so that the tops of the brackets are flush with the surface.

The brackets may now be fixed, as Figs. 1 and 3, and the rails slipped through and fastened to set screws. The end stops can now be fitted and have the mains lead soldered to them.

The construction of the wooden case can now be commenced by pinning the three pieces of wood, 31 in. \times 2 1/8 in., together, as Fig. 3; one end piece can also be fitted.

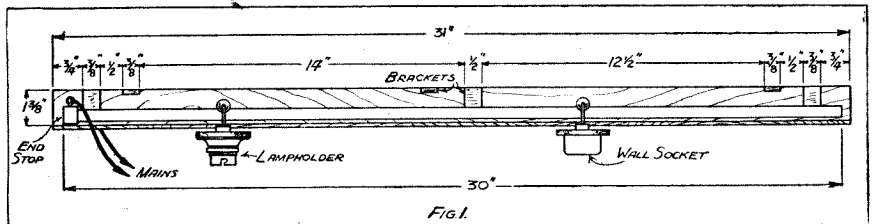
Fitting It Together

The thin strip of wood, 31 in. \times 1 1/2 in., can be pinned to the hard wood strip so that it just clears the bottom of the rails (see Fig. 3).

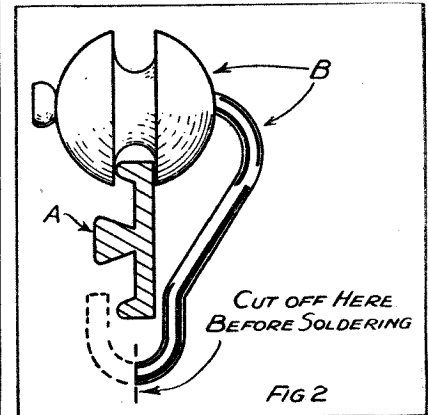
The whole is then fitted into the box with the thin piece of wood on top, and screwed so that both gaps are equal, not forgetting to drill two holes in the bottom of the box to take the mains lead (see Fig. 4).

The remaining piece of wood, 2 1/2 in. \times 2 1/8 in., can be hinged on to the other end of the box and will form a very convenient way of changing the order of the plugs on the rails.

Figs. 3 and 4 clearly show the position of all parts.



The actual fixing must be left to the reader, but a strong hinge fitted to the mains end of the box is the best method. The apparatus can then be screwed to a vertical batten at about 3 ft. above the bench, when it can be swung out over the bench to



The bottom loops of the rollers are cut off as shown here.

give light to work on the floor, if necessary.

There only remains now to arrange the lampholders, etc., so that they run steadily on the rails. Most important of all, they must be rigid with respect to their rollers.

The best way to do this is to cut a circle of 3-ply wood to fit exactly the base of the holder; should it be a lamp socket, two holes to take 4B.A. bolts should be drilled 1/2 in. apart, equally spaced from the centre; two strips of brass, 3/4 in. \times 1/4 in. \times 1/16 in. or 1/32 in., should then be cut. One end of each is drilled and countersunk to take

the 4B.A. bolts, the other turned up and assembled as in Fig. 3. The rollers, after having the bottom loop cut off as Fig. 2, can then be soldered to these strips, taking care to see that the wheels are correctly spaced to run nicely on the rails. Wires can then be soldered to the nuts of the 4B.A. screws and the holder fitted in the usual way.

In conclusion, there are just two things to mention: Don't oil the rollers to make them run easily, they should do so if they are in line; oil will spoil the contact.

It is also wise to scrape the top of the runners, as lacquer is sometimes used on these.



How to make A TELE-VIEWER FOR 30¢

The high cost of commercial television apparatus has prevented many an interested constructor from investigating the fascinating field of optical reception. In this article our ingenious contributor, Mr. H. Pratt, aims at providing a solution to the "economics" of "looking-in."

IT is not generally known that television pictures are being picked up and enjoyed on comparatively simple apparatus, and it is with a view to exploding the theory that this experimental field is confined to the expert or the enthusiast with money to burn, that this article has been written.

The accompanying list of components includes the major items required; the remaining parts, such as screws, wire, brackets, and tin, etc., were salvaged from the junk-box plus a

A 5-ohm variable resistance (a relic from the "bright-emitter" days) is connected in series with the motor as a speed control, and as the disc must be run in exact synchronism with the transmitter and maintained at 750 r.p.m., a 400-ohm potentiometer with a flash-lamp bulb in series was connected in parallel with this, and gives vernier control once the speed is obtained roughly with the 5-ohm control.

With a little practice no trouble is experienced in holding a picture in

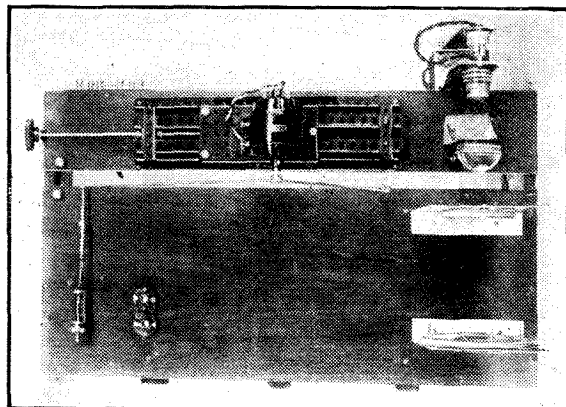
view with this, but if there is any tendency to "hunting," a greater degree of control can be obtained by arranging a simple string friction brake as shown in Fig. 6.

As an alternative drive for the disc it is possible to pick up small fan or vacuum-cleaner motors cheaply, and one of these could be pressed into service and run direct off the house supply with a suitable speed control resistance in series.

The Neon Lamp

The neon lamp used is an Osglim Indicator, having a flat circular disc electrode encircled by a narrow tubular element, and priced at 3s. 6d., obtainable from G.E.C. The glow from this lamp is localised to the top end of the bulb, and the disc electrode is not obscured by the outer element as in the beehive type of neon, which can be used as an alternative, but requires plenty of "juice" to operate it.

The indicator neon is rated at 250 volts, 5 watts, but will "strike" and glow quite well at 175-180 volts,



CONSTRUCTIONAL DETAILS

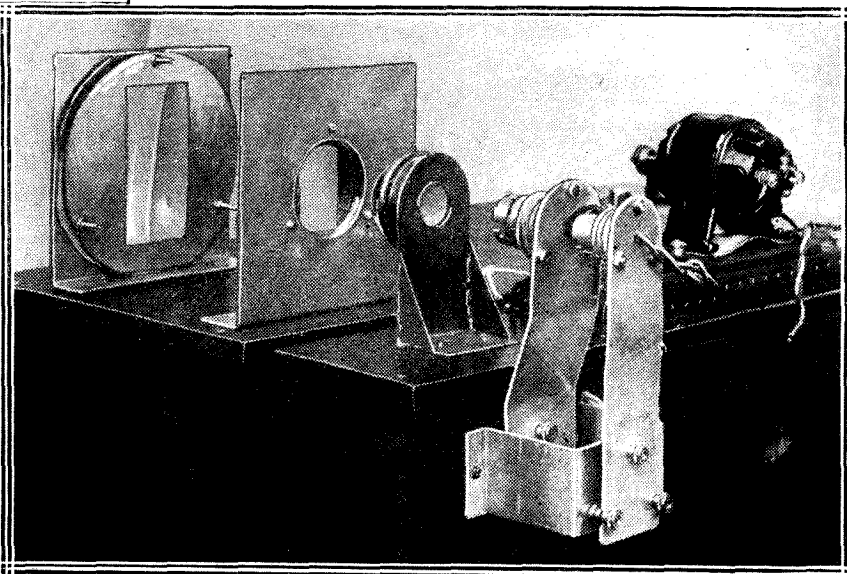
The bird's-eye view to the left of the apparatus shows clearly the disposition of the driving motor, scanning disc and optical gear. A "close-up" of the latter below shows how the neon lamp is held and how a "bullseye" lens is interposed between the lamp and disc.

little light-fingered pilfering from the "eldest's" Meccano kit.

To deal with the motor first, the actual model used is a small enclosed 3-pole armature, 4-6 volt D.C. series wound, of the type to be found in most toy shops, for driving Meccano models, etc., at a price ranging from 10s. to 15s.

Run On Raw A.C.

Although rated for use with a 6-volt accumulator, these motors will run quite well on raw A.C. obtained from the town supply (240-260 volts, 40-50 cycle) via a small 4- or 6-volt transformer of the type used for valve cathode heating in mains-driven receivers or in A.C. converters for accumulator charging.



No Trouble is Experienced in Holding a Picture

consuming less than 2 milliamps., and does not add much to the loading on a battery-operated receiver. These lamps have internal resistances inside the brass cap, and with some circuits better results are obtained by removing this resistance altogether, which can be done by carefully cutting round the brass cap with hacksaw or file.

Lamp Mounting

However, this necessitates special methods of mounting and connecting up afterwards, and should only be resorted to if the lamp will not function otherwise. The lamp can be normally mounted as shown in the general arrangement, Fig. 2, in a standard batten type holder (Woolworth), and is easily accessible for changing round for reversal of polarity or trial of different types of neon lamps.

A 50,000-ohm variable resistance is connected in series with the neon,

and controls the glow intensity and sharpness of image.

Neon-Tube Voltage

It is advisable to apply 190-200 volts to the neon with this resistance all out, ensuring that the lamp will strike and glow, the resistance then being brought in until the neon is working at its most sensitive point.

The scanning disc is perhaps the most important item in the televiewer, and requires patience and care in preparation. Several discs were tried before finally arriving at the sizes shown in Fig. 1. The 14-in. disc was cut from .018 sheet aluminium and made lighter by cutting the material away as shown. The disc may be a trifle "floppy" when stationary, but spins dead true at speed.

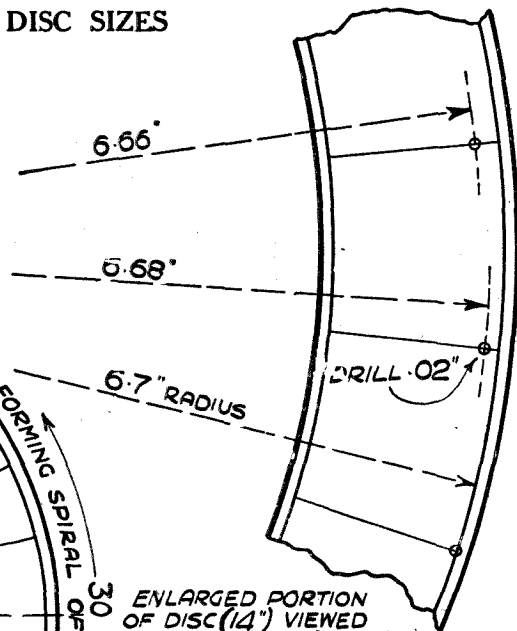
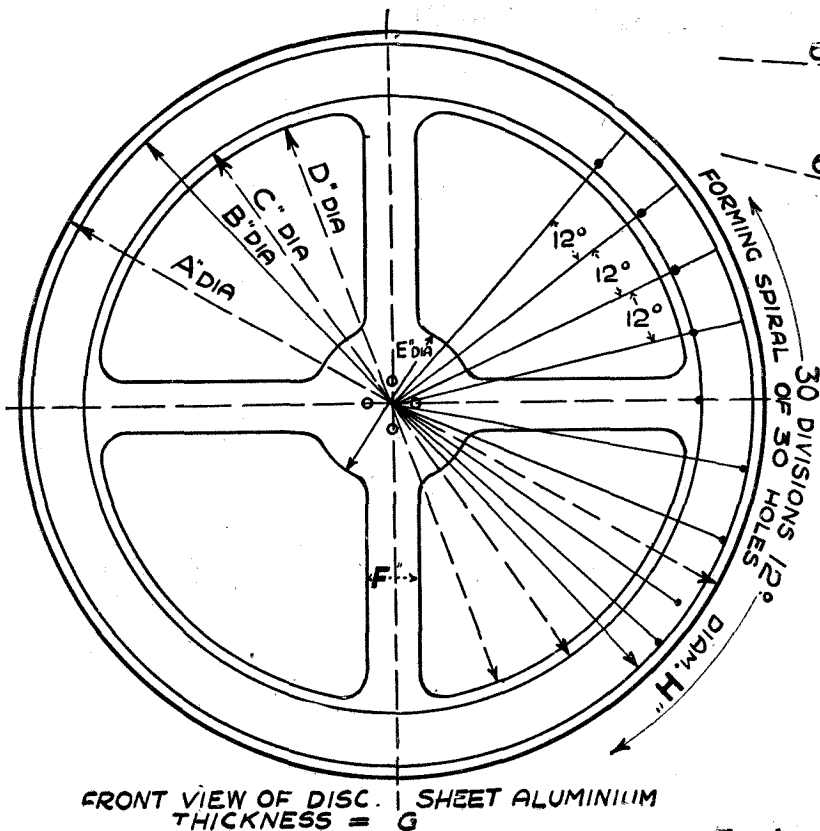
The pin-hole centres are marked off as shown with a pair of divider points, a centre punch mark being made at each intersection and then drilled with .02-in. drill, great care being taken to ensure that each hole is dead on its respective centre line. The round holes can then be made square by means of a .02-in. x .02-in. square punch made from a darning needle softened at the end and filed up square.

Square Holes Best

Quite good results can be obtained with the holes left as drilled, without squaring, but a brighter image and better detail results from the squared hole. The disc is mounted true on the motor shaft by means of a Meccano wheel having a set screw for gripping in position. Alternative sizes are

SCANNING DISC SIZES

The successful reception of clearly defined images is dependent on correctly drilling the scanning disc. Instructions are given here for two sizes of disc and two different transmission methods.

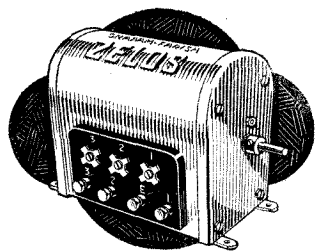
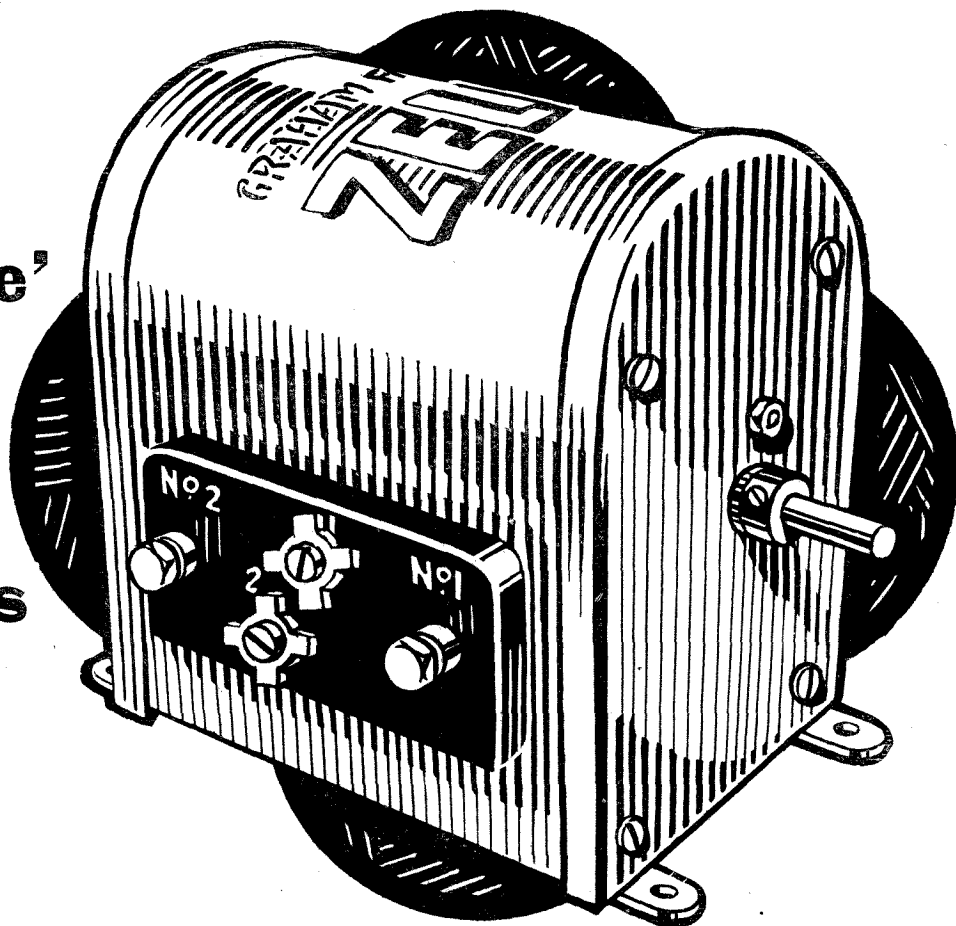


ENLARGED PORTION OF DISC (14") VIEWED FROM BEHIND. REDUCTION OF RADIUS TO EACH ADJACENT HOLE = H (DRILL FIRST HOLE ON DIAMETER B)

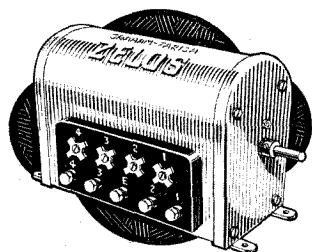
BAIRD SYSTEM	KEY LETTER	CONTINENTAL PICTURE SIZE	BAIRD SYSTEM
SIZES FOR 14" DISC		SIZES FOR 15" DISC	SIZES FOR 20" DISC
14" DIA	A	14 1/4" DIA	19 1/4" DIA
13.4"	B	14" "	19" "
12.2"	C	12 3/8" "	17.2" "
11.75"	D	11 5/16" "	16 3/4" "
3"	E	3" "	4" "
1" "	F	1" "	1/2" "
.018"	G	.018" "	.012" "
.02" DRILL	H	1/32" "	.03" DRILL

FIG 1

The
 'Rolls Royce'
 of
 Condensers



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 CONDENSER - - 19/6**



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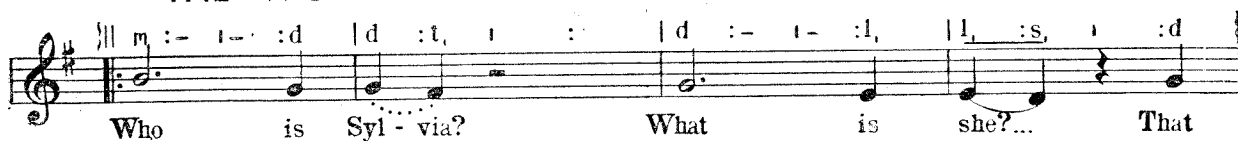
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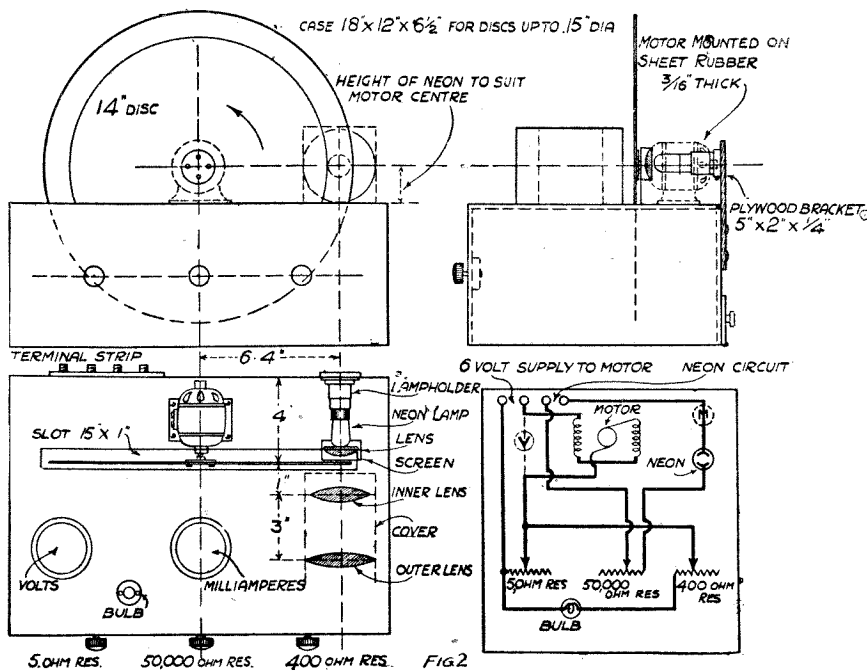
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Two or Three Persons Can Watch in Comfort



given for a larger disc (provided the motor obtained can handle this), which gives a bigger image and improved detail.

It should be mentioned here that, looking from the front of the televiewer, the disc *must* be rotated *anti-clockwise*. The neon lamp is behind the disc to the right of the motor, and the disc *must* be so attached to the motor that the line of holes commences to pass the neon at the bottom right-hand edge, and finishes at the top left-hand edge, looking from the front.

Enlarging Lenses

As the glowing plate in the neon indicator lamp is only approximately $\frac{5}{8}$ -in. diameter—and this is small for magnifying up to a reasonable picture,—a “bullseye” glass (Plano convex lens), approximately 2-in. diameter, removed from an old flashlamp was introduced between the neon bulb and the disc. This enlarged the glow considerably, and it was then necessary to place a screen having an aperture 1 in. wide and 2 in. high between the lens and the disc. If the disc be now rotated with the neon glowing, the spiral of dots gradually forms into a glowing oblong as the speed is increased.

By arranging a system of double-convex lenses in front of the disc opposite the neon, the image can be

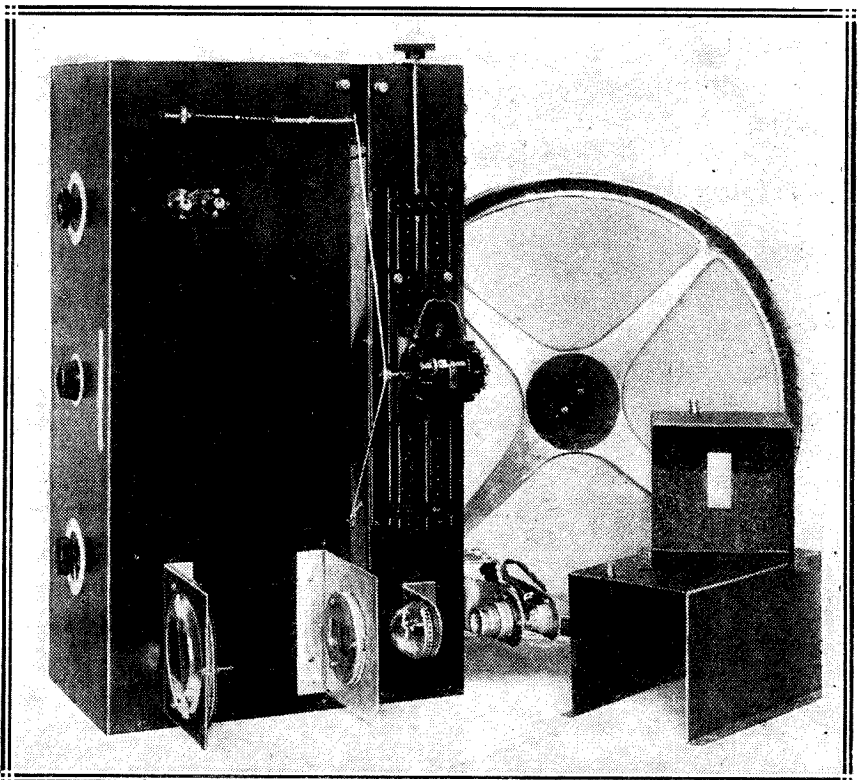
magnified up to a size convenient for two or three persons to watch with comfort in a semi-darkened room. In the original model two reading glasses (both by Woolworth) gave ample magnification for experimental purposes, but a later improvement in the shape of a 5-in. diameter outer lens gave much larger pictures, the whole being covered in and partitioned off to exclude external light.

Mounting the Parts

An inverted wooden box is suitable for mounting the whole of the apparatus on—a slot of suitable size being cut in the top to accommodate the scanning disc. In the model shown the motor is mounted on an adjustable rack bed, built from Meccano parts; but this is not essential, and only for convenience in experimenting with various disc sizes from 13 in. to 21 in. in diameter. Interchangeable extension brackets are also included to accommodate various types of neon lamps.

The building up of an experimental televiewer on the lines suggested above should present no difficulties to the radio enthusiast, but a few notes on alternative methods of connecting up the neon to the receiver and the

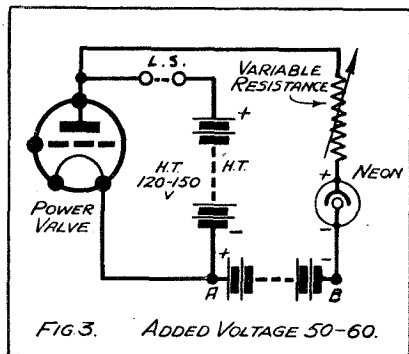
The general arrangement of the televiewer is shown diagrammatically above, together with a theoretical outline of the simple wiring. The method of arranging two lenses if desired, to give an increased size of picture, is clearly seen in the photograph below which shows the complete apparatus with the disc and covers removed.



Hand-Operated Speed Control is Ample

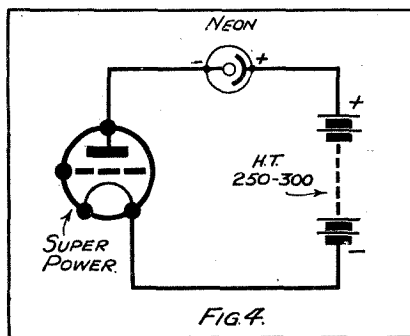
general operation of the set may not be amiss.

Fig. 3 is a circuit diagram showing the simplest method of connecting up to the output valve, the neon lamp bridging the loudspeaker and H.T. battery. If it is not desirable to apply 180 volts or more to the output valve plate (only super-power type valves will carry this with 15 or more volts G.B.), extra voltage for striking and operating the neon lamp can be applied at A B.



A simple method of connecting to the receiver.

With this circuit the neon will flicker nicely on moderate signals, but is rather prone to overloading, giving a very distorted image on strong signals. With some receiver circuits difficulty is sometimes ex-



If the output valve takes 250-300 volts H.T., this form of connection is practicable.

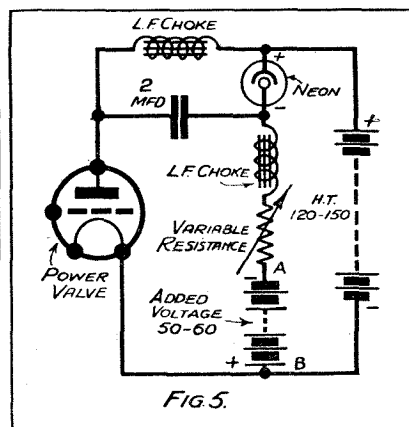
perienced with reverse or negative images—i.e. black objects appearing bright and vice-versa, and it is then necessary to reverse either the primary or secondary (not both) connections to one of the intervalve L.F. transformers.

Reversing Phase

If the receiver be of the resistance-coupled L.F. type, the only cures are either one stage R.C. to be added or subtracted, whichever is practicable, or, alternatively, if grid-leak rectification is used at the detector stage, change to anode bend. It might be mentioned here that the anode-bend method appears to be best for television, as it does not readily lead to over-modulation of the neon lamp.

Another method of connecting is shown at Fig. 4, but a super-power output valve in the last stage of the receiver is essential and an H.T. voltage of 250 upwards is required, so that this only becomes practicable for use with mains-driven receivers maintaining about 1½ watts output.

In the writer's experience the circuit shown at Fig. 5 was found to give the best results. Two matched L.F. chokes should be used, but actually a pair of disused L.F. transformers with their respective primary windings only, connected in circuit, gave quite good results. The neon striking



This slightly more complicated output circuit gives excellent results.

voltage can be readily varied without interfering with H.T. supply to the output valve and corresponding G.B. adjustment.

The Operation

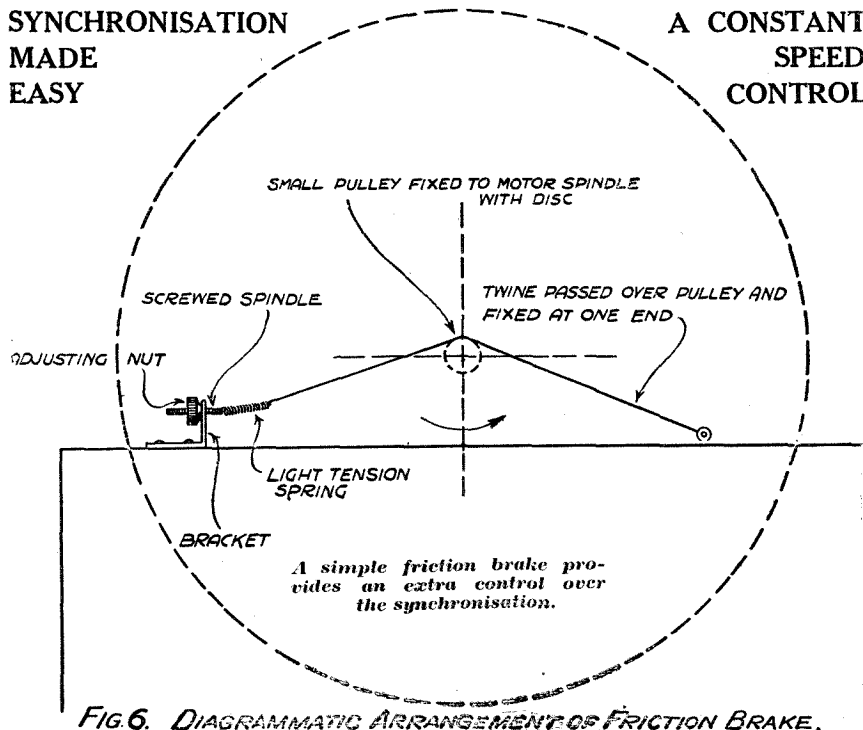
Now, with regard to the actual operation of the tele-viewer, the receiver should first be tuned on the loudspeaker to the television signals given from London National on 261 metres from 11.0 to 11.30 p.m. every Monday, Tuesday, Wednesday and Friday, the sound (speech and music) being transmitted simultaneously from Midland Regional. (As a matter of fact, the writer starts up about 10.45, and has the neon flickering merrily on speech or music in readiness for the actual transmissions. This is a very useful guide to the correct functioning of the neon, and some amusing patterns appear in the tele-viewer with dance music.)

A signal of reasonable strength coming from the loudspeaker, the output is then switched over to the

(Please turn to page 43)

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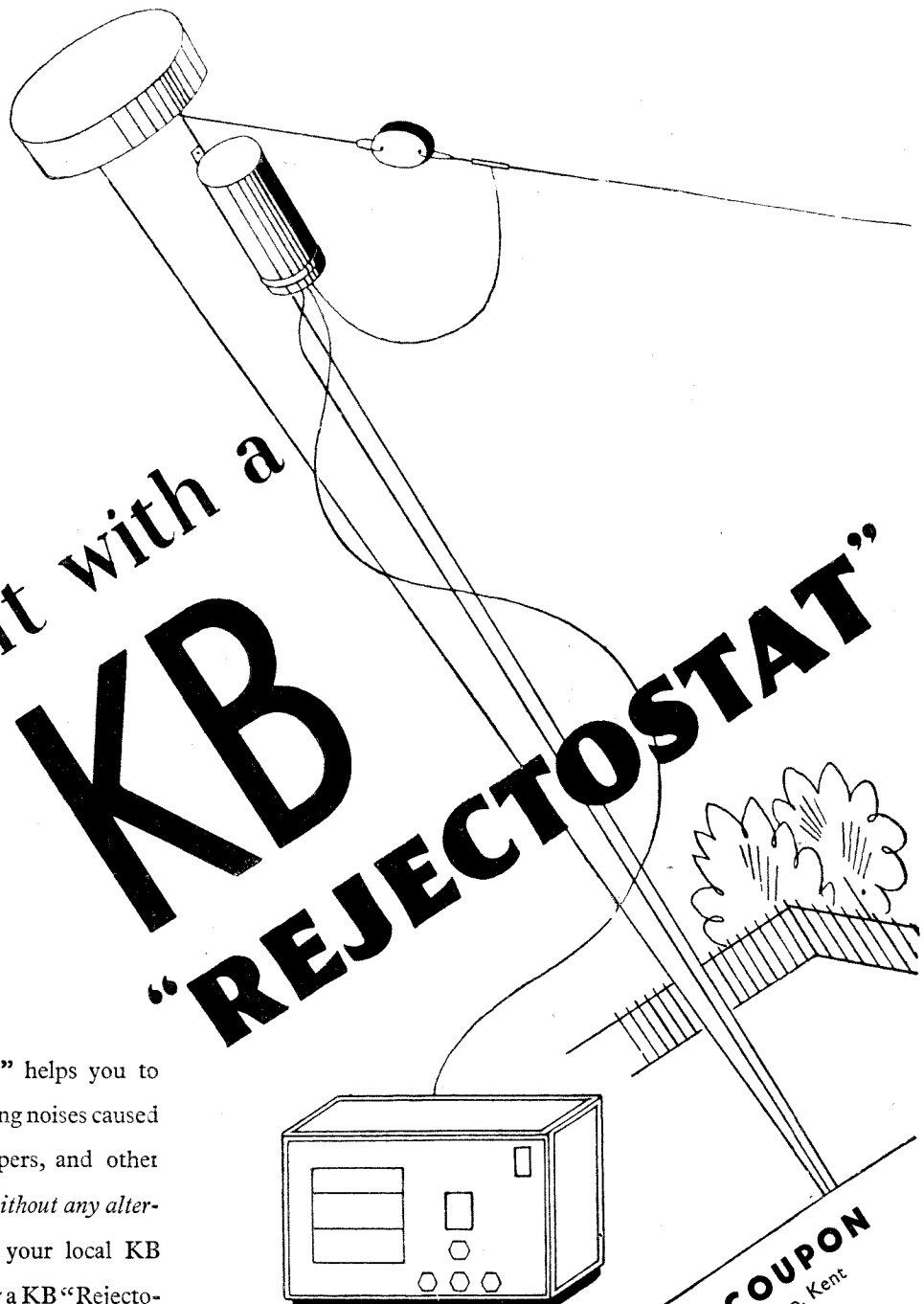
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QUESTIONS I Am Asked

by **JOHN
SCOTT-
TAGGART**

Q. 54. Why have the anode volts of an S.G. valve always to be higher than the screen voltage?

A. Because if the anode voltage is the lower, an awkward part of the characteristic curve is reached. A decrease of anode voltage will then produce an *increase* of anode current and vice-versa. This is called a negative resistance effect. The valve is acting in a way opposite to that of an ordinary resistance, and if there is an inductive circuit in the anode circuit (e.g. as is usual in H.F. amplification), continuous oscillations will normally be produced by the valve.

The effect is deliberately obtained in certain types of wavemeters.

Q. 55. How can I stop H.F. currents getting into the L.F. part of a set?

A. By a push-pull detector, or by means of a filter in the anode circuit of the detector or the grid circuit of the first L.F. valve.

The filter consists of an H.F. choke coil next to the anode of the detector valve. A condenser of, say, .0003 mfd. is connected across anode and filament (or cathode). A similar condenser may, in addition, be connected between the *other* side of the H.F. choke and the filament.

Two or more such filters could be connected in series if desired, although this is not usual. The condensers will in all cases cause some reduction not only of the H.F. leakage currents, but of the higher L.F. notes desired; hence the desirability of not using condensers of too high a capacitance.

It is to be noted that the filter scheme works more effectively on the medium than the long waveband.

A special form of filter consists of a "grid stopper," which is a plain resistance of, say, 100,000 ohms con-

nected between the grid of the L.F. amplifier and the grid end of the L.F. transformer. This resistance and the grid to filament capacity of the valve form a potential divider with the grid connected between the two parts. The voltage "tapped off" is small for high frequencies, but in the case of L.F. the reactance of the capacity is very high, and practically the full L.F. voltages are applied to the grid.

Q. 56. What is your opinion of the various patent aerials the size of an orange and which claim to give such remarkable signal strength and selectivity?

A. Unprintable. Prefer oranges.

World famous as a radio consultant, Mr. John Scott-Taggart puts his ability and unique experience at your disposal in furnishing month by month answers to readers' queries which are of interest to fellow radio enthusiasts.

Q. 57. What are the merits of the various multi-electrode valves which are proving so popular?

A. I doubt if they are, except amongst the set manufacturers. They economise in space, but there is rarely any technical superiority over the use of separate valves. Putting valves all into one bulb is rather like putting all your eggs into one basket. If the basket is safe, well and good. The average constructor and experimenter will prefer to keep his valves separate. There is really no limit to the compression of gadgets into a vacuum. Resistances and condensers have been inserted, although this may result in technical advantages due to a reduction in stray capacities. In the case of a Class B valve the same vacuum, and probably similar filament, makes for better matching and uniformity.

Q. 58. What is squegging? I can find no explanation of this anywhere.

A. Useful slang term invented during the late war to describe the low-frequency note heard when reaction is excessive in a wireless receiver; the squegger-effect is due to rectification by a leaky-grid condenser of the H.F. oscillations generated by the valve. The rectification process results in the building up of a high negative potential on the grid of the valve. If the leak resistance is of too high a value, the negative potential on the grid will build up until the valve will no longer generate oscillations. When the valve stops oscillating, the negative charge on the grid leaks away until the grid potential becomes more normal. The valve then starts oscillating again, the grid chokes up once more and the whole process is repeated at regular intervals, which may be almost any value from half a minute to a twenty-thousandth of a second.

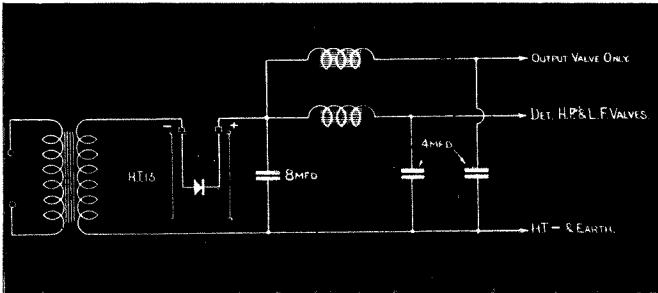
A regular series of plonks or a musical note is the symptom of squegging or squegging. The trouble is experienced in an ordinary receiver when certain kinds of disconnections or bad contacts exist, e.g. when there is no grid leak.

The use of too big a grid resistance will cause squegger action, since the negative charge is built up on the grid and cannot escape. The lower the resistance the higher the squegger note, until, if we make the resistance sufficiently low the squegger effect ceases.

The origin of the term is as follows: The change in note for different resistances provides a rough means of estimating high resistance values. There is an instrument called a Megger for doing this accurately. The word squegger is an abbreviation of squeaking-Megger.

The idea may be used for a rough estimation of very high resistance leakage paths.

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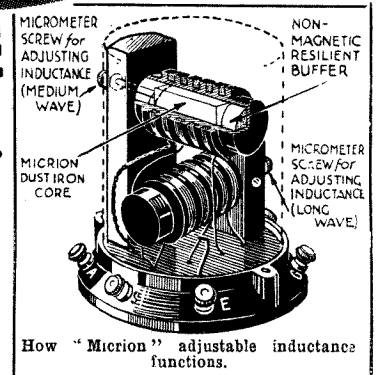
12/6

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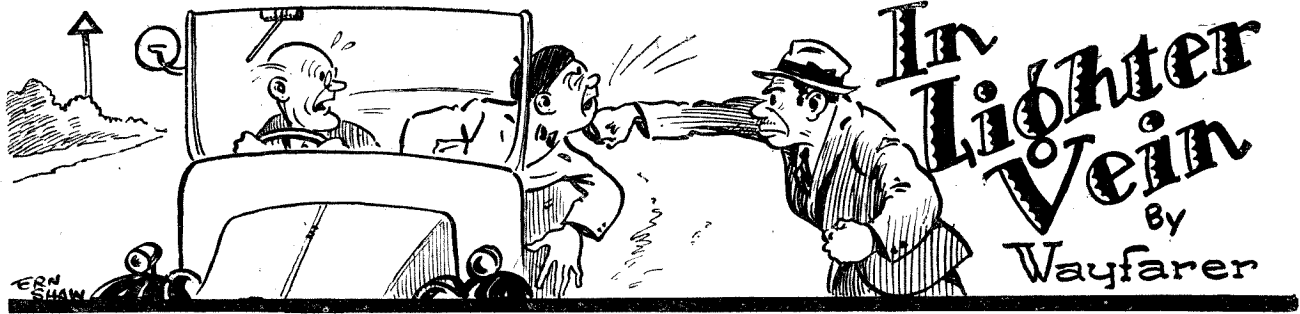
PARTICULARLY DOES THIS APPLY TO CONSTRUCTORS WHO HAVE BUILT SETS WITH THE FAMOUS AND POPULAR DUAL-RANGE COIL

which, although in its day giving truly remarkable results, is now superseded by the "Micrion" Coil, that is designed for modern broadcasting conditions that now render older coils obsolete.

The "Micrion" Coil replaces all existing coils without alteration of the circuit, and thus renders old sets modern without costly and difficult alterations to the circuit and calibration.

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THE MICRION FOLDER**





It is very difficult for brain-workers such as the Professor and myself to convince others of the magnitude of our labours. Just because they see us strolling about the streets or sitting on the lawn in deck chairs at times when others are cooped up in offices they have the idea that we never do a stroke. Ah me, could the unbelievers but realise the hours of unremitting toil that we put in at times when they are sleeping soundly in their beds, or galumphing on the tennis courts, or swopping lies about the fish that they nearly caught and the holes that they almost did in two under par.

RADIO RESEARCH!



"—my best inventions are thought out in bed."

Genius cannot be tied down to hard and fast hours of labour or to fixed places such as the desk or the laboratory. Much of my best work is done before breakfast, and to allow ample time for it, I generally partake of this meal at about noon. Believe me or believe me not, some of my finest inspirations occur and some of my best inventions are thought out as I lie in bed between the hours of 9 and 11.30 a.m.

The Brain-Workers' Burden

The Professor always claims that his best work is done in his bath, though Mrs. Goop, who has a nasty way of looking behind his ears, maintains that there is still room for improvement. When I mention that the Professor always takes his bath upon the fifth Saturday in the month, you will admit that he keeps his nose, if not to the grindstone, at any rate, to the loofah.

We brain-workers are seldom able to take the holidays that we deserve.

The Professor and Wayfarer, who are always very keen on combining work with pleasure, decide to take a trip to the West Country to investigate field strengths in that area. You will find their adventures most amusing, and as in most of their escapades they come to a very "sticky" end.

The rest of the world, like you, dear reader, just goes for a carefree vacation as a matter of course. We thinkers must ever take our labours with us wherever our vile bodies may go. For more than ten years the Professor and I have never had a genuine holiday. An occasional day off, yes; but never more than five per week. An odd trip to the seaside or the mountains or moors, true; but since the hotels that we visited had invariably comfortable beds and an ample supply of baths, neither of us could refrain from working.

Editors are Like That

This year we decided to take a complete, if somewhat belated, holiday. The idea was that we should make a trip to the West Country in the Professor's baby car, which is, of course, fitted with a built-in wireless set.

Here I am sorry to have to report a regrettable attitude on the part of the Editor. Seeing that our trip offered a wonderful opportunity for THE WIRELESS CONSTRUCTOR, we wrote suggesting that in return for our expenses and a nominal fee of twenty guineas per week per head we would be happy to supply him with a com-

"SPILLING THE BEANS"



P.-c. Mugglewump might gain promotion.

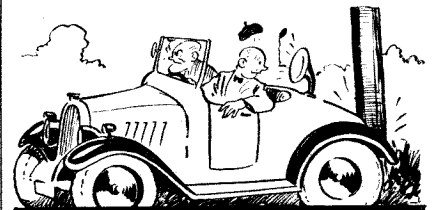
plete report upon the B.B.C.'s service in Devon and Cornwall. You will hardly believe it when I tell you that no reply was received to this letter, and when I telephoned to the Editor he told me to go to a place much farther away.

Most unfair I call it when others who construct far fewer sets for THE WIRELESS CONSTRUCTOR are allowed to go flapping all over the place in aeroplanes and things. I name no names.

Grist to the Mill

Despite the fact that our excellent scheme had gone west, we were quite determined that we ourselves would do likewise. Raising the wind was as usual somewhat of a problem, but we managed rather skilfully by selling half-crown tickets in a raffle for a ten-valve superheterodyne. Having collected £27 17s. 6d. for tickets, I suggested to P.-c. Mugglewump that he might gain promotion by investigating a local infringement of the Gaming

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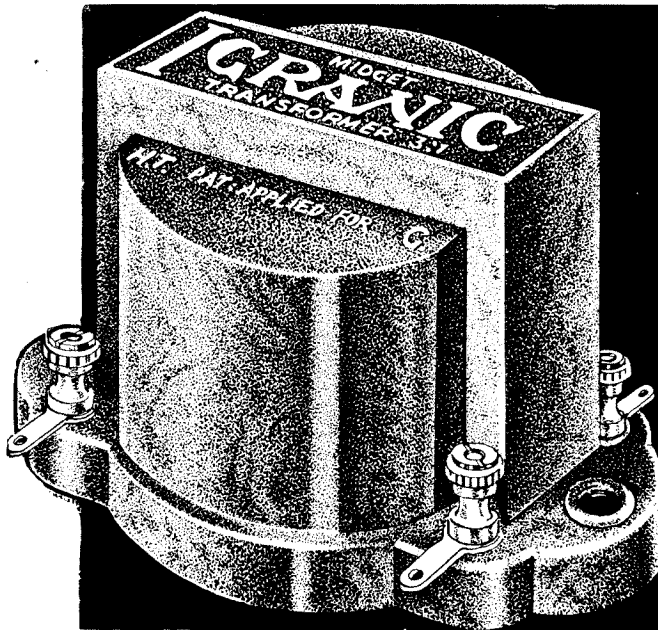
Act, and whilst he was still investigating, the Professor and I took the Great West Road.

Our start was timed theoretically for 10 a.m., but as I had still a good deal of work to clear up I did not have breakfast until two o'clock. However, by 4 p.m. we were well away, en route for the glorious West Countree.

What a pity it is that these motor bandit fellows have done so much to spoil touring these days. Uncertain of our way, we stopped and inquired from a pedestrian.

"Andover?" I queried.

"Sorry, I'm rather 'ard of 'earing," was the reply.



A Transformer I purchased in February 1925 is still in constant use and as good as ever . . . My slogan after all these years is "Once a user of Igranic, always a user of Igranic."
"Igranic Enthusiast," Leyland, Lancs.

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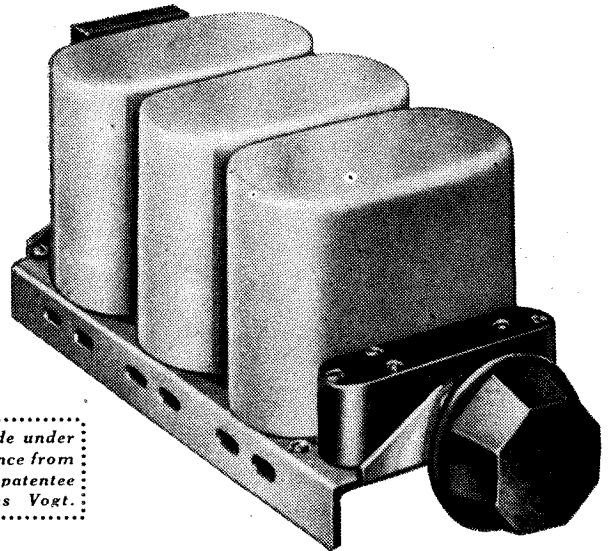
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CVS—55

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"They are the finest job Colvern have ever turned out"

writes one constructor



Made under licence from the patentee Hans Vogt.

It is impossible to tell you here all about Ferrocart Coils, so we have written a booklet explaining their advantages May we send you a copy? It's free!

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In Lighter Vein—continued

“ANDOVER?” I bellowed.
 “I’ll be danged if I do!” he shouted, catching me a swat that left me seeing stars until Stonehenge was far behind.

We started our investigations into the field strength of Washford Cross a little beyond Ilminster. This proved to be eminently satisfactory, working out at 50 volts per millimetre or 50 milli-volts per metre, I cannot remember which offhand. At any rate, we were able to listen to a thrilling talk on the “Digestive Troubles of the Dog Fish.” This only shows you how essential it is to have a wireless set fitted to your car nowadays.

Noises “Off.”

What with history lessons for schools and cookery hints and things, there is never a dull moment during the afternoons.

The Professor’s car set, by the way, embodies a number of novel and highly ingenious inventions. He has completely overcome the trouble of noisiness from the ignition system in a simple but highly effective manner. On the dashboard of the car there is a small switch labelled “ON” and “OFF.” On turning this to the “OFF” position, interfering noises from the ignition system immediately stop. The car does, too, of course, but the programmes are

much more enjoyable if one listens to them at rest instead of tearing along at forty miles an hour.

The set incorporates a gramophone portion, the turntable of which is worked by means of a belt running in a pulley on the propeller shaft. It is astonishing what snappy variations can be introduced by changing gear, and some records of the most modern type of music sound a great deal better when the car is put into reverse.

SOUND ADVICE



“—lorries are not nice things to hit.”

Meantime our investigations into the service area of the West Regional and West National stations were going ahead like anything. One very curious phenomenon was a great puzzle to us for a long time. We found that the farther West we got, the smaller was the field strength of the Washford Cross transmitters. With the aid of a slide rule and a set of log tables the Professor did elaborate calculations to show that this was a hitherto unsuspected sunset effect.

He was talking about the knighthood that he would probably receive as a small return for this epoch-making discovery; when, with the help of a voltmeter, I rudely shattered his dreams by demonstrating that a run-down H.T.B. was responsible for the phenomenon.

When planning our trip Westwards, I had clean forgotten that in the evening we would be driving straight towards the setting sun. I was at the wheel at the time, and presently the glare in my eyes grew so distressing that I found it most difficult to carry on.

Fourteen Days!

“Terribly trying, this glare,” I remarked to the Professor.

“Ah, ha,” he cooed. “This gives us a fine chance of trying out my great invention for motorists, the Anti-Glare Blind.” Next instant he had pulled a cord and down came a blind right over the windscreen.

We must have hit that lorry fair and square. And, believe me, lorries are not good things to hit.

And the worst of it is that our holiday has been knocked right on the head. Willy-nilly, we are at work again in the hospital where we are recovering from our injuries, for I have been ordered a fortnight in bed, and the Professor has been prescribed a course of baths.

THE “matching” of the two pentodes in a Q.P.P. output stage is best done with the aid of a milliammeter; variations being made in the voltage applied to the two screens until identical anode currents are obtained.

As with most other things, this process is liable to be confusing if a definite working procedure is not adopted.

Making Records

By far the simplest and quickest method is as follows:

Insert the milliammeter in the anode circuit of either one pentode and take a reading with anode and

METHOD IN MATCHING
A straightforward way of checking up the characteristics of valves suitable for Q.P.P.

screen voltages identical and grid bias set for Q.P.P. working. Jot this down on paper.

Then reduce the screen voltage by 1½ volts, remembering, of course, to switch off the L.T. when making the change. Jot this down also, and keep repeating the process by 1½ screen volt reductions for 9 volts or so.

Then transfer the meter to the anode circuit of the other pentode and make a written record of the anode currents corresponding to 1½ screen voltage changes for this one.

The list below shows two such records of a pair of Osram P.T.2 pentodes. The bias was 6 volts and anode volts 129 (120-volt H.T. battery plus 9-volt grid battery).

Selecting Voltages

It is then a very simple matter to make cross references between the two lists of readings to discover pairs of screen voltages which operate the two pentodes at identical anode currents.

For instance, 126 volts on the screen of the “second” pentode gave “matched” working with the “first” pentode when the latter’s screen was given 121½ volts.

T. B. S.

Screen Volts	129	127½	126	124½	123	121½	120
Anode Current First Pentode . .	2.4	2.3	2.15	2	1.9	1.8	1.6
Anode Current Second Pentode	2	1.9	1.8	1.7	1.65	1.6	1.5

HOW TO MAKE A TELEVIEWER FOR 30/-

—continued from page 36

tele-viewer and the driving motor is speeded up slowly until the correct synchronous speed is reached (750 r.p.m.), denoted by two thin, horizontal black lines about 1½ in. to 2 in. apart appearing through the lens. The images should then appear between these lines and can be maintained steady and the picture centralised by control on the vernier resistance or adjustment of the friction brake tension (Fig. 6). The resistance in series with the neon is then adjusted to give the correct degree of illumination for a sharp image.

Signal Control

No doubt many enthusiasts will wish to rig up some signal-controlled phasing device as an improvement over hand control. In the writer's opinion, however, the hand-operated speed control is ample for experimental purposes, and as Newcastle, his local station, is well outside the London National service area, a signal-controlled synchroniser would fail as the transmissions faded.

In stating the cost of the components to be 30s., a round figure has been chosen because certain items have no definite prices. However, even including the odds and ends of materials not mentioned in the list, the estimate of 30s. will be found in most cases to be on the generous side.

APPARATUS REQUIRED

- 1 Small motor, 3-pole armature type, series wound, 4-6 volts.
- 1 Osgilim neon indicator lamp, 250 volts, .5 watt.
- 1 Variable resistance, 5 ohms, to carry 2 amps.
- 1 Variable resistance, 400 ohms.
- 1 Variable resistance, 50,000 ohms, wire wound.
- 1 Flashlamp bulb, 3.5 volts, with holder.
- 1 Standard batten-type bayonet-clip holder.
- 1 Small reading glass (double convex 2-in. diam.).
- 1 Large reading glass (double convex 4-in. diam., or larger).
- 1 Plano convex bullseye glass from flashlamp.
- 1 Sheet aluminium, .018 in. (26 S.W.G.) thick by 15 in. square.
- Alternative for larger disc:
 - 1 Sheet aluminium, .012 in. (30 S.W.G.) thick by 20 in. square.

The simplest apparatus necessary for the reception of television has been described at some length, and it is felt that this will help many brother enthusiasts, looking for new fields to explore, on the road to successful reception. May your images never fade!

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Peto-Scott are pioneers in Radio and Television, and during fourteen years of Solid Service and Satisfaction we have established a reputation for fair dealing that defies competition. Customers come to us regularly for Sets, Kits, Part Kits, Components, Speakers, Eliminators, and Accessories. Cash, C.O.D., or Easy Payments. WE DEAL WITH YOU DIRECT. Peto-Scott's Easy Way System, with its strict privacy and no third-party collections, will bring radio to your home by convenient monthly payments. Send list for quotation; no obligation.

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1 Varley D.P. 21 L.F. Transformer	7	6
1 R.L. D.Y. 39 Class B Input Transformer	12	6
1 Ferraris O.P.M.17C Class B Output Transformer	15	0
1 Peto-Scott specified METAPLEX Baseboard, 14" x 10"	1	9

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CONSTRUCTOR TWO

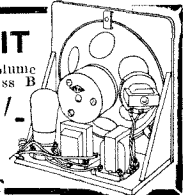
KIT "A" Author's Kit of first specified components including **ready drilled Ply Panel and METAPLEX** Baseboard, but less valves and cabinet. Cash or C.O.D. Carriage Paid. **£1.15.3** (Or 7 Monthly Payments of 5/6) Yours for **5/6**. 2 Mullard Valves: PM1HL & PM2A 15/9

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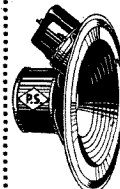
Assemble this amazing unit yourself in less than half an hour. Gives seven times the volume with mains quality from your existing Battery Set. Complete Kit comprises B.V.A. Class B Valve, Peto-Scott Permanent Magnet Moving-Coil Speaker, B.R.G. Driver Transformer and Input Choke, Seven-pin Valve Holder, Peto-Scott Baffle and Baseboard Assembly, all necessary Wires, Screws and Plug-in Valve Adapter, with full-size Diagrams and Assembly Instructions. Cash or C.O.D., Carriage Paid **55/-**



Or send only **6/-** Balance in 11 monthly payments of 5/-.

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KIT "B" As above but including 4 specified valves only. Cash or C.O.D. Carriage paid, **£14-3-6** or **£2-3-6** deposit and balance in 11 monthly payments of **24/-**.

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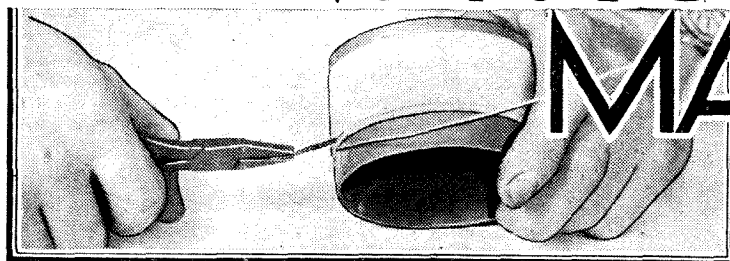
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CASH, C.O.D. or EASIWAY

CONSTRUCTING MATCHED COILS



It seems a lifetime since the days when amateurs were forced to construct for themselves every component part of a wireless receiver; actually it is considerably less than ten years.

One by one these jobs that used to turn black hair grey and make white men "see red" have been taken from us by obliging manufacturers, so that it can be said to-day that the construction of a receiver is very little more than the joining together of a number of constructed parts.

Advent of Ganging

In the matter of tuning coils this state of affairs is very apparent; a very short while ago almost every amateur was still constructing his own coils, in spite of the many excellent commercial types available, and the majority of us had "pet" theories on the design of them which no tempting advertisement could make us abandon.

This position remained until the tide of progress touched it with the arrival of ganged condensers, and the consequent necessity for accurately matched coils.

It is said that King Canute tried to stop the tide; the wireless "Canutes," however, packed up their coils of wire and bottles of shellac without argument; winding coils was bad enough, but when it came to winding three or even four coils that were electrically identical it did seem a hopeless proposition.

The difficulty to-day is to choose the best of an amazing array of commercial coils that all offer excellent value for money and all of which are equally trustworthy as far as performance is concerned.

Retarding Progress

The only real disadvantage to the present-day state of affairs is that the home-constructor does not learn anything about the components he

By **BERNARD BARNARD**

An accurate method of matching up home-constructed coils is fully explained in this article. The scheme outlined is also readily applicable to the matching of commercial coil units, and it provides an easy method of ensuring that band-pass and similar matched coils are worked at the full efficiency of which they are capable, instead of giving the poor results which accrue from mis-matching.

buys, from a practical point of view, and, furthermore, the possibilities of development and progress in the design of tuning coils is retarded since there is a big difficulty in the way of trying out various ideas that occur to experimenters.

Typical Coils

The chief purpose of this article is to explain a very simple but accurate method of matching up home-constructed coils; I have described, quite briefly, the construction of a typical set of coils so as to illustrate more clearly the process of matching, but it will be quite clear to the reader that any set of coils, whether of his own or of published design, can be checked in the same way.

Each coil is constructed on two formers each about 6 ins. long. One

has a diameter of 2 ins. and carries the primary windings; this is fastened inside the other former, which has a diameter of 2½ ins. and carries the secondary windings.

The short-wave windings are wound with 28 D.S.C. wire and the long-wave with 36 D.S.C.

Mechanically Identical

The turns required are as follows:

Primary windings (inside former), 40 turns for medium waves and 150 turns for the long band.

Secondary windings (outer former), 60 turns and 240 turns for medium and long bands respectively.

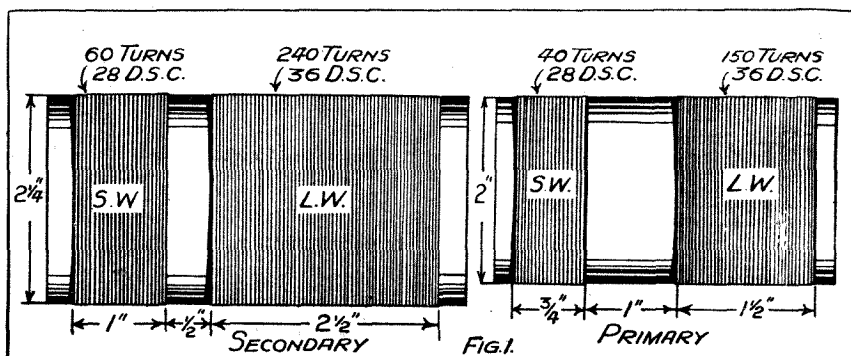
Construct as many coils to this specification as are required for the completed set of coils.

A certain amount of care must be exercised in the winding and assembly of the formers, so as to ensure that all the coils are as nearly identical *mechanically* as possible; this will greatly simplify the work of matching up.

The main points to watch are as follows:

Make sure that each winding starts at the same point on the former as its fellows; that is to say, if there is an inch between the end of the former and the commencement of the first medium-wave primary

THE SPACING AND SIZES FOR THE FORMERS



The coils are constructed as shown and the duplicates should be made exactly alike so that there are no mechanical differences between any two coils of the same type. This will greatly facilitate quick matching.

CONSTRUCTING MATCHED COILS—*continued*

winding, then there must also be the same distance allowed on all the primary formers.

It is important that there is the same space between all the windings; i.e., about half an inch between the end of each medium-wave winding and the start of each long-wave winding.

The inner formers must be rigidly fixed inside the outer formers so that they are concentric.

When fixing the connections from the windings to the bases of the coils make them all as nearly identical and of the same length as possible.

It is, of course, important that the number of turns on all the coils are respectively equal.

I do not intend to deal here with the question of mounting the coils or of arranging for ganged wave-change switches; these are considerations that must vary according to the use to which the coils are to be put, and the reader will therefore settle such matters for himself.

Effect of Coil "Cans"

However, it is most important that the coils are completed in these details before any attempt is made to match them; the leads to the bases and switch contacts are sure to throw a comparatively heavy capacity load across the coils, and it is best, therefore, to have this load in circuit when they are to be equalled up electrically.

If it is proposed to screen the coils in cans, it is necessary to match the coils with them removed; it is well known that the proximity of a mass of metal such as a screening-can will materially affect the inductance of a coil, but fortunately, if care is taken in the mounting of the coils, we can safely assume that the effect will be the same in each case, and the matching will not therefore be spoilt.

Circuit Arrangement

The apparatus required for matching the completed coils is almost sure to be available.

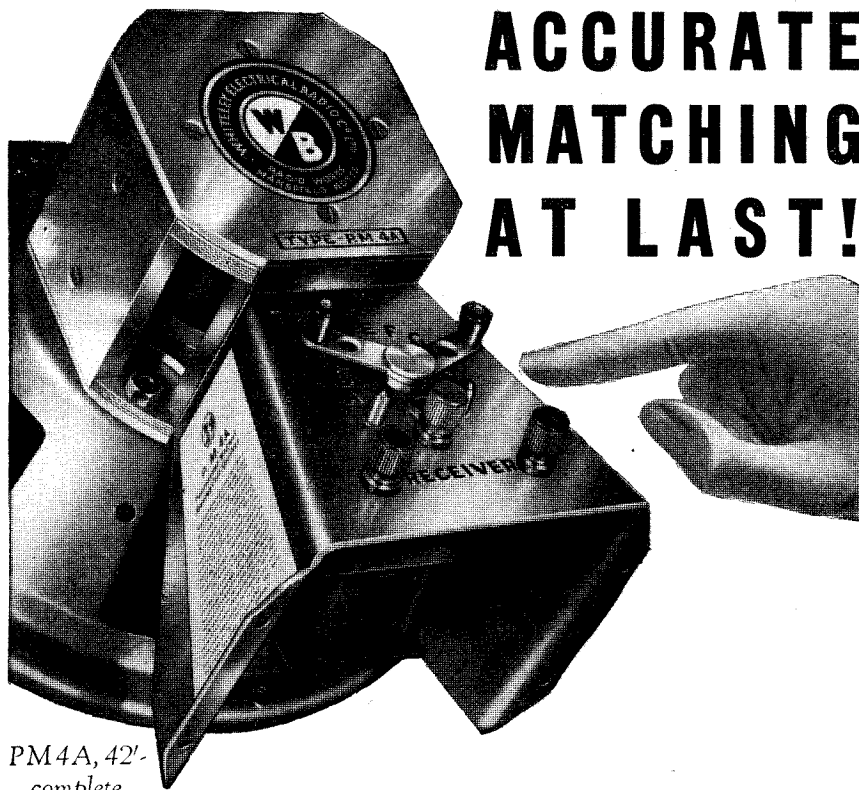
An ordinary detector valve is wired up to a closed tuned grid circuit, and a simple capacity controlled reaction circuit is included, so that we can make the valve oscillate.

A low-reading milliammeter (about 0-5 ma.) is wired in the plate circuit.

The arrangement is shown in Fig. 2.

The coils are ordinary short and

(Continued on page 46)



ACCURATE MATCHING AT LAST!

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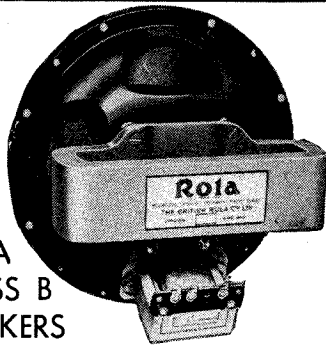
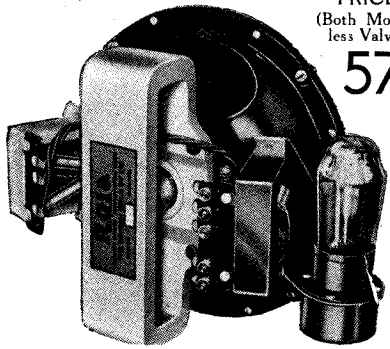
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Model B—For COSSOR 240, FERRANTI HP 2, CLARION B 24.

PRICE
(Both Models
less Valve)

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ROLA FR5—PM—33	Class B	29/6
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ROLA F6—PM—23	Class B	49/6
ROLA F7—PM—23	Class B	60/-

For COSSOR 240, FERRANTI HP2, CLARION B24.

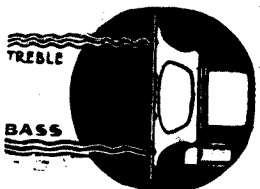
ROLA FR5—PM—32	Class B	29/6
ROLA FR6—PM—22	Class B	39/6
ROLA F6—PM—22	Class B	49/6
ROLA F7—PM—22	Class B	60/-

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ROLA
SPEAKERS
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Radio Reception



CONSTRUCTING MATCHED COILS

—continued from page 45

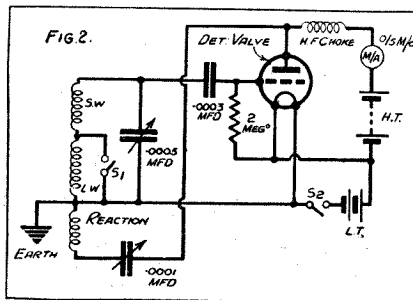
long-wave inductances, and any type available can be pressed into service, providing they are capable of giving fairly sharp tuning when used with an ordinary .0005-mfd. variable condenser.

They must be unscreened.

When you have finished connecting up, switch on the batteries and slowly advance the reaction condenser; if all is well, you will notice that the milliammeter needle kicks as the valve goes into oscillation.

Make sure that you get this effect on both short and long waves.

FOR EXACT MATCHING



This is the circuit required, and it will be noted that, with the exception of the milliammeter, all the parts are found in a single-valve set.

We now require two more variable condensers. One .0005 mfd. and one .0001 mfd.

These are mounted at the far end of the baseboard on a suitable ebonite panel.

We can now start the business of matching up our coils.

Take any one of the home-constructed coils and set it up close to the tuning coil of the oscillating valve.

Making a Start

The two condensers we have just mentioned are connected across our coil (secondary windings).

A small fixed condenser should then be joined across the primary winding; the actual value of this condenser is not important, but it should not be larger than .0001 mfd.

The completed circuit, ready for the commencement of operations, is shown in Fig. 3.

We shall start by matching the short-wave sections; all long-wave windings, including that of the oscillating valve, must therefore be shorted out.

Set the valve oscillating and, with the constructed coil closely coupled

to the grid coil of the valve, slowly rotate the .0005 condenser across the constructed coil.

The other .0005 condenser should be set with the moving vanes about half in mesh, and must be left in this position throughout the work.

When our coil is brought into resonance with the oscillating coil, i.e., when it is "in tune" with it, you will notice that the milliammeter gives a further "kick."

Note the position on the variable condenser.

The coil must now be moved away from the oscillating coil until this resonance "kick" is just discernible on the milliammeter.

This position must be very carefully noted and marked, for each coil to be matched will have to be set up in exactly this position in order that all measurements shall be made under identical conditions.

A means must be found for securely clamping the coils to the baseboard while the work is proceeding.

Taking Readings

Having fixed the position, the .0005 condenser across our coil should be set so that the milliammeter needle is just about to kick.

The .0001 condenser is then slowly rotated until the kick occurs.

The reading on this condenser dial must then be very carefully noted.

The coil under examination is now removed with the greatest care not to disturb any of the condenser settings.

The next coil for matching must now be fixed in the identical position on the baseboard, and the same small fixed condenser joined across its primary windings.

Rotate the .0001 condenser again until the kick occurs, and again make a careful note of the dial reading. Repeat the procedure for all the coils.

Removing Turns

If you then examine the readings you have secured, you will find that they all vary by several degrees.

Obviously, the coil that showed the highest reading will be the one which has the least inductance.

The other coils will have to have turns removed from them according to the amount by which they differ from this coil.

Start by removing not more than one turn at a time, and you will soon discover roughly how many degrees on the .0001 condenser dial correspond to one turn on the coil.

When you have removed what you consider to be sufficient turns, repeat

(Continued on page 47.)

CONSTRUCTING MATCHED COILS

—continued from page 46

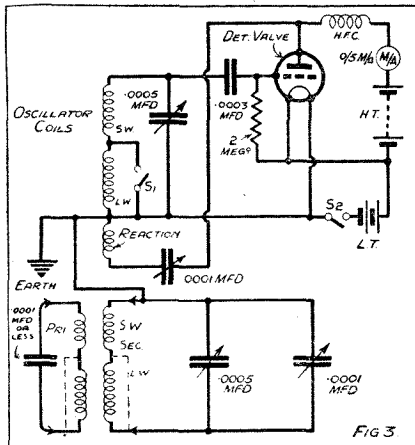
the experiments with the coils so treated.

You will find that they require a higher reading on the condenser than before, and are much nearer to the coil that previously gave the highest reading, i.e. the coil we have taken as a standard.

Final Adjustments

When you find the readings are all very much the same, final adjustments can be made by moving the first few turns along the former away from the main windings; this will have the effect of slightly reducing the inductance of the coil.

CHECKED BY THE "KICKS"



The "detector" circuit is made to oscillate after the constructed coil has been placed close to its grid circuit, and the milliammeter is then watched for "kicks."

When you are satisfied that the short-wave windings are all giving almost identical readings on the condenser dial, you may be quite sure that they are accurately matched.

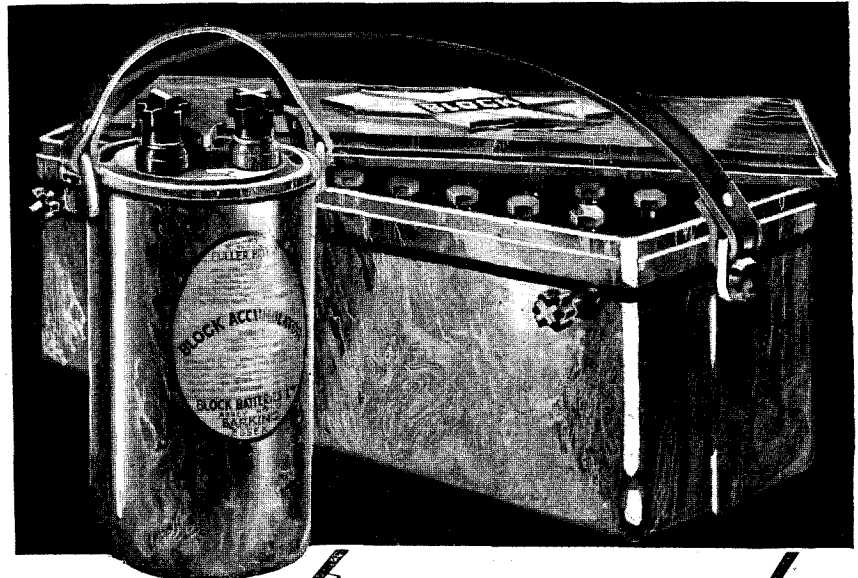
For Long Waves

It is now necessary to repeat the process with the long-wave secondary windings.

The procedure is exactly the same as before, except that the adjustments are made to the long-wave turns, and the greatest care must be exercised to ensure that the short-wave windings are not disturbed.

The process sounds rather long and tedious, but as soon as the reader gets accustomed to the method of operation, there is very little in the work which can be described as difficult.

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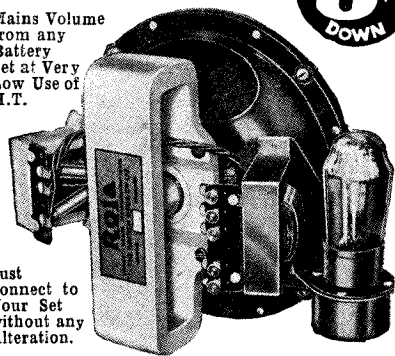
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ONLY 5 DOWN

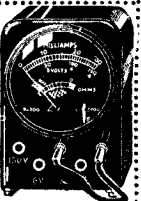
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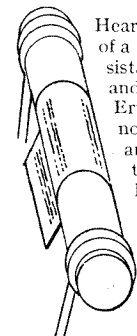


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Send only 5/- for 7 days' trial; if satisfied, pay balance in ten monthly payments of 7/6. (Cash in 7 days, £3/11/0.) Complete with Cossor, Mullard, or B.T.H. "Class B" valve and full instructions.

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Write for new Colour Code Chart. THE RADIO RESISTOR CO., 1, Golden Square, Piccadilly Circus, London, W.1.



OUR NEWS BULLETIN

The War Against Pirates

It is rumoured that the Post Office's annual winter drive against wireless pirates will have begun by the time this issue of THE WIRELESS CONSTRUCTOR is on sale. It is said that the North-East Coast will be the starting place, and that listeners in the Newcastle, Gateshead, Sunderland and South Shields areas who are using their sets without licences will get unpleasant surprises within the next few weeks.

We hope this little tip will serve as a reminder if your licence has not been renewed.

A Good Idea

According to the Wireless Correspondent of the "News Chronicle," the B.B.C. is contemplating a Children's Hour for grown-ups. This is not such a fantastic idea as might at first be thought, and if the B.B.C. can induce Sir James Barrie to co-operate with them, some really first-class broadcasts might result.

But the great problem is "What is the bedtime hour for grown-ups?"

For Fathers and Mothers

It appears that this idea emanated from the fertile mind of Mr. Eric Maschwitz, the B.B.C.'s Variety Director. He wants to show fathers and mothers—especially those who do not have time to listen to the Children's Hour—just what sort of entertainment is provided for the youngsters; so that fathers and mothers may recapture the fantasy of the fairy-tale and find pleasure in items designed for childhood's ears.

Good luck with your idea, Eric!

Broadcasting in India

It is said that increasing interest in Empire broadcasts from England is considered to be chiefly responsible for the big increase in the number of licences taken out in India this year. During the year 1932 the number of licences taken out was 8,557; while during the first six months of this year 6,276 licences were taken out, as against 4,165 during the corresponding period for last year.

It is a sign of the times that some of the most important London newspapers are devoting a good deal of space lately to the problem of regulating broadcast wavelengths. The other day the "Daily Mail" had an important leader calling attention to the many conferences that have been held during the last ten years to deal with the ever-growing chaos in the ether.

As was pointed out, twenty-seven nations signed the Lucerne Convention regarding wavelength regulation, but now seven nations are not satisfied with the wavelengths allotted to them and have refused their signatures.

Of Great Importance

"The matter is of great importance," stated the "Daily Mail," "to the millions of people who listen night after night all over Europe. The effectiveness of jamming was realised during the War... since then listeners have learned that interference can spoil an evening's amusement more than anything else. It is high time that the great wavelength muddle was straightened out, and it is hoped that recalcitrant nations will at last conform."

A Growing Menace

There is not only the problem of wavelengths to be settled by the Union Internationale de Radiodiffusion, but there is also the growing menace of the use of certain Continental stations for disseminating unfriendly propaganda concerning neighbouring countries.

If broadcasting stations are to be used for pseudo-political stunts of this kind, then it is obvious that the B.B.C.'s motto "Nation Shall Speak Peace Unto Nation" is one which should be the subject of international understanding between nations.

For ten years broadcasting has been more or less legitimately used, and it will be a sad day when the practice of blackguarding each other by radio becomes a habit.

OUR NEWS BULLETIN

—continued

Bing Crosby's Visit

Bing Crosby, the famous American crooner, who is reported to be paying his first visit to this country very shortly, is the highest paid radio star in the world. He has been booked to appear at the London Palladium and a West End cabaret at the largest fee ever paid to an artiste.

An American Idol

Crosby is reported to be the idol of American girls and women because of his curiously personal way of singing. No doubt many readers of *THE WIRELESS CONSTRUCTOR* have seen the film, "The Big Broadcast," and have been able to form their own opinion as to whether Bing will be a success on the British side of the Pond.

Heard This One?

This month's wisecrack:

Newspapers may make readers' eyes start from their sockets, but the dear B.B.C. cannot allow its listeners' tender ears to burn.—"Newspaper World."

Prices To Increase

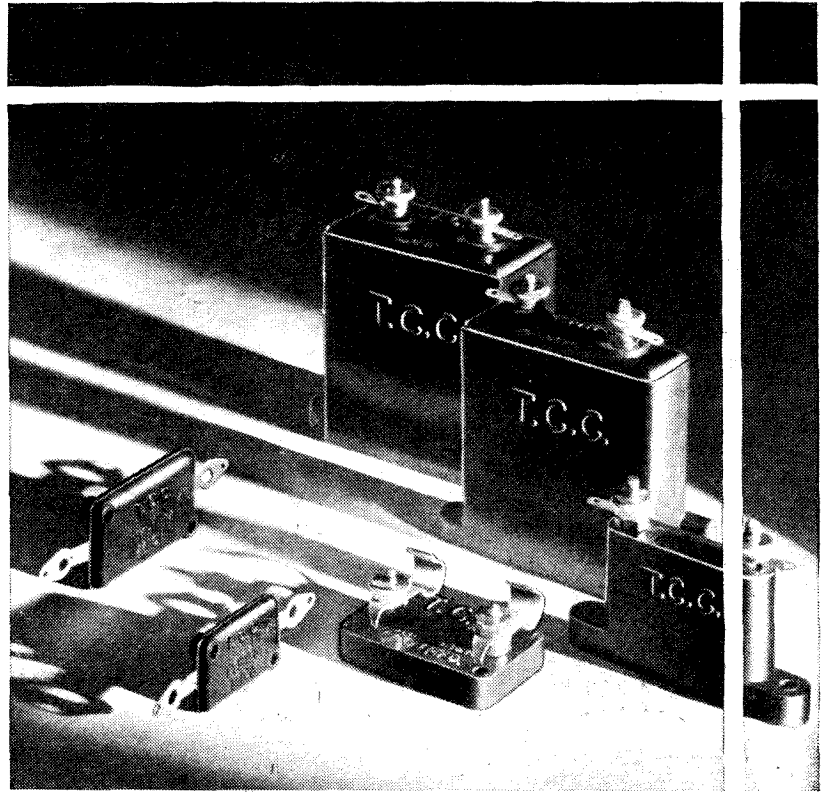
Mr. W. Burnham, the Chairman of the Radio Manufacturers' Association, has given a hint which all your friends should bear in mind if they are contemplating getting a wireless set in the near future.

In other words, they had better get their wireless sets now, because prices are going up! There has been a very good boom for wireless sets this year, and most British factories are working full time; but the special bargain prices available round about the Exhibition period will shortly be altered, so if you have any friend who wants to get a really first-class three- or four-valve set at a bargain price, you had better urge him to hurry up and get it while the going is good.

A Radio Play Competition

Our contemporary, "Popular Wireless," is offering a prize of £50 for the best radio play. The B.B.C. is co-operating, and Mr. Val Gielgud—the B.B.C.'s Director of Radio Drama—has undertaken to broadcast the winning play. If you are interested in radio play-writing, you should make a point of getting a copy of "Popular Wireless," and reading all about this novel competition.

It might be said right away that there is no entrance fee, and the rules and regulations governing the competition are of the simplest kind.



T.C.C. means
SAFETY

ALWAYS



Research — intensive concentrated research—Creating the means to solve the ever present problems of Radio — Rejecting all but what experience has found 100% right. That is the job of the vast T.C.C. organisation—that is why none but the perfect product finds its way to the storeroom. But even more, that is why T.C.C. spells SAFETY at all times. Throughout the world the "condenser in the green case" is synonymous with condenser efficiency—whatever the need there is a T.C.C. to fulfil it—adequately—the reason for the choice of T.C.C. by all the leading set designers.

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To Success

MAKING SHIELDS FOR YOUR VICE

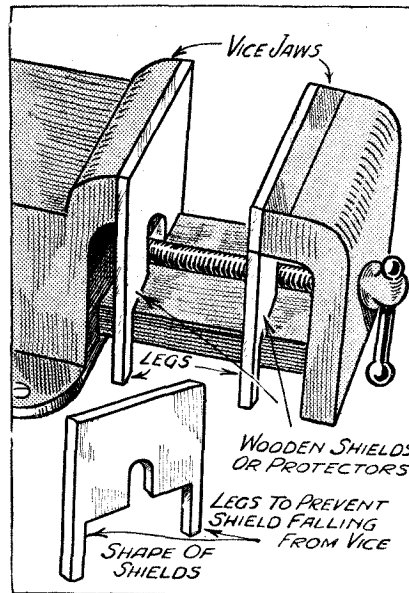
Details of a method of protecting woodwork when it is clamped in the jaws of a vice. Also a suggestion for moving accumulator charge-indicators when they become stuck.

A NUMBER of constructors who use a metal vice for woodwork find that the sharp edges of the jaws are liable to damage the wood facing if no precautions are taken to shield the grips.

A temporary measure adopted in most cases is to insert two small pieces of wood between the jaws, but as these are not usually cut to any definite shape, readjustment is necessary every time the vice is opened.

To overcome this inconvenience the above shields should be carefully shaped and cut according to the measurements of the vice jaws as shown in the diagram. By using a piece of fairly hard wood about half an inch in thickness, these shields could be regarded as a part of the vice.

CUT FROM WOOD



The shape of the protectors and also the way in which they fit are shown in this diagram.

Accumulator Tell-Tales

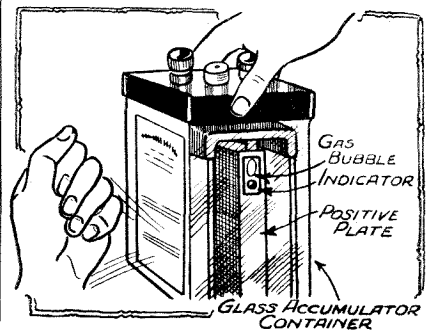
THOSE little coloured balls which fit into a slot in the positive plate of an accumulator and tell you when the cell is run down, are very useful. That is, if they do not stick.

Sometimes the sticking is due to the indicator being jammed up against the plate. At other times gas collects

in the slot, and keeping out the acid, prevents the little ball rising.

In the former case a sharp bang on the side of the cell with the fist is usually effective in moving the indicator. In the case of gas collecting, shaking the electrolyte about as well as banging the container with the fist will generally overcome the trouble.

MOVING THE BEAD



Internal hydrometer beads that have become fixed may be moved by banging the case with your fist.

THE EDITOR'S CHAT

—continued from page 3

although still of a crude nature—definitely indicate that television in the home is not only possible at a reasonable price, but can provide many fascinating hours of work and experiment for the genuine enthusiast.

Inexpensive Efficiency

For some reason or another there has been a falling off in popularity of the two-valve set during the last few years, but if you glance through the details for building The Constructor's Two, which is fully described in other pages, you will realise that inexpensive efficiency is one of the outstanding merits of a set which, though only using two valves, is capable of giving excellent loudspeaker results.

The Constructor's Two has also sufficient selectivity to be of real practical use, in spite of the present crowded condition of the ether.

We also publish in this issue full constructional details for making a mains unit for Class B Sets. Every

(Continued on page 51)

THE EDITOR'S CHAT

—continued from page 50

reader knows that the problem of providing a well-regulated H.T. supply for Class B receivers from the mains has always been an acute one, but our popular contributor, Mr. Victor King, has now evolved a design which he is able to describe in detail at just the right moment.

A First-Rate Unit

Battery-set owners who get their supply from the electric light may hold the opinion that they have reached a definite full-stop in their experiments until they can afford to build an all-mains instrument. This is particularly the failing among readers who have a D.C. supply; but Mr. Victor King makes it perfectly clear that the "can't-get-any-further" attitude, as taken up by the battery-cum-mains H.T. set owner, is a form of pessimism founded upon a fallacy.

His mains unit for Class B sets is, in itself, definite evidence and justification for his stepping into the breach with a unit which will enable readers to reap the benefit of mains H.T. for any type of Class B receiver.

A MAINS UNIT FOR CLASS B SETS

—continued from page 17

as detector and S.G. taps respectively for sets in which an S.G. stage is employed. They are both resistance-capacity decoupled.

The H.T.—terminal is connected as usual to the H.T. negative of the receiver with which the unit is to be used, while a fifth terminal is provided for earth. This latter is important in case the positive electric light main is earthed when the use of a direct earth to H.T.—, as is usual with H.T. battery supply, would cause a short circuit of the mains.

Earth Connection

Accordingly, we provide a fresh earthing point, which is insulated from the mains as far as direct current is concerned, but is in effect directly connected (through the 2-mfd. condenser) with regard to H.F. and L.F. impulses. So in connecting the unit the earth connection to the set itself should be transferred to "E" on the mains unit, the sets earth terminal being left unconnected.

(Continued on page 52)

SUPERIAL is too costly to IMITATE

In every way Superial is superior to all other Aerials. It has longer range, super selectivity and crystal clear reception. It is simple to fix—no insulators are necessary and no separate lead-in is required.

Compare any other Aerial with Superial and you will realise the poor quality of the ordinary outer covering—examine more closely and you will discover that the imitation is made up entirely without the essential rubber vulcanization—therefore without protection. Get Superial and be safe—it costs only a little more, but is worth more than double. Then, of course, there is the extraordinary efficiency of the scientific combination of ferrous and non-ferrous metals (including copper) far superior to the copper only Aerial.

Look at the illustrations below. The greatly enlarged photograph shows Superial with its seven strands completely encased from end to end with **extra heavy vulcanized rubber insulation**, so thick, it is actually like a rubber tubing. This insulation is then protected with heavy braiding and finally compounded and waxed to resist every condition of weather—hot or cold, all the year round for many years to come.

THE AERIAL WHICH MADE BROADCASTING POPULAR
SUPERIAL
ELECTRON'S SUPER-AERIAL

100 ft. 3/6 : 75 ft. 2/6 : 50 ft. 1/9 : 25 ft. 1/-

From Dealers everywhere.

BEWARE OF IMITATIONS

LOOK AT THE NAME AND THE BOX

Scientific combination of highly conductive ferrous and non-ferrous soft metals.

Thick vulcanized rubber insulation, a real protection against corrosion.

Complete protection is ensured with Flax braiding, heavily waxed and compounded

£500

FREE LIGHTNING INSURANCE FOR 2 YEARS



LOOK AT THIS POOR IMITATION. A piece of ordinary covered Aerial. The cheap cotton "covering" is not true insulation, neither is it a protection against corrosion or lightning. It quickly perishes on exposure, becomes unravell'd and serves no useful purpose. Do not confuse it with vulcanized rubber insulation, which is a perfect protection.

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Post in g.d. envelope.

16.W.C.

A MAINS UNIT FOR CLASS B SETS

—continued from page 51

As there may be a difference of potential of up to 250 volts (dependent on the voltage of the mains) between the two sides of the 2-mfd. condenser in the earth lead, it is important that the component be of good manufacture and adequate voltage rating. It should at least be of the 250-volt *working* type.

The actual connections of the unit are obvious, so there is no need to discuss them here. Taps on the potential divider provide decreasing voltages in each socket from 10 to 0, the steps being equally spaced as regards resistance values between them.

FROM MY ARMCHAIR

—continued from page 21

stormy day. Remove your shoes and stockings and stand heavily on the patch of earth, meanwhile gripping the bare lead-in with your hands which should first be dipped in the salt solution. Wait in this position until the house is struck by lightning. Then draw your own conclusions. Your wife will probably draw your insurance. Many wireless enthusiasts have been tickled to death by this suggestion.

Modern component practice appears to get more and more complicated as regards terminals provided. Of course, all this is to the good in some ways as making components suitable for widely different conditions, valves, etc. Some losses usually occur by making apparatus too versatile, and I am wondering whether we may not come, ultimately, to the kind of circuit illustrated on page 21.

J. S.-T.

WHEN I BROADCAST

By JOAN INGLESANT

BEFORE I broadcast I keep to the unbreakable rule of at least two hours' refreshment at the piano.

That does not of a necessity mean that I practise pieces that I have already got note perfect, but I just play to my heart's content, choosing the best music in the world to assist the pleasant task.

Now there has come into being the very thing that I was looking for.

Mark Hambourg has seen fit to edit a new part work which contains all the gems of the world's most glorious music.

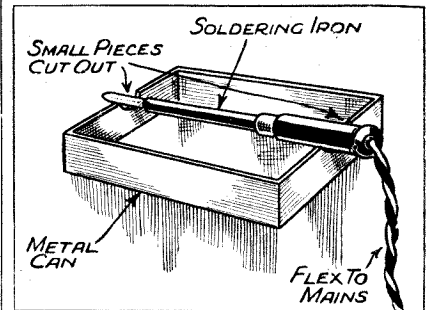
Such beautiful pieces as "Prelude in A Flat" by Chopin, Rachmaninoff's Prelude, "Chanson Triste," Rubinstein's "Melody in F." All these are to be found in "Master Melodies of the World," this publication that no pianist should be without. It contains nine complete pieces, full music size, and is published weekly at one shilling.

In the old days I used to have to turn over this piece of music and that in order to prepare my selection for this quiet rehearsal, but now I have that all arranged for me, and I can assure Mr. Hambourg that this work has come as a boon and a blessing to me, and I am sure it will prove so to many another.

A SOLDERING IRON STAND

You'll have no more burns on the bench or work-table if you make this little gadget.

A HOT soldering-iron, whether of the electric or ordinary type, can cause quite a lot of damage if left on the workshop bench whilst the set-builder is busily occupied in preparing the various leads to be joined. For instance, if it is rested on the insulated handles of a pair of pliers the insulation properties will be quickly ruined.



This simple stand for an electric iron is easy to make but extremely handy.

In view of the above a welcome addition to the workshop would be in the form of a stand for the iron, which can be made quite simply by cutting two pieces out of an old can as shown in the diagram.

HAVE YOU HAD?

particulars of the famous "Magnum" Short Wave Adapter, which is now available for every type of receiver? Full particulars with a list of short wave stations and free trial offer, on request.

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Piano built (Pat. 8125). The acoustic Tone brings a fine thrill.
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INDEX TO ADVERTISERS

	PAGE
Amalgamated Press Gift Books for Boys	Cover iii
Block Batteries, Ltd.	47
British Blue Spot Co., Ltd.	Cover iv
Britannia Batteries, Ltd.	52
British Rola Co., Ltd.	46
Burne-Jones & Co., Ltd.	52
Carrington Manfg. Co., Ltd.	51
Colvern, Ltd.	41
Cossor, A. C., Ltd.	2
Dicone Radio	50

	PAGE
Gilbert, J. C. (Cabinets)	50
Graham Farish, Ltd.	29 and 33
Heyberd, F. C., & Co.	50
Heraud, E. J., Ltd.	48
Henley's, W. T., Telegraph Works Co., Ltd.	1
Igranic Electric Co., Ltd.	41
Jackson Bros. (London), Ltd.	Cover ii
Kolster-Brandes, Ltd.	37
London Electric Wire Co. & Smiths, Ltd.	Cover iv
"Master Melodies of the World"	34
New Electron Works, Ltd.	51
Peto-Scott Co., Ltd.	43

	PAGE
Pickett Bros. (Cabinets)	52
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Radio Resistor Co.	48
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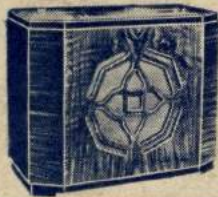


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