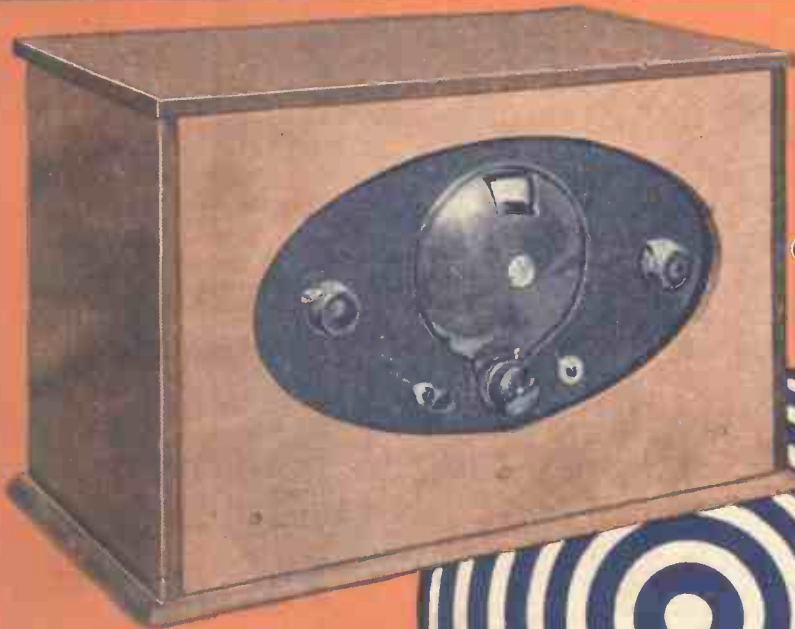


The Wireless Constructor

6^D
MONTHLY

EDITED BY
PERCY W. HARRIS. M. I. R. E.
Vol. X. SEPTEMBER, 1930. No. 47.



DESIGNED
BY
VICTOR KING
THE
"EXPLORER"
TWO

ALSO IN
THIS ISSUE

The
"GRAMO"
AMPLIFIER

by

PERCY W. HARRIS M. I. R. E.



THE WORLD'S FINEST VALVES REDUCED IN PRICE



**RADIO
EXHIBITION
Olympia, 1930
STAND
No. 105**

*The
amazing*

MAZDA

RADIO VALVES

H.210
HL.210
L.210
H.607
HL.607
P.220
P.240
P.425
P.625A
P.625B
P.650
SG.215
PEN.230
PEN.425
AC/PEN.

	NEW PRICE	OLD PRICE
H.210 HL.210 L.210 H.607 HL.607	8/6	10/6
P.220 P.240	10/6	12/6
P.425 P.625A P.625B	13/6	15/-
P.650	18/-	20/-
SG.215	20/-	22/6
PEN.230 PEN.425	22/6	25/-
AC/PEN.	27/6	30/-



THE EDISON SWAN ELECTRIC CO., LTD.
Incorporating the Wiring Supplies, Lighting Engineering, Refrigeration and Radio Business of The British Thomson-Houston Co., Ltd.

Radio Division:
1a Newman Street, Oxford Street, W.1
Showrooms in all the Principal Towns

EDISWAN

V.65

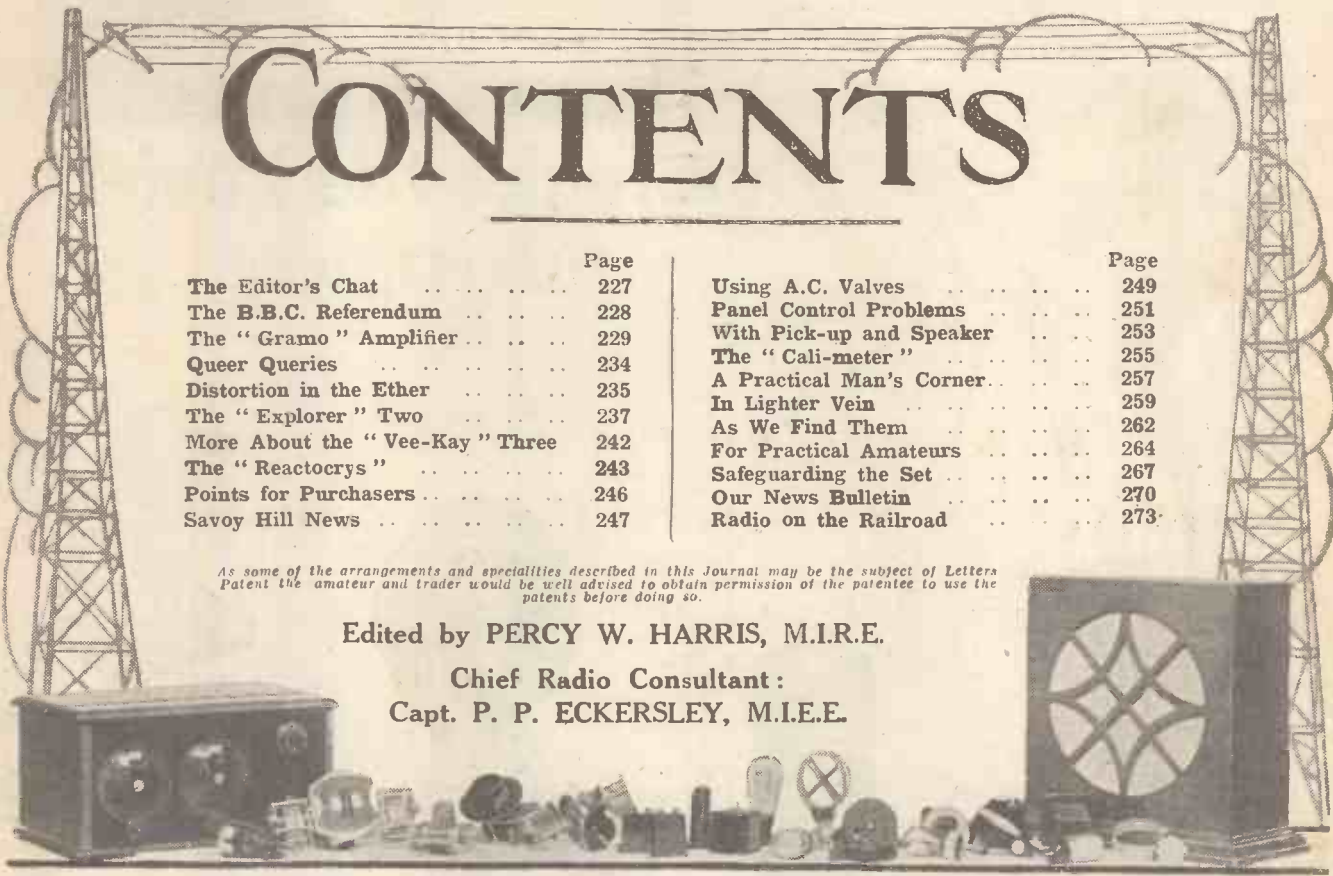
CONTENTS

	Page		Page
The Editor's Chat	227	Using A.C. Valves	249
The B.B.C. Referendum	228	Panel Control Problems	251
The "Gramo" Amplifier	229	With Pick-up and Speaker	253
Queer Queries	234	The "Cali-meter"	255
Distortion in the Ether	235	A Practical Man's Corner	257
The "Explorer" Two	237	In Lighter Vein	259
More About the "Vee-Kay" Three	242	As We Find Them	262
The "Reactocrys"	243	For Practical Amateurs	264
Points for Purchasers	246	Safeguarding the Set	267
Savoy Hill News	247	Our News Bulletin	270
		Radio on the Railroad	273

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

Edited by PERCY W. HARRIS, M.I.R.E.

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



AMPLION BALANCED ARMATURE SPEAKERS

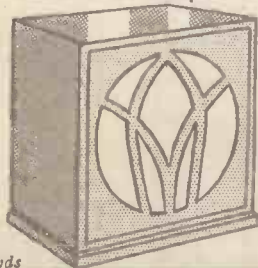
High notes and low notes crisp and true and evenly balanced, speech so clear that you can hear the slightest inflection of the voice, volume that is full and free from distortion—such superb reproduction is due to the Amplion Unit, made specially for the AB41 and AB45, and a great step forward in the perfection of loudspeakers.

AB41 (Oak) £5-15 - (Mah.) £6-6
AB45 (Oak) £6-15 - (Mah.) £7-7

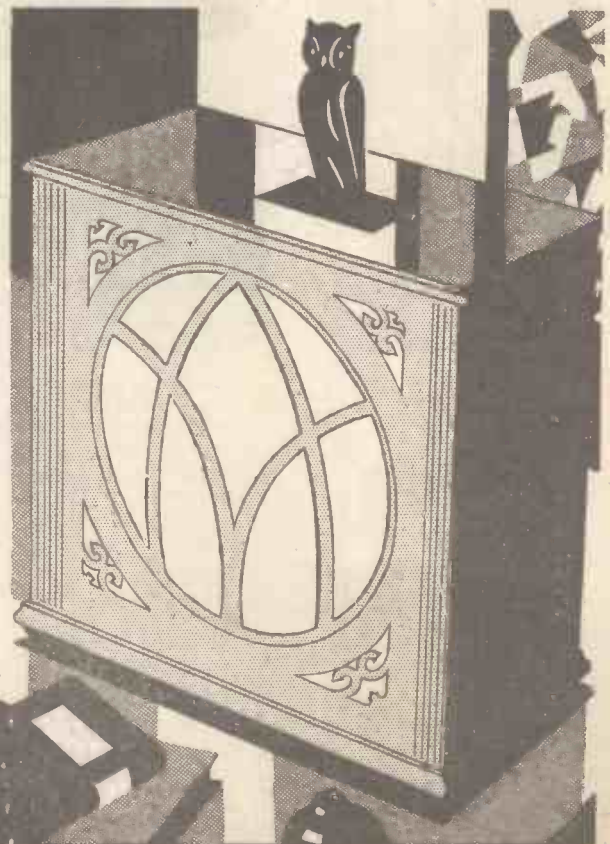
The Popular AB6 Model
(on left)

The first Amplion Balanced Armature Speaker and one of the most successful speakers that Amplion have produced.

Oak - - - £4-10-0
Mahogany - - - £4-17-6
Walnut - - - £4-17-6



royds



AMPLION

Catalogues from GRAHAM AMPLION LIMITED, 26, SAVILE ROW, LONDON, W.1



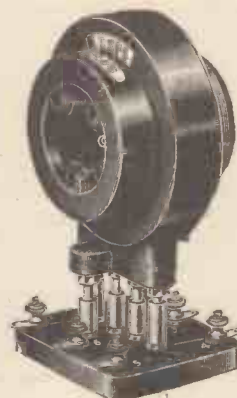
Four Strings that make the Perfect Instrument



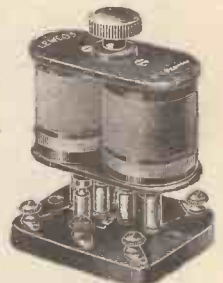
LEWCOS
L.F.
TRANSFORMER



LEWCOS
HIGH FREQUENCY
CHOKE



LEWCOS
SUPER
COIL



LEWCOS
BINOCULAR
COIL

**VISIT OUR
STANDS**
No. 72 & 73
At the Radio
Exhibition
at Olympia
from
SEPT. 19-27

LEWCOS RADIO PRODUCTS

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

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

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

Copies of one or more of the following descriptive leaflets will be sent on request. Please quote reference number.

- | | | |
|-------------------------|---|----------------|
| LEWCOS BINOCULAR COIL | - | Reference R.37 |
| LEWCOS SUPER COIL | - | " R.43 |
| LEWCOS H.F. CHOKE | - | " R.33 |
| LEWCOS L.F. TRANSFORMER | - | " R.61 |



Stocks held at the following Branches:—
BELFAST
BIRMINGHAM
CARDIFF
DUBLIN
GLASGOW
LEEDS
LIVERPOOL
LONDON
MANCHESTER
NEWCASTLE
NOTTINGHAM

THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED
Church Road, Leyton, London, E.10

The WIRELESS CONSTRUCTOR

Published by the Amalgamated Press, Ltd., Fleetway House,
Farringdon Street, London, E.C.4.

THE EDITOR'S CHAT

A Pick-Up Amplifier—A Novel Receiver—Victor King Introduces the "Explorer" Two—Improving Reception Conditions.

WIDESPREAD as is the popularity of electric gramophones, there are many readers of the WIRELESS CONSTRUCTOR who, owing to the cost of the apparatus involved, have so far not enjoyed the remarkable quality which such reproduction gives. True, it is possible by means of adaptors (as has been shown many times in this journal) to use a pick-up and an ordinary wireless receiver, but it is sometimes far more convenient to keep the apparatus separate.

A Special Feature

A special feature of the present issue is the "Gramo" Amplifier, in which high quality and low cost go hand in hand. Complete with valves, it costs under £10, and with the aid of a good electrical pick-up and any good quality loud speaker it will enable you to convert your old and probably now discarded gramophone into a modern electrically reproducing instrument of first-class quality.

No accessories in the way of high-tension and low-tension batteries are required, as both H.T. and L.T. are provided from alternating current mains simply by plugging into the nearest lamp socket. The well-known WIRELESS CONSTRUCTOR aluminium chassis is used, and, as you will gather from the illustrations, the appearance of the set is efficient and very pleasing.

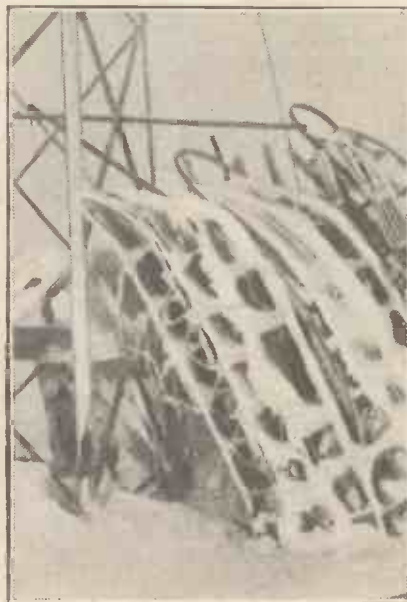
Real Novelty

Next in our list we have a real novelty in the shape of the "Reactocrys," which provides just that step between the crystal set and the fully-fledged valve receiver which many users wish to take. It must not be forgotten that in many thou-

sands of homes a crystal receiver with a pair of 'phones serves to give inexpensive amusement and information in a very convenient manner.

Owing to the good service rendered the crystal set is "kept on," the owner being reluctant to scrap it, although the advantages of a valve set to get just that extra strength are often realised. The "Reactocrys" is a little unit which turns an ordinary crystal set into a valve set, giving all the advantages of a one-valver yet leaving the crystal set in such a state

RADIO IN THE ANTARCTIC



The foot of one of the aerial masts used for stacking sledges during Admiral Byrd's Antarctic expedition.

that it can be used again as a crystal receiver within a few moments.

This great advantage enables the battery power to be economised, for

in many cases the signals given by the crystal will be quite good enough, while on special occasions when several pairs of 'phones are used, or when trying to get a station out of range of the crystal, the batteries and valve can be brought into play.

Not only is the strength but also the selectivity greatly increased by using the "Reactocrys." It is also one of the most economical units ever described in this journal, and is sure to have a wide popularity.

Victor King

No doubt the success obtained with the "Reactocrys" will lead many to build more ambitious valve receivers, and here Mr. Victor King steps in with the "Explorer" Two, in which the excellent wave-change scheme already connected with the name "Explorer" is again brought into action in a simple and efficient two-valve set.

In this receiver not only are both wave-bands covered so far as the broadcasting is concerned, but the modern demand for receivers covering the very short waves is fully met. On the broadcast band the change from the lower to the upper region is made at once by means of a switch

Efficient Change-Over

On those occasions when it is desired to listen to very short-wave broadcasting, such as that from the United States, the changing of a single six-pin coil will do all that is necessary. It is worthy of mention that the circuit is so designed that no losses due to a switch are introduced on the short wave-band.

If your set is of the older type, without wave-change switching, you

(Continued on page 280.)

THE B.B.C. REFERENDUM

This Year's "Proms."—Russian Broadcasting and Propaganda.

By Our Special Correspondent.

IT has been suggested many and many a time that the B.B.C. should try some scheme whereby programmes could be planned in accordance with the wishes of listeners. Newspaper ballots have been tried, but with inconclusive results—inconclusive because the percentage of "voters" for certain items in various classes of programmes has always proved very small when compared with the actual number of listeners in the country.

Will it Work?

Assuming there are twelve million more or less regular listeners in the country, it is hard to see how any ballot can be of much practical use unless at least 50 per cent express their views when a ballot is taken. Of course, a few thousand entries for a ballot of this type will mean that certain types of programme will be voted for to an extent which will place them at the top of the poll; yet the majority verdict of a few thousand listeners who participate in a newspaper ballot is no real indication of the views held by the majority of listeners.

It is *some* indication, but not definitely reliable or conclusive. Consequently we wonder whether any valuable results will result from the B.B.C.'s decision to take a referendum of listeners with the intention of bringing programmes more into line with public taste.

So far the most successful referendum of this kind (undertaken by the "Daily Mail") resulted in 1,285,083 votes being cast, when variety easily won first place, followed by light orchestral music, military bands, dance music, and topical talks.

Seven Million Wanted

But 1,285,083 votes represent a fairly small proportion of the population of listeners in this country. Three million licences have been taken out, and assuming only three listeners per licence, the voting public totals 9,000,000.

The number of listeners per licence is probably higher: it has been estimated at five per licence—a total of

15,000,000. To get a really sound idea of what these listeners want, at least 7,000,000 should vote when their views are canvassed. But it is extremely unlikely that they will.

A Limited Appeal

It was rather amazing that the "Daily Mail" ballot resulted in 1,285,083 votes being cast, although prizes were given in this case.

We are not aware that the B.B.C. intends offering prizes, and in any case, to begin with, the referendum will apply only to that part of the B.B.C.'s programme arranged by the Central Council for Adult Education. The referendum will thus be limited to the views of listeners concerning one-fifteenth of the total weekly broadcast.

Probably, if results are encouraging, the B.B.C. will decide to apply the referendum scheme to other programme departments. But the organi-

However, the referendum, when applied to one specific aspect of broadcasting, may prove productive of interesting and even valuable results; and especially would we like to see a referendum taken of Sunday programmes.

Those Sunday Programmes

Exactly what the majority of listeners like in the way of Sunday programmes would probably surprise the B.B.C.

One of the main purposes of the referendum, in connection with the Central Council for Adult Education broadcasts, will be to ascertain "the most acceptable method of presentation and time of each item." We suggest that the referendum should also include a question for ascertaining the *type* of broadcast most favoured by listeners who are interested in this class of broadcasting.

The results—if the voting is substantial—should prove very illuminating. But we feel dubious about the response the B.B.C. will get. Referendums are not really popular. Politics have proved that!

Queen's Hall "Proms."

The thirty-sixth season of the Queen's Hall Promenade concerts opened on Saturday, August 9th, under the conductorship of Sir Henry

GETTING READY FOR AN "O.B."



A tree stump with a false centre, in which a microphone was concealed, in the middle of the Warwick Pageant Ground, to give listeners the impression of being actually among the 6,000 performers.

sation necessary will probably surprise the B.B.C. when it gets down to it. The task of sorting-out replies, adjudicating, etc., will be pretty big—and expensive.

The "Radio Sounds" competition, organised by our contemporary, "Popular Wireless," some years ago, roved that.

Wood, and the B.B.C. Symphony Orchestra of ninety performers.

The programmes are built up on similar lines to those in former years. Monday night, as usual, will be devoted to Wagner, Tuesday and Saturday nights to popular items, alternate Wednesdays to Brahms and Bach, and Fridays to Beethoven.

(Continued on page 278.)

The "GRAMO" AMPLIFIER



A neat two-valve L.F. amplifier which incorporates an H.T. mains unit and employs indirectly-heated A.C. valves. It makes an ideal unit for attachment to any electrical pick-up.

By PERCY W. HARRIS, M.I.R.E.

SOME while ago I received a letter from a reader asking whether it was not possible to design for readers of the WIRELESS CONSTRUCTOR an inexpensive, simple, and efficient mains-driven amplifier, in order that a good electric gramophone could be built for a really low price.

"Private Address" Type

He pointed out, quite rightly, that far too many electric gramophones (and designs for such) seemed to have arisen from the idea that anybody who owns an electric gramophone wants to fill the Albert Hall, whereas the ordinary man-in-the-street is perfectly content with reproduction of the same strength as that given by the ordinary mechanical gramophone, provided the quality is better.

For the reasons just referred to, most electric gramophones have what might be called "public address" amplifiers, which, while having many merits for dances and large halls, are needlessly powerful and expensive for private use. I therefore sat down to design what I might have called the "private address" amplifier as distinct from the "public address" type, and, frankly, I think readers of the WIRELESS CONSTRUCTOR will like it.

Firstly, it is, of course, mains-driven. Secondly, it is made up on the WIRELESS CONSTRUCTOR aluminium chassis, thus having a neat and business-like appearance. Thirdly, its power is ample for ordinary room use; while, fourthly, its total cost, with valves, is round about the £9 mark.

Nothing Difficult About It

Flexible leads go from its transformer to the nearest electric-light socket, a pick-up is connected to one pair of terminals, and your loud speaker to the other. If you have, as many people, a mechanical gramophone, all you have to do is to attach the pick-up to the tone-arm, in place of the ordinary sound-box, and there you are!

A "PRIVATE ADDRESS" AMPLIFIER

This unit is designed to give just the right amount of volume required in the average room, with the utmost clarity and purity. It is cheap to build and economical to run.

If you want something a little more elaborate you can place the whole outfit into a cabinet, constructed quite cheaply, with either a clockwork or electrically-driven turntable. It is not necessary to purchase a moving-coil speaker for this outfit—if you have one, well and good. Any good, modern loud speaker of the balanced-

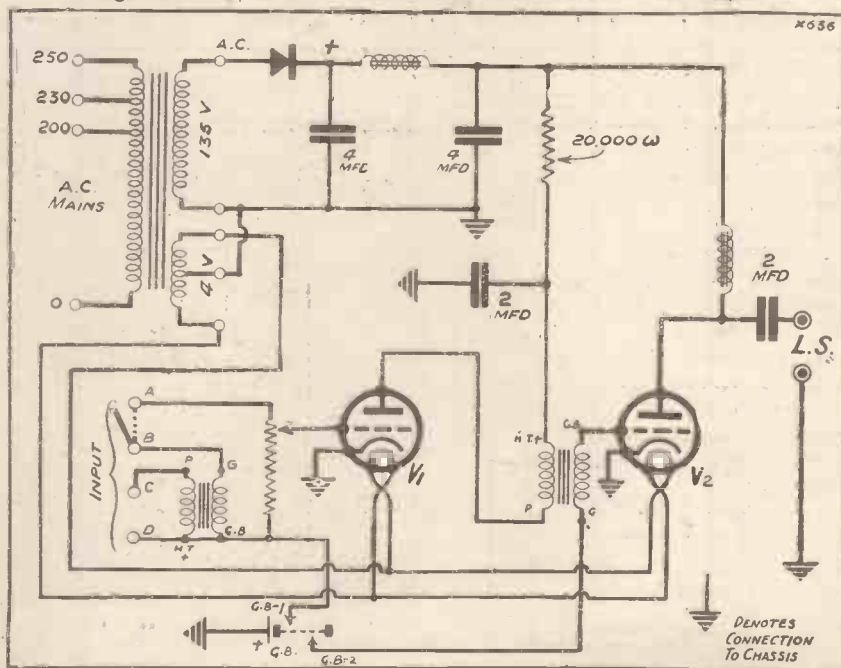
to use without any cabinet or further expense, quality rather than appearance being his main desire.

He had a good clockwork-driven turntable and a good speaker (I think it was an Amplion Lion). He said he was sure many readers would back him if his request were made known.

Collecting Components

Before beginning any constructional work, collect together all the components without exception. This is necessary as there is none too much space to spare, and while the components can be varied from those illustrated provided the same general

QUALITY WITH SIMPLICITY AND POWER



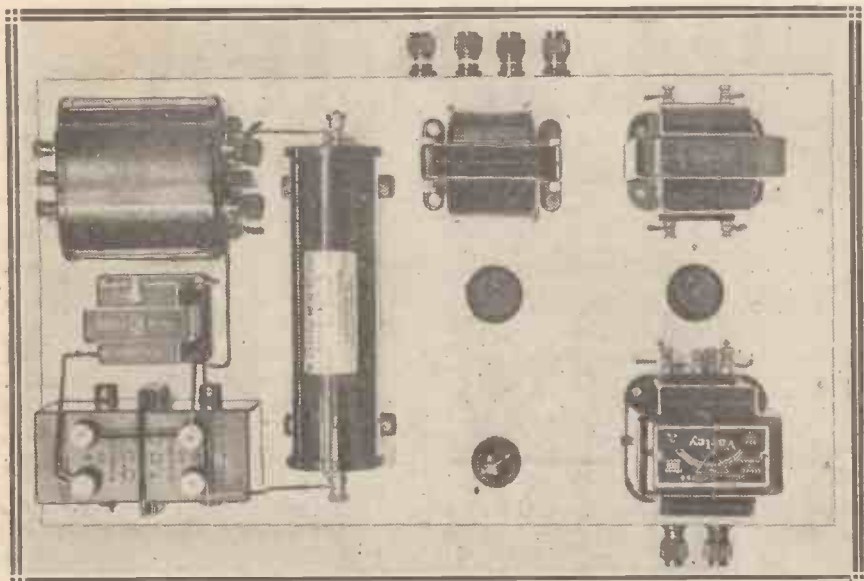
Here is the complete theoretical conception of the gramophone amplifier. When one remembers that the H.T. and "filaments" are supplied from the mains, it is easy to appreciate the straightforward nature of the arrangement.

armature type on a suitable cone or diaphragm will suit excellently.

I should quote the reader's letter again to point out that his request was for a mains-driven amplifier unit, which, he said, he was quite willing

standard of quality is maintained, these components do vary in size considerably, and unless you have them all in front of you when you lay out your set you may be in difficulties later.

The "Gramo" Amplifier—continued



This photograph shows how extremely neat and simple the finished amplifier is. There is only one variable control, and that is the knob for adjusting volume: It can be seen between the rectifier and the output choke.

The mains transformer calls for no special comment other than that it is essential that the output voltage should not exceed 140 volts maximum,

and had better be 135, or your Westinghouse rectifier may be injured. The L.F. choke illustrated—the Hypercore, made by Radio Instru-

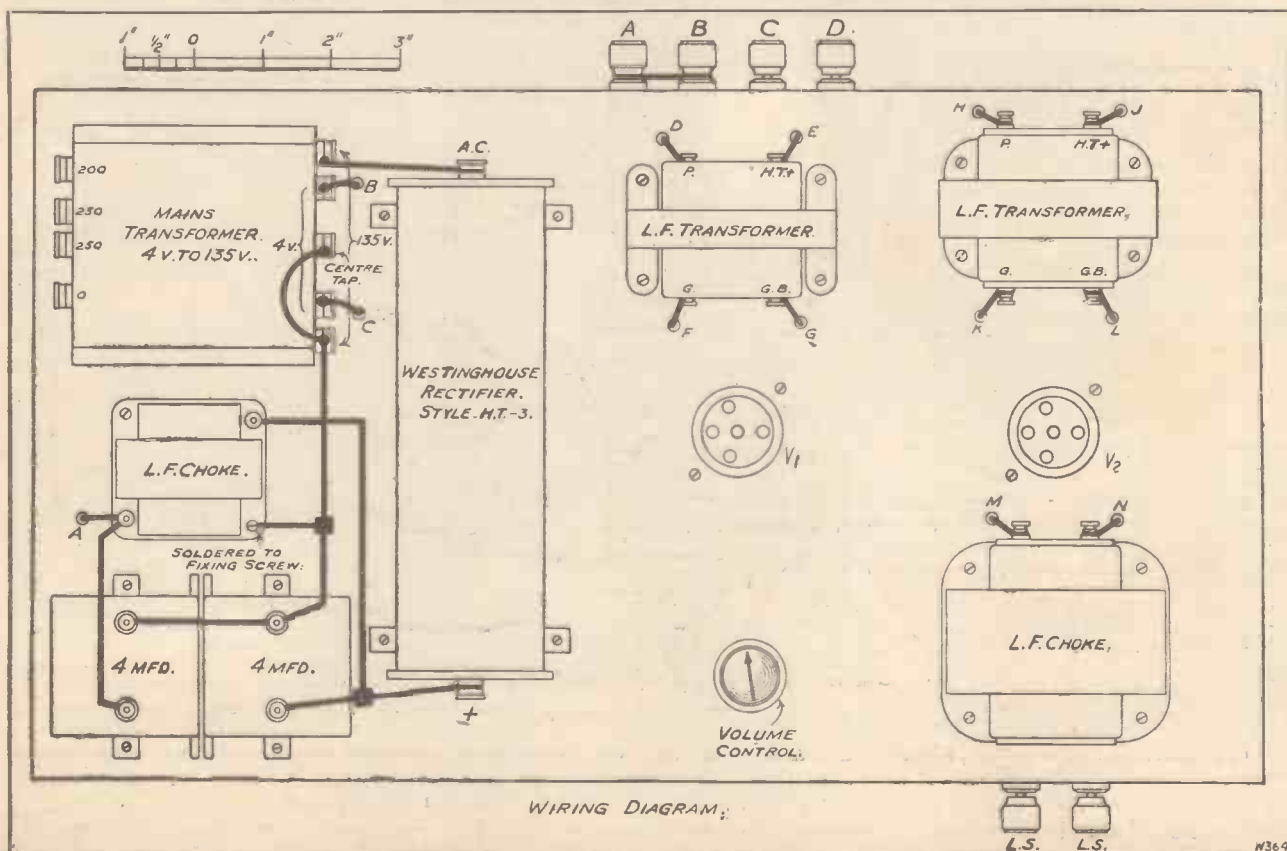
ments, Ltd.—is particularly small and neat, and fits into the design quite well in the position shown. Any good L.F. transformers can be used, as may any good quality output choke. You have quite a wide choice in the fixed condensers, but those chosen are typical of good modern practice.

The Circuit Design

Coming now to the circuit design, which we should study before beginning the practical work in order that we may know just what we are doing and why, it will be seen that a single-wave rectifier is used. It may be thought that this would not give sufficient smoothing, but it must be remembered that the total output of this rectifier is not high, and smoothing is comparatively simple for such current, particularly when we have a high-grade L.F. choke in conjunction with two condensers of 4 mfd. each.

The circuit is particularly simple, and where various connections are permanently made to "earth," this is really to the chassis itself, which

NEATNESS IS ONE OF THE OUTSTANDING FEATURES



The majority of the components are mounted on top of the metal chassis, but most of the wiring is underneath. This is the diagram of the wiring above the chassis.

The "Gramo" Amplifier—continued

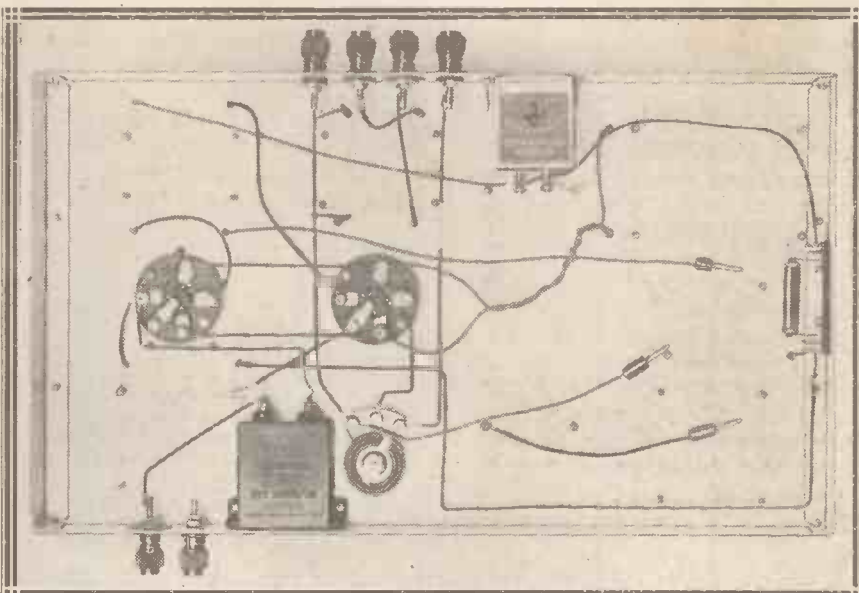
simplifies wiring and reduces harmful induction effects.

The first point of interest is the arrangement of input terminals, for some pick-ups will work better through an input transformer and others directly on to the grid of the first valve. By using four terminals and linking two we can arrange for the pick-up to be taken to the primary of the transformer, the secondary of which is joined to the grid and cathode of the first valve.

Connecting the Pick-Up

By removing the link and using another pair of terminals we can disconnect the first transformer, and arrange for the pick-up to go straight on to the grid. At this point it should be mentioned that pick-ups vary considerably in their voltage output, and one should be chosen which has a fair output for this amplifier.

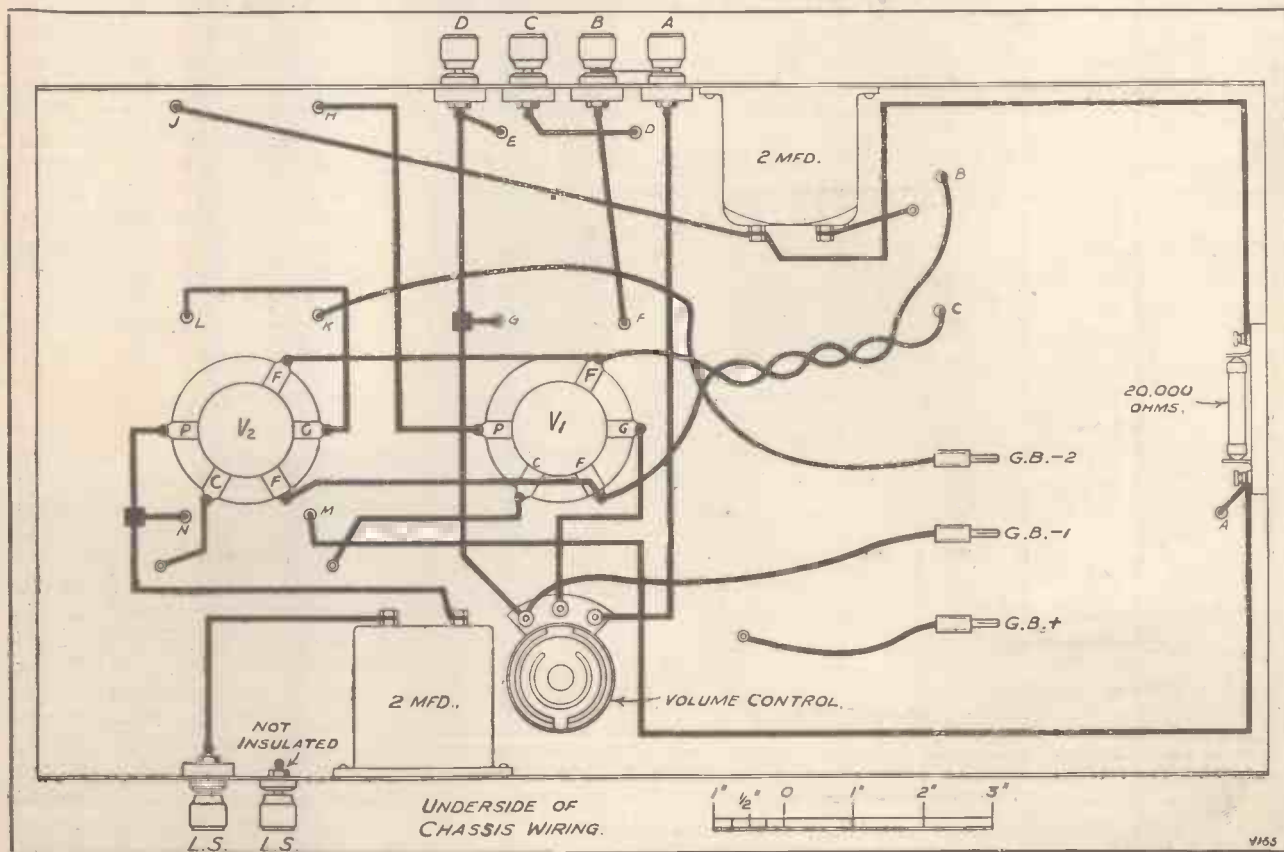
Many, indeed, will require the use of the volume control to bring the strength down to that suitable for an ordinary room, while comparatively



This photograph should be used in conjunction with the wiring diagram on this page, when you will find it quite easy to wire-up the amplifier. Note the twisted leads which supply the "filament" current.

few will be used with the volume control adjusted to provide full volume. It will be noticed that what has sometimes been called "automatic

MOST OF THE WIRING IS HIDDEN FROM VIEW BY THE CHASSIS



Here is the wiring underneath the chassis. The points where wires pass through the chassis are lettered, and these letters correspond in both wiring diagrams.

The "Gramo" Amplifier—continued

grid bias" has not been used in this set, the ordinary grid-bias battery being provided. The so-called automatic grid bias is really obtained from the high-tension supply. For example, if we wanted 10 volts grid bias on this set in this way we should only have about 110 volts H.T. and 10 volts grid bias.

By using a battery for grid bias we not only simplify the set and reduce the cost, but get the maximum H.T. wanted for the particular unit. Incidentally, the grid-bias battery should last at least a year, and as it fits snugly underneath the chassis it was decided that this was by far the most practical method of providing grid bias.

Sound Design

There are no special remarks to be made upon the rest of the circuit, except to say that it is a good, sound, standard design. The use of a decoupling resistance and output choke prevents unwanted feed-back effects.

There are no dangerous high voltages on the output side of the transformer such as occur when a double-wave rectifier with a centre-tapped winding on the transformer is used, so that risk of shock is considerably reduced.

easier than many other methods. Aluminium is a very soft metal, particularly easy to drill, while the method of construction adopted has been specially chosen to facilitate the work of the home-constructor.

The chassis will be delivered to you

them out on the chassis as close as possible to the positions shown in the drawings. When you have satisfied yourself that everything is properly laid out and symmetrical on the upper side, take a lead pencil and mark through the securing holes of the

YOUR SHOPPING LIST

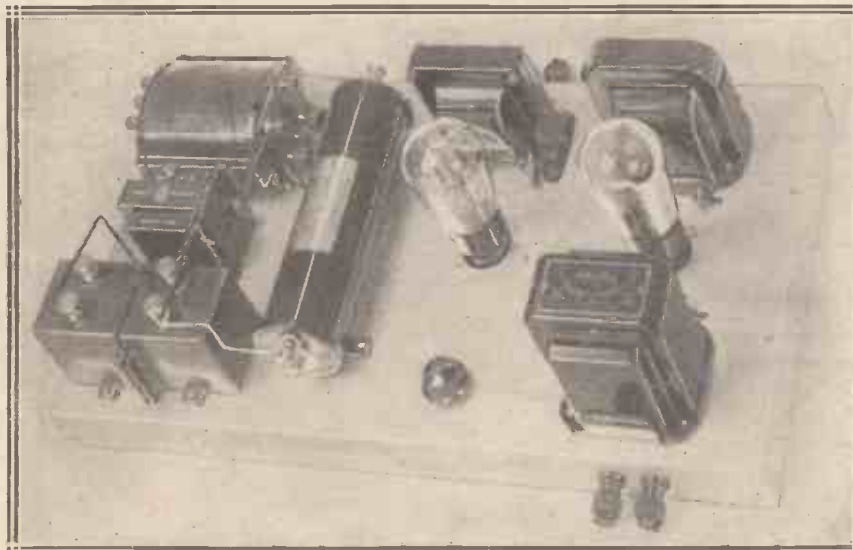
- 1 "Gramo" Amplifier aluminium chassis, fitted with two A.C. valve holders and terminals as shown (Ready-Radio, or Magnum, etc.).
- 1 A.C. mains transformer with tapped input and double output, one winding for 135 volts and the other 4 volts with centre-tap (Heayberd, or equivalent type).
- 1 Westinghouse metal rectifier, type H.T.3.
- 2 4-mfd. condensers, 200 volts working (T.C.C., or Dubilier, Lissen, Mullard, Hydra, etc.).
- 1 20-henry L.F. choke (R.I. Hypercore, or Ferranti, Varley, Wearite, etc.).
- 1 20,000-ohm resistance and holder (Ready Radio, or Ferranti, Varley, Bulgin, R.I., etc.).
- 1 2-mfd. condenser (Hydra, or Lissen, Mullard, Ferranti, Dubilier, T.C.C., etc.).
- 1 2-mfd. condenser, 200 volts working (T.C.C., etc.).
- 1 L.F. transformer (Ferranti A.F.3., or Varley, Lissen, R.I., Telsen, Igranic, Mullard, Lotus, Leweos, etc.).
- 1 L.F. transformer (Lissen, etc.).
- 1 Output choke (Varley, or Wearite, Lissen, R.I., Ferranti, Magnum, etc.).
- 1 Volume control (Igranic, or Lissen, R.I., Magnum, Varley, Gambrell, Wearite, etc.).
- 1 H.L. type indirectly-heated cathode A.C. valve.
- 1 L. type A.C. valve or equivalent.
- Grid-bias battery.

by your dealer all ready fitted with the valve holders and terminals, the terminals with one exception being insulated from the chassis. The exception is the loud-speaker terminal which is connected normally to

various components so that you can see exactly where to drill.

Now move these components and carefully drill your holes. Any ordinary drill such as you use for ebonite will do, and when you have drilled through turn over the chassis on the back and there you will see a very heavy burr. The simplest way to remove this is to take a small countersink bit, lay the chassis upside down on a piece of soft wood and spin the countersink bit a few times. This will neatly pare off the burr, leaving a clean hole.

ALL READY FOR CONNECTING UP!



With the valves in place the amplifier has a particularly pleasing and scientific appearance. The valve holders are actually mounted under the chassis, just the "business" part of them projecting through.

If you have not before tackled the construction of a set on an aluminium chassis, do not imagine it is difficult work. On the contrary it is much

negative L.T., this going straight to the chassis.

With your parts assembled as suggested earlier in the article, lay

Completing Construction

Before mounting the components on the top, drill the chassis in a similar way for the underside components. None of the holes need to be bigger than is necessary for the clearance of the 4 B.A. cheese-head metal screw, except the hole which takes the volume control.

This hole must be big enough to take not only the shank of the volume control, but also the necessary insulating washer, as the device must be insulated completely from the chassis. The firm from whom you obtain the chassis will supply you with the necessary insulating washers here.

The various components are now secured in position, cheese-head 4 B.A.

The "Gramo" Amplifier—*continued*

metal screws being used with nuts. After mounting all the components in place, drill the further holes necessary to take the leads which come through the chassis.

A $\frac{1}{8}$ -in. hole is about right, as the wire which passes through must be covered with a protected sleeving to prevent chafing. This sleeving should preferably be fairly heavy Systoflex, and a single yard will be ample for the whole set.

Insulate the Wiring

The Systoflex, of course, must be of a size suitable to fit easily over the wire used for wiring-up, which should, of course, be insulated by using such a wire as Glazite. If bare wire is used the whole of each piece can be shielded by Systoflex sleeving.

Glazite insulation is perfectly satisfactory for all ordinary purposes, but is easily rubbed through when placed against the edge of a hole, and in all cases where passed through the chassis a protective sleeving should be run over the insulation.

Several connections, it will be seen, go straight to the chassis, such as grid-bias positive, one loud-speaker terminal, H.T. negative, and centre-tap of the transformer. By joining up the L.T. circuit as shown, either directly- or indirectly-heated 4-volt valves can be used.

For example, you will find it quite practical to use in place of an A.C. valve in the last socket a 4-volt super-power valve of the battery-driven type. I have used a P.M.254 here, and its operation has been quite free from hum. In the first socket, however, a special A.C. valve must be used.

I have not shown any special clip for the grid-bias battery, as these batteries vary in size considerably, and the user will probably prefer to adopt his own ideas in this regard.

Grid Bias

In any case, there is adequate space underneath for any of the 18-volt grid-bias batteries now on the market. When deciding upon grid bias, remember that the high-tension voltage is 120, $1\frac{1}{2}$ to 3 volts being adequate for the first valve. Grid bias for the second will be found on consulting the makers' chart or data sheet.

The diagrams have been carefully marked to show which leads come through the chassis and which are joined directly on to it. As it is not

normally possible to solder on to aluminium, those connections which are made to the chassis are soldered to the nearest securing screw holding components to the chassis.

In case any reader may feel puzzled as to the use of four terminals on the output choke, it should be pointed out that the one illustrated is so designed that the two halves of the choke can be used in series or parallel.

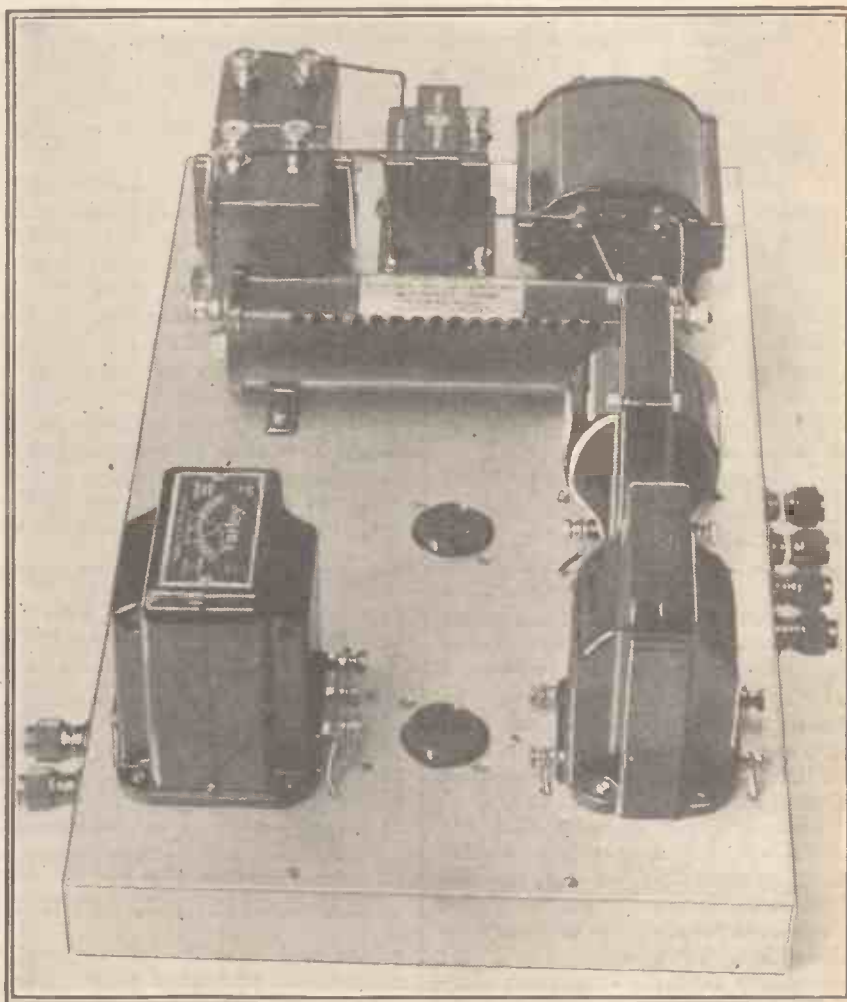
fixed condenser can be used with safety.

Operation

The ones illustrated have a working voltage of 200, which, of course, is far above the voltage to which they are submitted in the set, while the makers have their own safety factor above that figure.

And now a few words about operation of this amplifier. On the input

FEW WIRES TO WORRY ABOUT



The wiring is quite easily carried out, and presents a very neat appearance when finished, as most of the leads run underneath the base.

It is not necessary to use a dual type here, as any of the good L.F. chokes will suit. In the wiring diagram only two terminals are shown so as to avoid confusion.

One of the reasons that the cost of the "Private Address" Amplifier has been kept down is the fact that the voltage on the output of the rectifier is particularly low, so that a relatively inexpensive type of

side of the mains transformer you will find four terminals, three at the top and one at the bottom. The two leads from the mains are attached, one to the bottom terminal and the other to one of the three terminals, depending upon your mains voltage.

These terminals are marked 200, 230, and 250 respectively. If your voltage is 220, then use the 230

(Continued on page 276.)



QUEER QUERIES

Some typical radio faults reviewed and questions answered.

By P. R. BIRD.

I SUPPOSE nearly all set-builders have had the annoying experience of getting good results from a rough hook-up which failed to work even half as well when "poshed-up" and put into a cabinet. There are half a dozen things that will cause such a disappointment, including such old friends as longer battery leads and altered spacing, but a very keen Nottingham experimenter who had a stubborn case of this kind tracked it to the cabinet itself.

Via the Cabinet?

He found that even when leaving everything else untouched the set became unstable when the cabinet was fitted over it. The only explanation that appeared to cover the circumstances was capacity feed-back, due to conductive properties of the cabinet—which, of course, should have no conductive properties at all—and sure enough when a different cabinet (of the same dimensions) was tried there was no trace of the trouble.

Such a queer instance does not often arise, nor get the careful tracking that this one did, but the hint is worth passing on, so if you have been worried by a "can't-be-boxed-in" howl, don't forget the possibility that the cabinet or base-board may be "conducting itself improperly" instead of being strictly neutral electrically, as it is supposed to be.

A Valve with a Temperature

"What is wrong when a valve warms up?" is the question that is puzzling a Birmingham reader, who accidentally "took the temperature" of his valve one day while making an investigation inside the set, and noticed that the power valve was quite

hot instead of being just warm as usual.

By his own confession he was interfering with the inside of the set while it was switched on, and this is rather risky where very high values of high tension are employed. However, in this particular instance the damage would have been done in any case, for what had happened was that owing to a faulty connection in its grid circuit the 24 volts negative grid bias which should have been given to the power valve had not been applied.

It was this that had caused the valve to become hot, for one effect of

readers that with power and super-power valves the provision of adequate grid bias is not merely important, but is vital to the correct functioning of the valve, which may be seriously damaged, if not ruined altogether, if the grid is disconnected from the grid-bias battery. It is for this reason that you should never readjust the negative grid-bias plug while filament and H.T. batteries are on, but you should always switch the set off until the alteration has been made and the G.B. plug is safely in the new position.

To leave the set on while you remove the "power" G.B. plug from one negative grid-bias socket to the next is a sure way of shortening the life of your last valve.

Using "X" Coils

The "X" type of coil has several advantages over the ordinary plug-in coil in certain circumstances, but instances have arisen when an "X" has been installed with disappointing results. Some readers have purchased an "X" coil with the idea of improving selectivity, only to find that it makes very little difference.

In several cases we have found that this has been caused because the coil holder has been wired the wrong way round. In normal circumstances, where an "X" coil is used, the coil holder in which it is placed will be on one side wired to the earth terminal, and under ordinary conditions it is

WHEN THE SET WON'T WORK!

Present-day radio is remarkably reliable. But every set "goes off" sometimes, and it should not therefore be assumed that it is wearing out. All it wants is proper maintenance—like a car or a bicycle, or any other similar contrivance. If you have any knotty little problem requiring solution, remember that the WIRELESS CONSTRUCTOR Technical Queries Department is in a position to give an unrivalled service. The aim of the department is to furnish really helpful advice in connection with any radio problem, theoretical or practical. Full details, including the scale of charges, can be obtained direct from the Tech-

nical Queries Department, WIRELESS CONSTRUCTOR, Fleetway House, Farringdon Street, London, E.C.4. A postcard will do. On receipt of this all the necessary literature will be sent to you, free and post free, immediately. This application will place you under no obligation whatever. Every reader of the WIRELESS CONSTRUCTOR should have these details, which will enable him to ask his questions so that we can deal with them expeditiously and with the minimum of delay. London Readers, Please Note: Application should not be made by telephone or in person at Tallis House or Fleetway House.

ample grid bias is that it greatly reduces the amount of plate current flowing; and as in this instance there was no grid bias, the plate current had risen to an unprecedented degree, just as though the high tension had been increased far beyond the maker's limit. The result of this was to impair the life and efficiency of the filament, for it was called upon to give an extraordinarily high emission and therefore behaved just as it would have done had the voltage applied been raised high above the normal.

This incident will serve to remind

the pin of this coil holder that is connected to earth.

The terminal which corresponds to the socket of the holder is, of course, joined to grid, etc. If, therefore, your "X" coil fails to give satisfactory results, make sure that the leads to the coil holder appear to be in the right direction.

If the coil you are using has reversed connections, naturally it will require reversed connections in the coil holder; but if you are dissatisfied with results, a trial with reversed connections is easily made.

DISTORTION IN THE ETHER—

HOW WAVES GO WRONG

by NOEL ASHBRIDGE B.Sc., A.M.I.C.E.



There is so much said about the inefficiencies, major and minor, of the transmitter and of the receiver and its associated equipment that the possibilities of distortion occurring in that vital link, the ether, are apt to be overlooked. However, in this article the Chief Engineer of the B.B.C. throws clear light on this intriguing and important aspect of radio.

THE last five articles of this series have dealt with subjects all directly connected with the actual transmission of broadcast programmes. It is obvious that from the listener's point of view this is only half the story, and that without good reception any amount of care which may be taken with the transmission is, to an extent, wasted.

It will be interesting to consider first of all what happens after the electric waves have been set up in the ether by the aerial at the transmitting station. By this time the standard of musical quality has been fixed, if one neglects the possible use of correction networks and kindred devices at the receiving end.

The Two Routes

The question now arises: Can distortion take place in the ether itself? The answer to this question is both "No" and "Yes." With plain, straightforward daylight reception at a distance of, say, 30 miles from a high-power station, it is sufficiently accurate to say that no ordinary distortion can be introduced by the medium of transmission—i.e. the ether.

This applies to the two ordinary broadcast wave-bands of 200 to 545 metres and 1,375 to 1,900 metres, but with the ultra-short waves—that is to say, very roughly, from 15 to 100 metres—all kinds of complications may arise, even at this short distance.

After dark the statement is still nearly true, down to a wave-length

of, say, 250 metres, if freak conditions are neglected, such as reception at the bottom of a deep valley. However, at a distance of from 70 to 100 miles for wave-lengths from 350 to 550 metres, and from 50 to 80 miles for wave-lengths from 250 to 350, we have to take into account the fact that the waves are reaching the aerial by two separate paths.

One of these is the direct or "ground" ray, and the other is the "reflected" ray. The former travels over the surface of the earth in a comparatively straightforward way, but its attenuation varies very greatly

with the nature of the intervening country.

The latter only reaches the earth after coming into contact with the "Heaviside" layer, which is assumed to exist at a height above the earth of from 60 to 120 miles.

Direct and Indirect

The amount of radiation reflected by this layer in any given direction varies from one moment to the next, and when the ray finally arrives on the earth it combines with the "direct" component.

Naturally, in these circumstances,

BERLIN'S FIRE STATION



Some of the modern radio apparatus that Siemens and Halske have installed at the Berlin Central Fire Brigade Station.

Distortion in the Ether—continued

the phase relationship between the two rays is constantly varying. Thus we are bound to get amplitude variations, but we may get other kinds of distortion in addition.

Differential Fading

Due to this effect the worst reception conditions usually occur when the reflected or direct rays are roughly equal, and obviously the distance from the station at which this takes place depends on the strength of the direct ray, which in turn depends on the nature of the intervening country, since the attenuation of the direct ray is affected by the latter to a very much greater extent than the reflected ray.

In actual practice it is more usual to experience plain, straightforward

transmitters. It was found that the best reception was from Brookmans Park on 261 metres, although, of course, there was some fading.

Daventry 5XX was receivable, but badly interfered with by atmospherics; moreover, apart from the occasional fades, the 261-metre transmission was very considerably stronger. Of course, during daylight it disappeared entirely, whereas 5XX remained at the same strength.

In these circumstances, on wavelengths above, say, 250 metres, serious distortion, apart from variations of strength, is not common.

When it does occur it is probably due to differential fading of the carrier and the two side-bands, but it should be remembered it is possible sometimes to get re-radiation, in other

observed that when listening to Leeds at considerable distances the quality is frequently rather "mushy," although the strength is often very good and even steady for considerable periods.

This bad quality is not, of course, radiated by the station, but is introduced between the transmitter and the receiver, only, of course, when receiving at considerable distances, and even then it is not always present.

On the "Ultra-Shorts"

This is a phenomenon which more frequently occurs when receiving ultra-short waves. If suitable meters are used it will be noticed sometimes that the carrier is increasing while the strength of the side-bands, i.e. the telephony, is falling. Again, sometimes the carrier is steady while distortion comes and goes.

For this reason it has been suggested that better reception on short waves would be possible if telephony or music were transmitted with no carrier, and with one side-band only, in order to limit as far as possible the difference between the maximum and minimum frequencies transmitted.

When receiving a distant station which is fading badly there is usually bad distortion in the trough of the fades. Detector effect may magnify this to a very considerable extent, and for this reason one should get better results when the general level is sufficiently high to allow the detector to be working on a straight part of the curve. In these circumstances only the very bad fades will be noticeable.

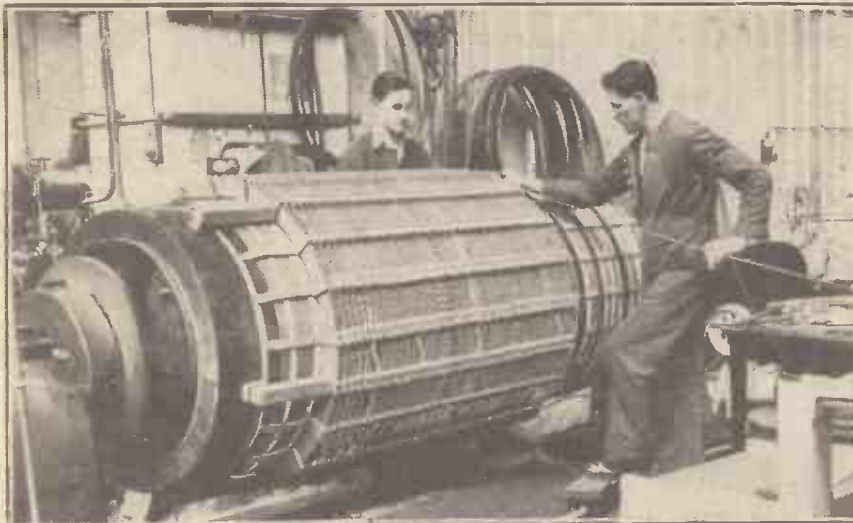
Aerial Interactions

Of course, there are other possible distortions, which, strictly speaking, are nothing to do with the medium of transmission, and yet are not introduced by the receiver or the transmitter.

Unfortunately this type of distortion is very common, and is due to interaction between neighbouring aeri-als. Moreover, the trouble is liable to occur even when neither receiver is actually oscillating.

There is only one definite cure, and that is to arrange the aerial in such a way that it cannot couple with any others. Unfortunately this is not always possible, especially in the case of flat-dwellers.

AN OUTSIZE IN COILS!



Winding one of the coils of a 132,000-volt transformer at the B.T.-H. works at Rugby. Not a job that could be done on the kitchen table!

variations of amplitude without any very noticeable amount of other kinds of distortion. Again, variations of strength are less noticeable when listened to on a loud speaker than when observed on a millimeter showing the amount of rectified current in the detector anode circuit.

At greater distances, when the ground ray has become negligible, reception usually improves and the only difficulty is plain, straightforward fading of the reflected ray.

During a recent visit to Switzerland the writer particularly wished to hear a certain programme broadcast (after dark) from the B.B.C. National

words, reflection from a neighbouring building containing a considerable quantity of metal.

The Lesson of Leeds

Differential fading arises from the fact that a broadcasting station radiates a band of frequencies which has a difference between its extremes of some 14 to 18 kilocycles, and in these circumstances it is possible that the different frequencies may not be reflected by the Heaviside layer in exactly the same way as they are radiated by the aerial at the broadcasting station.

No doubt many readers will have

The "EXPLORER" TWO

An all-wave two-valve receiver of extreme efficiency, which employs the entirely new scheme of wave-changing recently introduced by the "Wireless Constructor." Maximum efficiency is obtainable on the short waves without introducing any drawbacks on the broadcast bands.

By VICTOR KING.



It is not unnatural that Radio and Aviation, two of the most recent of sciences, or inventions, call them whatever you like, should go hand in hand to a large extent.

an aerodrome throughout the whole of their journeys.

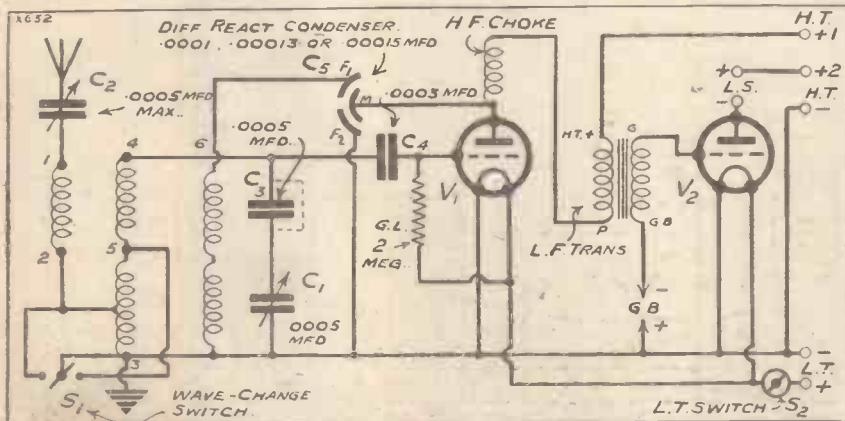
Then, again, in the same connection there is direction-finding by radio,

In the case of the Royal Air Force, wireless assumes a very vital importance. Short-wave communication enables a squadron leader to give instructions to all the pilots with him at the same time, and even picture transmission has been used to send weather and other charts to machines in flight.

And so one could go on for a long time, but perhaps the most outstanding way in which radio is linked with aviation is in such exploits as the crossing of the Atlantic. Of all such flights the recent trip of the Southern Cross was probably the most thrilling, for many short-wave enthusiasts were able to follow the course of the plane right across the Atlantic by means of the wireless messages sent out from it.

Of course, a set which would work on the short waves was necessary, but this was only one of the good things to be heard with such a set. One is not tied to the reception of

LONG WAVES, MEDIUM WAVES AND SHORT WAVES



In this theoretical diagram of the circuit employed the wave-change broadcast coil is shown. The special short-wave coil has no connections to pins 2 and 5, so that the wiring to the wave-change switch S_1 is completely out of circuit. The L.F. part of the circuit follows normal and efficient lines.

For instance, the building up of cross-Channel and other regular passenger air routes has been greatly assisted by wireless telephony, which enables the pilots to be in touch with

which enables a pilot to be given his exact location a few minutes after asking. This service is naturally of great use during foggy weather.

MAKE YOUR SHOPPING LIST FROM THESE DETAILS

- 1 Ebonite panel, 12 in. \times 7 in. (Lissen, or Trollite, Paxolin, etc.).
- 1 Cabinet for above, with baseboard 7 in. deep \times 14 in. long (Camco, or Lock, Pickett, Gilbert, etc.).
- 1 Wooden panel, 14 in. \times 9 in. \times $\frac{3}{4}$ in.
- 1 '0005 variable condenser, of plain or slow-motion type (Lotus, or Lissen, J.B., Ormond, Polar, Formo, Ready Radio, etc.).
- 1 Slow-motion dial if above condenser of plain type (Lissen, or Igranie, J.B., Brownie, Ormond, Formo, etc.).
- 1 '0005 variable condenser, Brookmans type (Ready Radio, or equivalent type).
- 1 '0001-, '00013-, or '00015-mfd. differential reaction condenser (Lotus, or Lissen, Ready Radio, Dubilier,

Polar, Formo, Ormond, Magnum, Wearite, etc.).

- 1 "On-off" switch (Igranie, or Lissen, Benjamin, Lotus, Bulgin, Junit, Wearite, Ready Radio, Magnum, Ormond, etc.).
- 1 3-spring wave-change switch (Wearite, or Ormond, Ready Radio, Paroussi, Magnum, Bulgin, etc.).
- 1 Six-pin coil holder (Colvern, or Leweos, Magnum, etc.).
- 2 Six-pin coil formers, one ribbed and one slotted, each 2 $\frac{3}{8}$ in. in diameter (Colvern).
- 1 oz. each of 22 D.C.C. and 34 D.S.C. wire, 2 oz. of 26 D.S.C.
- 2 Sprung-type valve holders (W.B., or Benjamin, Lissen, Lotus, Igranie, Precision, Wearite, Junit, Bulgin, Magnum, etc.).

- 1 '0003 fixed condenser (Dubilier, or Ferranti, Lissen, Ediswan, Atlas, Mullard, T.C.C., Igranie, etc.).
- 1 '0005 fixed condenser (T.C.C., or Lissen, etc.).
- 1 2-megohm grid leak and holder (Igranie, or Lissen, Ediswan, Dubilier, Mullard, etc.).
- 1 H.F. choke (Magnum, or Leweos, R.I., Lissen, Varley, Ready Radio, Dubilier, Lotus, Climax, Wearite, Bulgin, etc.).
- 1 L.F. transformer (Lissen, or Ferranti, Varley, Telsen, R.I., Igranie, Mullard, Leweos, Lotus, etc.).
- 9 Indicating terminals, markings as shown on diagrams (Belling and Lee, or Igranie, Eelex, etc.).
- 1 Ebonite terminal strip, 12 in. \times 1 $\frac{1}{2}$ in. Wire, screws, Systoflex, plugs, etc.

The "Explorer" Two—continued

broadcasting emanating from Europe only, but can listen to stations in America, or even in Australia; in fact, one can listen to any part of the world.

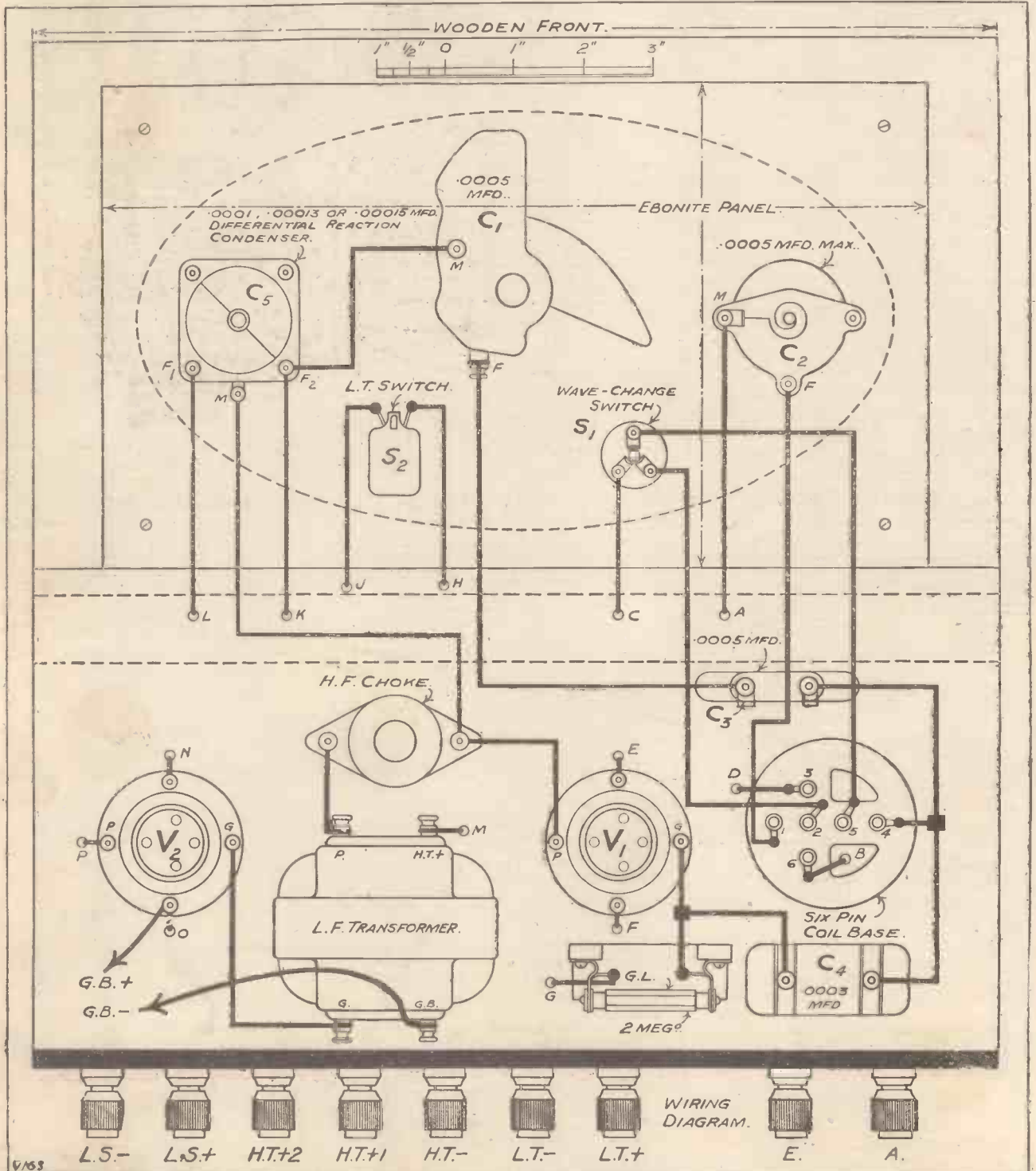
Have you ever thought about all the fun you are missing if your

set will not receive short waves?

No doubt you will answer: "Most certainly I have," and it is quite likely you will add: "But I don't want to sacrifice one jot of my broadcast range and quality

for the sake of short waves."

In that case, the "Explorer" Two is just the set you need; in fact, it will fit your requirements as well as a shell fits a gun. In every way it is exactly what you require.



The scale on this diagram will enable you to mark out points in the oval which can afterwards be joined free-hand. Mark out horizontal and vertical "diameters" first.

The "Explorer" Two—continued

There is maximum efficiency on both the long and short broadcast waves, together with wave-change switching. There are as good results waiting for you on the short waves as if you built a special set for them, and when going over to the short waves you have only one coil unit to change.

Remarkable Qualities

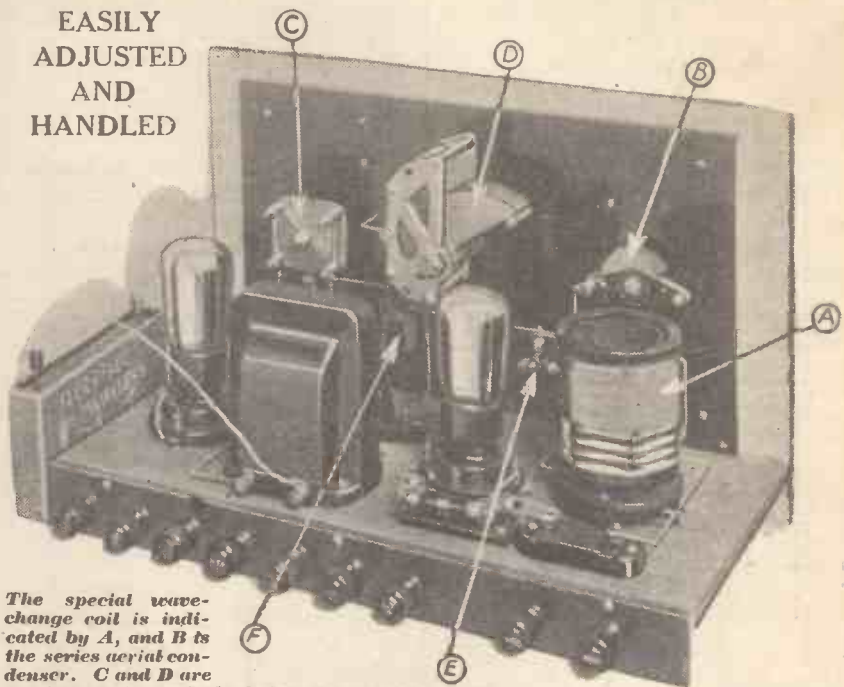
These remarkable qualities have been obtained by means of special six-pin coils. Similar coils were used in the "Explorer" Three receiver, which I recently described.

This set was so popular, and the special wave-change six-pin coil made such a wide appeal, that many requests were received for a simpler and even cheaper set using it.

I have, therefore, produced the "Explorer" Two design, so that even those whose pockets are "rather shallow" may benefit by this entirely new scheme of wave-changing.

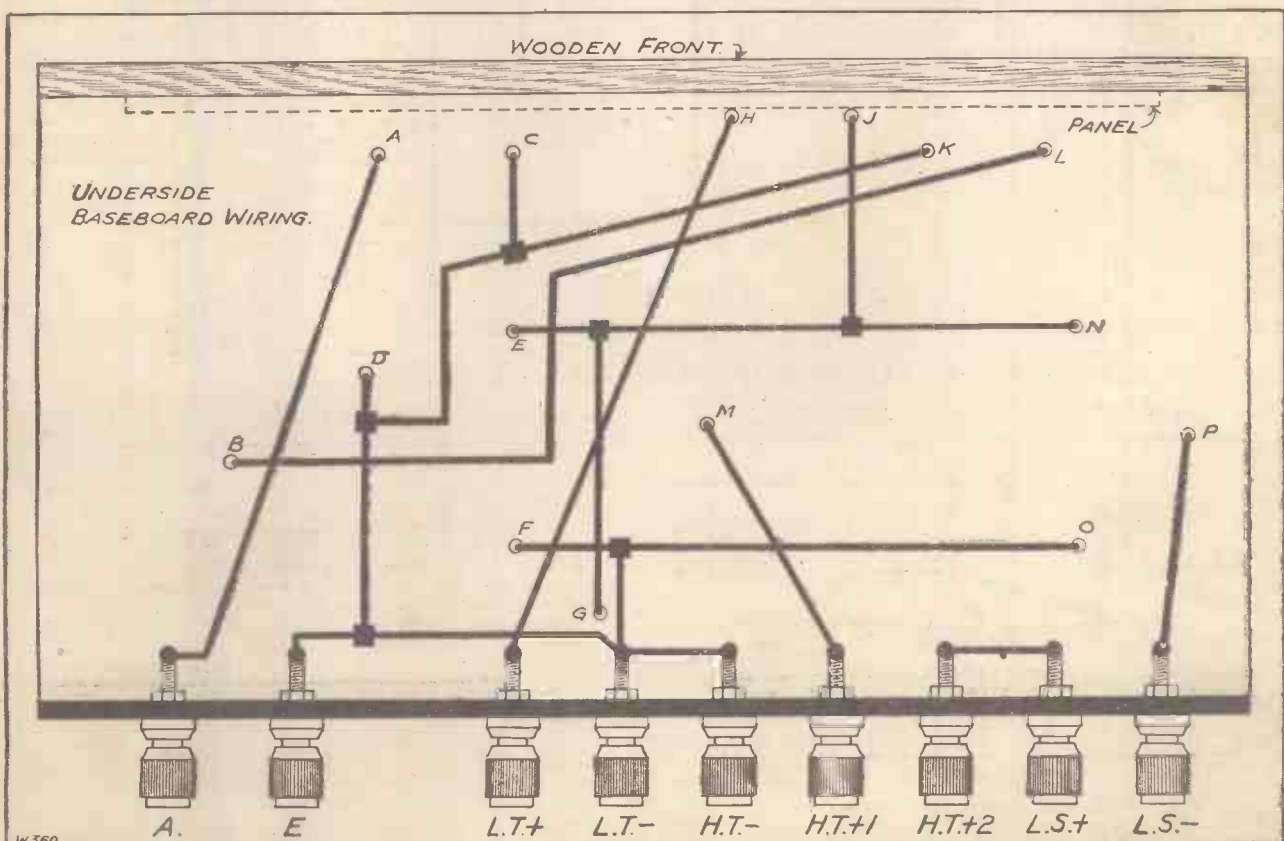
Briefly, the scheme is this. There are two 6-pin coils, which between

**EASILY
ADJUSTED
AND
HANDLED**



The special wave-change coil is indicated by A, and B is the series aerial condenser. C and D are the two main controls, being the reaction condenser and tuning condenser respectively. E is the wave-change switch, and F the "on and off" switch.

SUB-BASEBOARD WIRING PRODUCES SIMPLICITY OF CONSTRUCTION



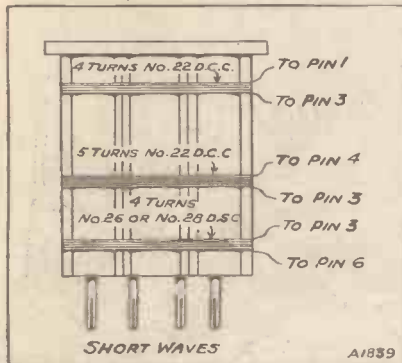
This diagram shows the wiring below the baseboard. The points where the wires pass through the baseboard correspond with those of similar letters on the diagram on the opposite page.

The "Explorer" Two—continued

hem cover all three wave-bands. One is for short waves, and the other for normal and long waves.

The former has four connections to it, and the latter six; the two extra ones being joined up to the wave-change switch on the panel. When the short-wave coil is in position these two leads are completely out of circuit, and therefore there cannot be any losses due to them.

THE SHORT-WAVE COIL



The short-wave coil is extremely simple, consisting of three small windings arranged on one former.

You will consequently appreciate that to change from the normal to long waves the interior of the set does not have to be touched. To go down to short waves you simply remove one 6-pin coil and put the other in its place, and remove the shorting strip across the condenser C_3 .

The capacity of this condenser is .0005 mfd., and its purpose is to reduce the effective capacity of the

.0005 variable tuning condenser C_1 to .00025 for short waves. This makes tuning on the high frequencies very much easier than if .0005 mfd. capacity were employed.

The special coils are wound on standard 6-pin formers and details for making them are given later in this article. But if you are not keen on making your own there are one or two commercial makes of them available.

In the theoretical circuit diagram the broadcast coil is shown, so that you can follow out the method of wave-changing. The condenser C_2 helps greatly in adjusting selectivity on broadcast waves, and enables sufficient reaction to be obtained with any aerial on the short waves.

Adequate Selectivity

While on the all-important subject of selectivity let me assure you that most of you will find it adequately endowed with this quality for your local conditions. On the other hand, if you are right in the swamp area of a powerful station it will be advisable to use a trap of some sort, such as the King "Cut-Out," described in the May issue of the WIRELESS CONSTRUCTOR.

Apart from the points just mentioned, the circuit is built along straightforward and sound lines. So we can now go right along with the constructional details.

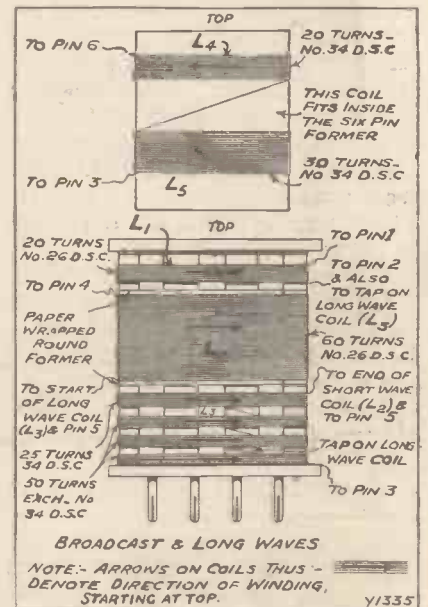
You will note that the popular and sensible "chassis" method of construction is utilised. The baseboard

is raised above the bottom edge of the panel so that much of the wiring may be placed below it.

Simplifies Wiring

This greatly helps to simplify wiring and gives the set a neat appearance. Another point about the construction is that the main

FOR BROADCAST BANDS



The reaction windings for the broadcast bands are carried on a separate small former which slides inside the main former.

panel is of wood, with an oval hole in it backed by a piece of ebonite carrying the controls.

THE "WIRELESS CONSTRUCTOR" "EXPLORER" TWO

A Det. and 1 L.F. set for Short, Normal, and Long Waves.

VALVES.

These may be 2-, 4-, or 6-volters. V_1 should be of the H.F. type, and V_2 should be of the small power type.

VOLTAGES.

L.T.: To suit valve rating, i.e. 2, 4 or 6 volts.
H.T. + 1: 45 to 60 volts.
H.T. + 2: Up to maximum rating of power valve, and not less than 100 volts.
C.B.: $4\frac{1}{2}$ to 9 volts, according to valve used, and H.T. voltage applied to H.T. + 2.

COILS.

Two special 6-pin coils are required. They were fully described in the "Wireless Constructor" for June, 1930. One covers short waves and the other normal and long broadcast waves.

OPERATING DETAILS.

ON BROADCAST WAVES.

Use broadcast 6-pin coil and short-circuit .0005 fixed condenser in series with tuning condenser.
Tune on centre dial and control reaction with right-hand knob.
Have left-hand condenser as near maximum as possible, consistent with sufficient selectivity and reaction. (Reducing its capacity increases selectivity.)
Right-hand switch switches set on and off. (Pull out for "on.")
Left-hand switch changes from long to normal waves. (Push in for long and pull out for normal, i.e. medium waves.)

ON SHORT WAVES.

Use short-wave 6-pin coil and see that .0005 fixed condenser in series with tuning condenser is not "shorted."
Tuning is same as for broadcast waves.
Adjust left-hand condenser in conjunction with voltage on H.T. + 1 until reaction control is smooth and consistent over whole range of centre dial.
Left-hand switch is now inoperative. Right-hand switch switches set on and off.
Tuning will be quite sharp, so it is necessary to adjust the controls very gradually, particularly when searching.

The "Explorer" Two—continued

This gives the set a very pleasing appearance, and quite a touch of professionalism. It also enables a smaller piece of ebonite to be used. Of course, if you prefer an ordinary ebonite panel you will only have to substitute one in place of the present wooden panel. Elsewhere you will find a complete list of the components that you will require, together with the names of suitable makes. The first step in the construction is to prepare the chassis.

Panel Vignette

Drill the panel in accordance with the details on the panel layout diagram, and mount it together with the wooden panel (from which the oval piece should have been cut with a fretsaw) to the baseboard. The terminal strip with the terminals fixed in place should also be be fixed to the baseboard.

Now mount all the components and drill holes through the baseboard at the points where wires have to pass through. These holes are lettered in the wiring diagram.

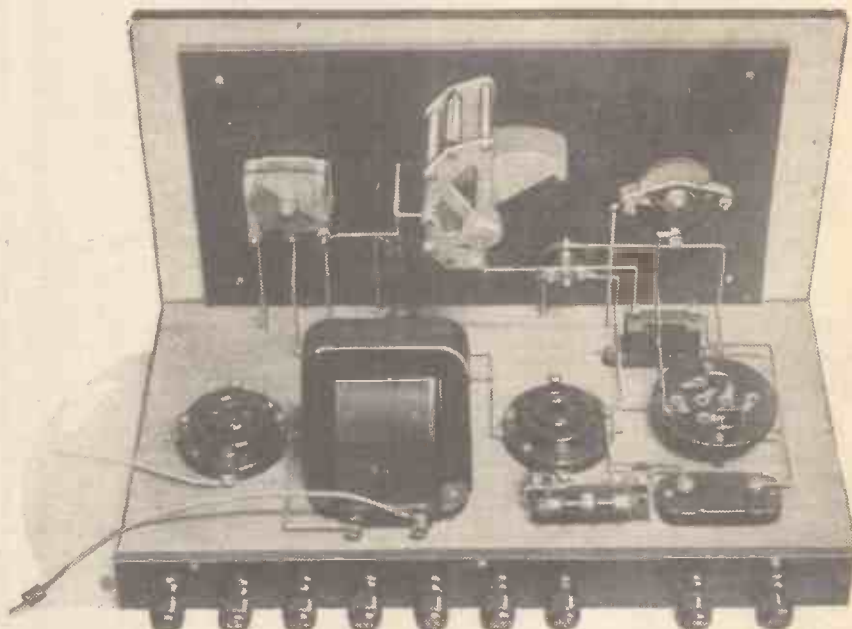
The receiver is now ready for wiring, which is best carried out with tinned copper wire threaded through lengths of Systoflex. Follow the diagrams very carefully when wiring.

You will find a separate diagram of the wiring underneath the baseboard, and all the points at which the wires pass through to the top

are lettered. These letters correspond with those on the other wiring diagram, so that you will have no difficulty in tracing out all the connections.

26 D.S.C. wire, and the 34 D.S.C. wire. You will also need a short piece of former which, when it is wound, will just fit inside the longer former.

THE WHOLE WORLD ON TWO VALVES



This view of the set gives a good indication of its neatness and accessibility. The grid-bias battery stands on the baseboard next to the second valve. The 6-pin coil holder may be seen at the other end of the set.

Having completed the set you can now wind the coils. We will deal with the broadcast one first. For this coil you use the ribbed former, the

All the details of the windings and their connections are given in a special diagram, which you should study for a little while and then follow exactly. The first winding to put on is L_1 in the top slot. It consists of 20 turns of the 26 D.S.C. wire.

Completing the Coil

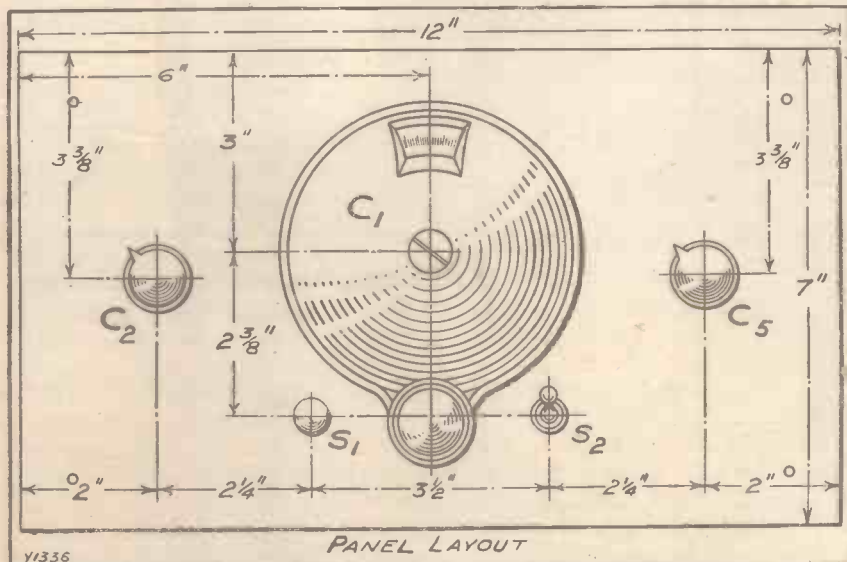
Secure the ends of the wire by taking them through small holes in the former and finish them off on the inside and about 3 in. long. This will allow for connecting up, which should be done after all the windings are in place.

Next wind the 34 D.S.C. wire into the bottom four slots, taking care to put the right number of turns in each slot. A tap must be made to the wire between the bottom and next slots.

L_2 is a single-layer winding, and to prevent it going down into the slots a piece of stiff and dry paper should be wrapped round the unused slots and stuck in position. On top of this L_2 is wound.

(Continued on page 276.)

THE CONTROLS THAT BRING IN MANY STATIONS



The ebonite panel itself is attached to the back of the main wooden panel in which an oval is cut so that the controls show through. This scheme gives a very pleasing effect to the completed receiver.

MORE ABOUT THE "VEE-KAY" THREE

By VICTOR KING

Last month full constructional details of this efficient wave-change set were given, and here are some further operating hints and tips which will be very useful to those who have made the receiver.

By the time these operating notes appear in print I imagine that quite a number of you will already have made my last three-valver, and, I hope, will have proved to your own satisfaction that the "Vee-Kay" Three is indeed a set for the searcher.

I am usually rather reluctant to drag myself away from the research benches just for station chasing, but I must confess that on several occasions since this set was tested and passed for publication I have gone back to it with the feeling that I simply must add a few more to the already somewhat lengthy list of stations received.

A Permanent Record

It is the policy of the WIRELESS CONSTRUCTOR to cram every issue full of good things, and to offer as much and as varied a fare as possible every month. Consequently it is not unusual for me to find myself getting towards the limit of the available space without having said all that could be said regarding operating details.

You know, I always think a set constructional article is like a good picture—it is never really finished, but naturally the line has to be drawn somewhere. Anyway, there are just one or two things that I'd like to chat about before leaving this set to your tender mercies, and first and foremost perhaps is the operating panel.

This, as most of you know, was an idea introduced by the Ideas Committee, and it forms a very useful and permanent record of the set if you cut it out and stick it inside the lid of the cabinet. It is not always possible to preserve your copies of the WIRELESS CONSTRUCTOR, and if you paste this ready reference inside the lid it will not very much matter if the copy containing the necessary operating details is mislaid.

H.F. Coupling Coils

I spoke last month in the constructional article about the coils required for H.F. coupling purposes (those marked L_3 and L_6 in the various dia-

grams), and, you will remember, I specified a No. 35 or 40 for the short waves and a No. 150 for the long-wave band. As a matter of fact, it may be possible in certain cases to improve results by trying different sizes in these positions.

Selectivity Adjustments

These two coils form the primaries for coupling the H.F. valve to the detector, but in addition they also function as reaction coils. Consequently, since the coils are serving a dual purpose, experimentation in sizes may enable you to find coils more suited to your particular set of conditions than those specified.

Alteration of the tapping positions on the "X" coils affords another method of increasing selectivity, although in this case the actual sizes of the coils should be exactly as specified, otherwise the set will not cover the whole band of broadcasting waves. If you find that you are still unable to obtain quite such a high degree of selectivity as is required for your particular locality, do not forget that the semi-variable condenser on the baseboard (below the reaction condenser) is also intended as an extra selectivity control.

The H.F. Grid Bias

Just a word about the H.F. grid-bias values. I have found during my experiments that with certain makes of 2-volt valves, $1\frac{1}{2}$ volts bias is rather too much, and consequently if you are using 2-volters you may find as I have found that bias can be left out altogether with a slight improvement in results. (The plus and minus leads should, by the way, be short-circuited in this case.) But only leave the bias out if a definite improvement results, because otherwise its

THE "VEE-KAY" THREE RECEIVER

(The circuit employed is an H.F., Det., and 2 L.F., with wave-change switching.)

VALVES.

- 1st: Screened-grid H.F. (vertical mounting).
2nd: H.F. and detector type. (Impedance of 20,000 to 30,000 ohms.)
3rd: Power or super-power type.
Valves of the 2-, 4-, or 6-volt battery-fed type should be used.

COILS REQUIRED.

(Positions given looking at set from front.)

- Left of Screen:
Coil nearer panel—250X.
Other coil—60X.
Right of Screen:
Coils parallel with panel—One nearer panel, No. 40. Other one, No. 60.
Coils at right angles to panel: Left-hand, No. 150. Right-hand, No. 250.

NOTES.

- The loud speaker may be connected either way round, because the set employs an output filter circuit.
The flex leads from the switch on the H.F. side of screen are joined to terminals on "X" coils.
The flex lead from H.F. choke nearest screen goes to terminal on cap of S.G. valve.

H.T. AND G.B. VOLTAGES.

- H.T. + 1: 60 to 80 volts
H.T. + 2: 120 or 150 (see maker's instructions on valve as to maximum rating).
H.T. + 3: Maximum H.T. voltage rating of power valve, or nearest available voltage.
G.B. for S.G. Valve: $1\frac{1}{2}$ to $4\frac{1}{2}$ volts (plug on H.F. side of screen).
G.B. for Power Valve: Value to suit particular valve (see maker's instructions).
Accumulator voltage will depend upon valves chosen.

CONTROLS.

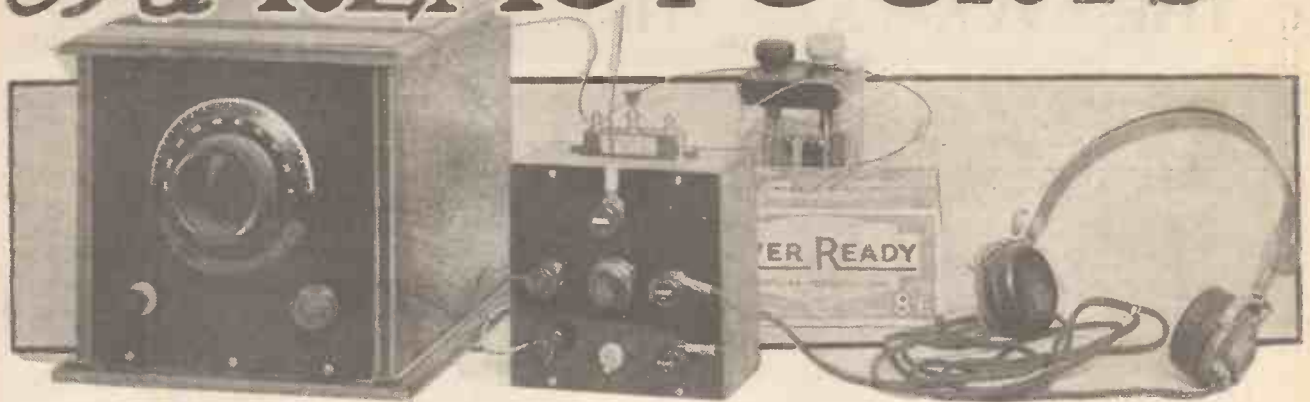
- Two slow-motion dials are for tuning. With same make of "X" coils and ordinary coils these should keep in step.
The lower centre knob controls wave-change switches, and should be pushed in for short waves and pulled out for long.
The upper centre knob is reaction control. Reaction is increased by turning clockwise.
The volume control is the knob on the extreme left of the panel, and this is balanced on the right by the knob of the L.T. switch.

The smaller you make the coils in these positions the greater will be the degree of selectivity obtainable, but there is a limit, because if you use coils that are too small you will probably find it impossible to obtain a reaction effect. Quite apart from this there are, as a matter of fact, certain other objections to the use of very small coils, the chief one of which is the fact that your signal strength will suffer.

presence is effecting an H.T. economy.

And now once again I have come to the limit of my space, but I have managed to say a few things which I was unable to deal with in detail in the original article and which may be helpful to those of you who have built the set. I am always keenly interested to hear from my readers as to the results they are obtaining, although, alas, it is not always possible to give a personal answer to every letter received.

The "REACTOCRYST"



THE biggest drawback to a crystal set is our inability to obtain reaction on it; and yet crystals are very closely connected with oscillations!

There is the ordinary detector crystal which rectifies oscillations, the quartz crystal which controls oscillations, and there are such things as oscillating crystals which produce oscillations.

ALL YOU REQUIRE

- Ebonite panel 6 in. x 6 in. (Trolite, or other good branded material).
- 1 .0001 reaction condenser (Lotus, or Lissen, J.B., Ormond, Polar, Formo, Magnum, Dubilier, etc.).
- 1 L.T. switch (Igranic, or Lissen, Lotus, Benjamin, Bulgin, Magnum, Ready Radio, etc.).
- 1 Sprung-type valve holder (Benjamin, or Igranic, Lotus, Lissen, W.B., Magnum, Formo, etc.).
- 1 H.F. choke (Ready Radio, or Leweos, Varley, Lissen, R.I., Dubilier, Lotus, Igranic, Bulgin, Magnum, etc.).
- 1 .0003 fixed condenser with grid-leak clips (Lissen, or T.C.C., Ferranti, Dubilier, Igranic, Mullard, etc.).
- 1 2-megohm grid leak (Lissen, or Dubilier, Igranic, Ediswan, Mullard, etc.).
- 1 .0003 max. compression type condenser (Formo, or Leweos, R.I., Lissen, Igranic, etc.).
- 5 Terminals (Belling-Lee, or Igranic, Eelex, etc.).
- Plywood, wire, screws, etc.

We cannot use crystals of the last type to produce reaction for three reasons. First, because they would not work in an ordinary crystal set; second, because they are extremely difficult to get hold of, and, lastly, because they need an expert to wake them up and set them going.

If we could make a crystal set "react" it would immediately become vastly more selective, and it would also be capable of bringing in

quite a number of Continental stations as well as the local.

That, you will say if you use a crystal receiver, is just what you want to do to make your set ideal for modern conditions.

Well, here is a neat little unit which enables you to get just that effect by using a valve detector instead of your crystal detector. It is extremely cheap to make, and can be added successfully to practically any type of crystal set in existence.

No Alterations

What is more, it does not involve any alterations to your present set, which can be used as before at a moment's notice. With the unit in use your results will be many times louder than before, you will be able to separate two local stations as easily as with a valve set, and will be able to hear many extra stations, including the more powerful ones on the Continent.

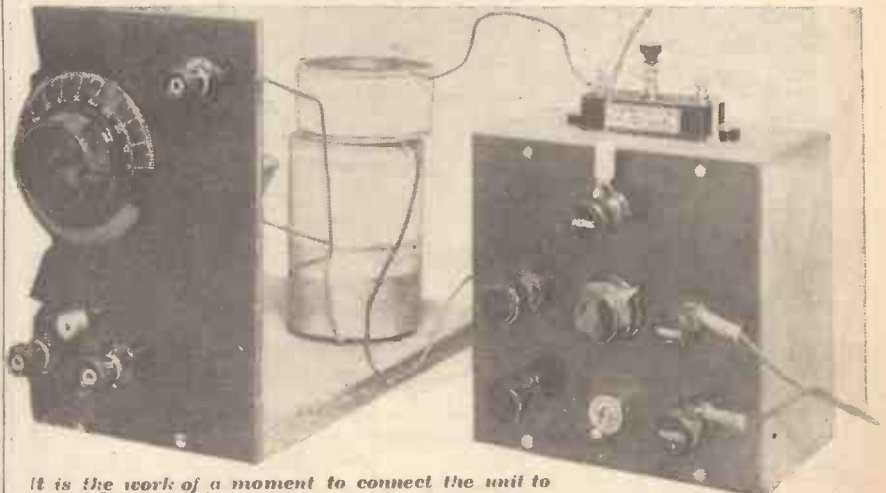
In the circuit diagram you will see a coil marked "Coupling Coil." This coil is coupled with the tuning coil in the crystal set, and serves the dual purpose of aerial and reaction inductance when the aerial is connected to the unit.

"If only I could use reaction on my crystal set!" How many crystal users have uttered that heartfelt wish? But if you cannot make your crystal oscillate you can do the next best thing—just add a little unit which at once turns your crystal set into a one-valve receiver for DX work. Full details of how to do this are given in this article, and if you try it we are sure you will think it a really "nobby" notion.

By A. S. CLARK.

Apart from this the circuit is arranged on ordinary lines for a valve detector with reaction. The condenser C₂ is of the compression type and does not have to be altered once the best setting for it has been found.

THE "REACTOCRYST" IN OPERATION



It is the work of a moment to connect the unit to your existing crystal set, and then you can settle down to listen to those distant stations you have so long wanted to hear.

The "Reactocrys"—continued

It gives an adjustment of the degree of selectivity obtainable without having much effect on reaction, which is controlled by the variable condenser C_3 . The actual tuning is carried out on the main tuning control of the crystal set.

Simple to Build

You will have no trouble with the constructional work, which consists of drilling the panel, winding a small coil, mounting a few components and wiring up.

The panel is supported on a square wooden frame with sides 6 in. by 3 in. This frame is easily made from ply-

wood, and you will see that the valve holder, H.F. choke and grid condenser and leak are mounted on the inside of one of the pieces of wood.

On top of the wooden frame the compression type condenser C_2 is fixed, the connections for it being brought through holes in the wood.

Now for the coil. The one in the photographs is for the normal broadcast band, on which the unit will be found most useful, particularly from the point of view of selectivity. It is wound on a piece of insulating former about $2\frac{1}{2}$ in. in diameter and about $1\frac{1}{2}$ in. long.

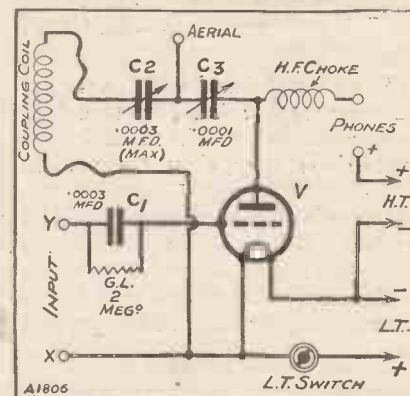
The size of the former is not critical,

nor is the number of turns of wire or the gauge of it. Gauge 24 D.C.C. wire was used in the original and 20 turns were put on. You should wind on this number, and, if necessary, alter afterwards in accordance with the directions given later.

Accessories Required

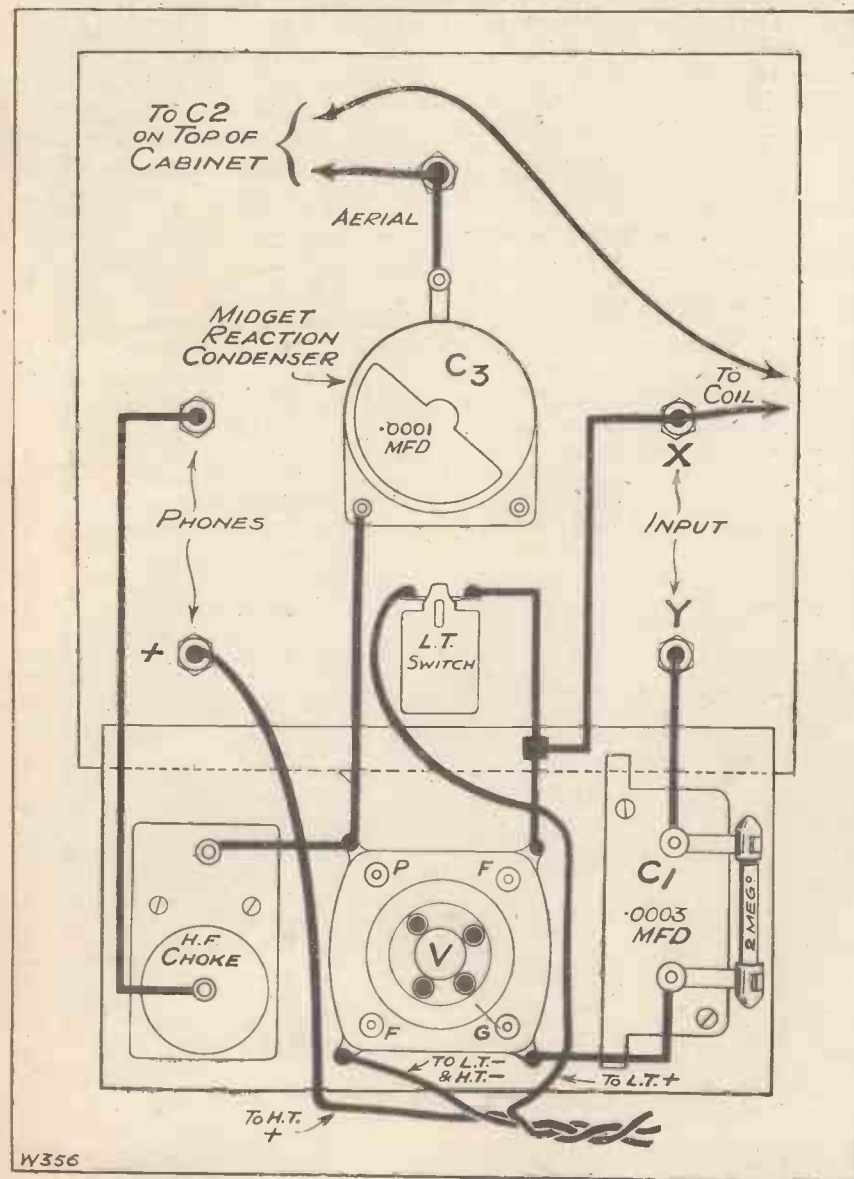
You will need a valve of H.F., det., or general-purpose type, which can

A SIMPLE CIRCUIT



Compare this with the wiring diagram on the left: it will help you when wiring up.

THE UNIT CAN BE BUILT IN ONE EVENING



Just about a dozen connections and the simple wiring is completed.

conveniently have a filament rating of 2 volts, although, of course, a 4- or 6-volt valve may be used just as successfully. An accumulator to suit the valve will also be required, and a 60-volt H.T. battery.

The unit is connected up as follows: Place the coupling coil as near as possible to the tuning inductance in the crystal set and fix it tightly in place with string or by wedging with cardboard. The leads to this coupling coil must be long enough to allow it to be placed right inside the crystal set if necessary.

Few Connections

Leave the earth connected to the crystal set, but join the aerial to its new terminal on the unit. Terminals X and Y on the unit are joined to the crystal-set telephone terminals, X going to the one which is joined to earth. You can ascertain which this is by following out the wiring from the telephone terminals.

The next thing to do is to short the crystal detector with a piece of thin copper wire. You will find that there are two connections to the crystal detector, and the ends of the copper wire must be securely joined to these points.

The "Reactocrys"—continued

VERY FEW COMPONENTS

You can see from this rear view of the "Reactocrys" unit how very simple it is to build, and how few components are required in its construction.

The semi-variable condenser on top of the wooden frame is C_2 , which is used for varying the aerial coupling of the unit.

to be adjusted to get smooth reaction. When searching for distant stations keep the reaction condenser in such a position that the set is just off the reaction point.

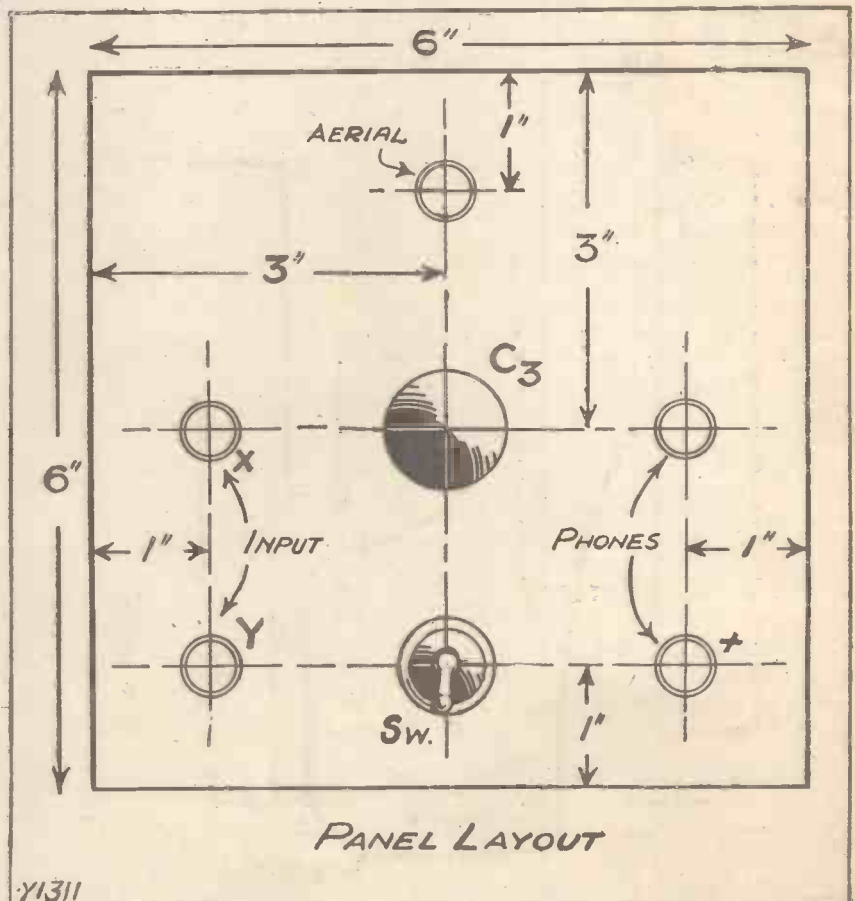
An Important Point

It will be necessary to adjust the reaction condenser with the tuning condenser to do this, but you will soon find the knack of gradually increasing the two controls together and vice versa.

Don't forget that the unit, unlike your crystal set, needs switching off when you have finished with it. If you fail to do this you will waste the "juice" in your accumulator and H.T. battery.

Should you find that the coupling coil is not a very convenient size for placing up close to the tuning inductance in your set, you can wind it in hank form, or on a larger former. Approximately the same length of wire (5 yds.) should always be used.

HOW THE PANEL IS ARRANGED



PANEL LAYOUT

Y1311

Tuning is carried out as usual on the crystal set, C_3 on the panel of the valve unit being employed for reaction control.



Connect up the batteries and 'phones and you can try the unit. It is switched on by pulling out the L.T. switch. Set the reaction condenser at zero and the condenser C_2 a little way from its maximum, and tune in a local transmission.

Now see if you can obtain reaction effects by increasing the capacity of C_3 . If you cannot, it will be necessary to try the effect of adding a few turns to the coupling coil, say five.

Obtaining Smooth Control

If, however, you get plenty of reaction, but with rather a ploppy control, try the effect of reducing the H.T. voltage. Should this not result in a nice smooth control, try removing a few turns from the coupling coil.

When you have got the reaction control satisfactory, the value of the condenser C_2 can be reduced if you wish tuning to be a little sharper. Do not reduce its value so far that you are unable to obtain reaction.

Should you desire to experiment with the unit on long waves, the coupling coil should be wound with a much finer wire, such as 36 D.S.C., and should have about 100 turns on it for a start. This number may have

POINTS FOR PURCHASERS

Some interesting items from the manufacturers about their latest lines.

BEFORE getting down to the news about components, etc., there are one or two little items of general trade news that ought to be mentioned this month.

First, about the radio side of Kingsford Smith's great Atlantic flight in the Southern Cross. From the time he launched himself on his formidable attempt at Dublin, Ireland, to the time he landed at Harbour Grace, in Newfoundland, when lack of fuel and atmospheric conditions precluded still further progress in the programme he had set himself, Captain Kingsford Smith made the fullest possible use of his wireless equipment.

The General Electric Co., Ltd., with a commendable degree of enterprise, had made special arrangements whereby members of the Radio Society of Great Britain should be notified by telegram of the start of the venture, in order that they might keep in contact subsequently with the operator of the Southern Cross. Practically every message from the time of embarkation to the landing in Newfoundland was intercepted by one or another of the society's members. Standard Osram valves were used on the 'plane.

Wireless for the Blind

The movement for providing all the blind with facilities for listening to the B.B.C. programmes is proceeding apace. A few weeks ago, Burne-Jones & Co., Ltd., secured a contract for the very respectable total of six thousand wireless sets, these being provided in connection with the British Wireless for the Blind Fund.

The Windmill Charger for Batteries

From Wilkinson & Partners, Ltd. (Hatfield, Herts), we have received some very interesting particulars of a windmill generator supplied to the British Arctic Air-Route Expedition.

This expedition, which has just left England, will remain in Greenland for a year. As always transport and upkeep are enormously important items, so the automatic windmill battery charger is the subject of very high hopes.

The apparatus is automatic in its action, and will charge batteries at any time during the day or night when the wind is sufficient. The dynamo is practically weatherproof, and requires virtually no attention for periods of several months.

The propeller is made of special material designed to withstand atmospheric influences, and is direct-coupled to the armature shaft, thus obviating all gearing, with its attendant troubles and loss of power. The windmill electric generator is easily and quickly erected in an open space, upon the roof of a building, or other similar site.

Its life is computed to be ten years, and the cost of working is practically nil.

A WIND-DRIVEN CHARGER



This ingenious device is being used by a British Arctic Expedition.

(Full details can be obtained from the makers on application to the above address.)

For the Mains User

Listeners who have electric light mains will be specially interested in the various leaflets, etc., now procurable from F. C. Heyberd & Co., 10, Finsbury Street, E.C.2.

The following lists may be had on request:

- No. 936. Building Eliminators and
- „ 940. Chargers (employing Heyberd Transformers and Westinghouse Rectifiers).
- „ 939. Overnight Battery Chargers (Valve Rectification).
- „ 937. Summary of Heyberd Mains Transformers, Chokes, etc.
- „ 930. Measuring Instruments. List 103. Radio Testing Set.
- „ 935. Battery Eliminators and How to Build Them. (Valve Rectification.)

New Ferranti Literature

Ferranti's have been busy lately at the task of overhauling the literature they supply to the radio public, and the result is a whole sheaf of new booklets, charts, etc., of interest to every reader of the WIRELESS CONSTRUCTOR.

The H.T. Supply Unit Chart No. 1 shows how to make a mains unit suitable for use with any receiver of up to five stages, the unit having the very considerable output of a maximum of 200 volts at 100 milliamps. All the necessary how-to-build details are given, dimensions, valves to use, resistances, etc. (As this unit is for working from the A.C. mains, a Westinghouse Metal Rectifier is incorporated.)

H.T. Supply Charts

H.T. Supply Chart No. 2 is for building an A.C. H.T. unit from Ferranti components exclusively, employing a U.8, D.W.30, or U.9 valve rectifier. The output from this unit is somewhat smaller than from type No. 1.

For running still smaller sets, having up to three stages, H.T. supply units Nos. 7 and 8 are available. These employ Ferranti components in conjunction with metal rectifiers.

The maximum output with the No. 7 is 20 milliamps. at 120 volts, and with the No. 8, 30 milliamps. at 180 volts.



Calm after Storm—A Vicar of the Ether—The Problem of S.O.S. Messages—Earlier News?—B.B.C. and the Empire—The New Microphone Voice—Television Develops—Broadcasting House Difficulties.

BY OUR SPECIAL COMMISSIONERS

Calm after Storm

My friends at Savoy Hill appear to be greatly impressed by the calm which has descended upon the high politics of broadcasting. Mr. Whitley, the new chairman, was warned publicly and privately that he was clutching the proverbial hornets' nest.

But, so far as I can ascertain, the hornets are away, or else dormant. But what counts is that the energy of those at the head of the broadcasting service, instead of being wasted in futile internal strife, may now be directed to the solution of some of the real problems of broadcasting.

A Vicar of the Ether

It was about three years ago, or just before the Rev. Dick Sheppard left St. Martin-in-the-Field to become Dean of Canterbury, that it was suggested, and indeed urged, upon the board of Governors that the famous vicar of St. Martin's should be given a full-time appointment as chaplain to the broadcasting service. (Special point was given to this suggestion because it was felt that his broadcasting had had a good deal to do with the honour that was conferred on him.)

For some obscure reason the B.B.C. neglected to take advantage of an opportunity which would never recur. In the years that have passed, the Rev. Hugh Johnson, also of St. Martin's, has gone a considerable way in continuing and developing "Dick" Sheppard's broadcasting tradition. The week-day morning service is extraordinarily well done.

I put it to the B.B.C. that a special appointment should be created

for Mr. Johnson; that he should become officially the first Chaplain to the Service, the first Vicar of the Ether.

The Problem of S.O.S. Messages

In 1929 no less than 881 S.O.S. messages were broadcast; this represented 130 more than in 1928. The proportion of successes was 41.6 per cent; of failures, 54 per cent; and of unknown results, 4.4 per cent.

The increase in the number of requests that come through the police and other official channels is causing some apprehension at Savoy Hill. It is felt that already S.O.S. messages

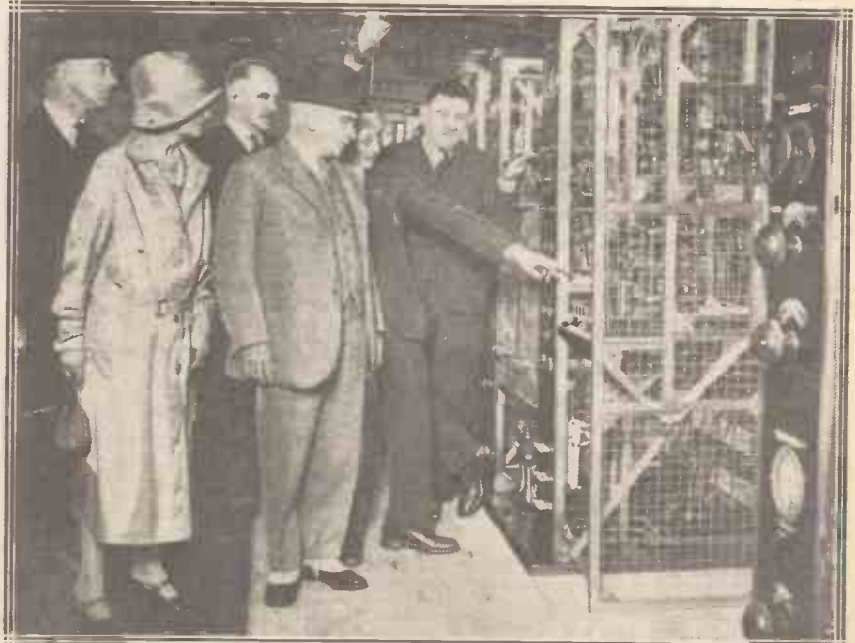
are bulking unduly in the programmes, and that perhaps the time has come to dispense with them entirely.

It seems to me that S.O.S. messages do belong to an era of broadcasting much more elementary than that which has now been attained.

Earlier News?

The arrangement between the B.B.C. and the news agencies for the material of the News Bulletin is about to lapse. From the angle of the B.B.C. the only important change that would seem desirable would be freedom to broadcast important news

AT THE DORCHESTER BEAM STATION



Delegates to the recent Empire Press Conference inspecting the apparatus installed at the Dorchester station in connection with its beam telephony service, by means of which some of the delegates spoke to Marchese Marconi on his yacht at Genoa.

Savoy Hill News—continued

earlier in the day than 6.15, which is the present rule.

The first News Bulletin might well be put forward to six. So far as the material of the bulletin is concerned, the B.B.C. is virtually in the position of a news agency with comprehensive rights. The editing is now done at Savoy Hill.

B.B.C. and the Empire

Sir John Reith's clear explanation to the Colonial Conference did much to clear away misapprehensions about the attitude of the B.B.C. towards the short-wave service to the Empire overseas.

Not without reason, I have had occasion in this column to complain of the lukewarmness of Savoy Hill on Imperial matters.

The New Microphone Voice

B.B.C. announcing has not yet become so stereotyped that a successful new announcer passes unnoticed. It is about three months since the voice of Mr. Emrys Wheldon came on the air for the first time.

In my opinion, he has been an unqualified success, and for reasons which are of importance to the whole future of announcing. Mr. Wheldon is a young man who combines rare scholarship with much practical experience, wide range of sympathy, and a singularly pleasant and well-controlled voice. He can afford to take liberties with routine, and even with the sacred script of the B.B.C. "pronunciation Bible."

When I hear Mr. Wheldon give the news I feel that I am listening to the

epoch in the relations between the Baird Company and the B.B.C.

Of course, the old hostility had gone with the beginning of the experiments last autumn, but for many months there was no inclination on the part of Savoy Hill to do anything more than was absolutely necessary to implement the Postmaster's instructions.

From the Studio ?

But relations improved in marked fashion during April—there was some active new agency at work healing old wounds—and it soon became apparent that the B.B.C. would take a more definite co-operative interest in television. "The Man With a Flower in His Mouth," produced by Mr. Lance Sieveking and Mr. Sydney Moseley acting together, has led to the consideration of other proposals.

I should not be surprised to see soon an experiment in televising from Savoy Hill an actual studio performance. The young men in the research and experimental sections of the programme department of the B.B.C. are all out to do something really big with television.

Broadcasting House Difficulties

The annual report of the B.B.C. suggests that Broadcasting House, in Portland Place, will be ready by the end of 1931, but I would back March 31st, 1932, as being nearer the real date of opening.

I understand that the occasion will be a very special one and that it is hoped His Majesty may be willing and able to officiate. Meanwhile there is a good deal of perplexity about the plans and the accommodation.

As at present designed the biggest studio cannot hold more than about one thousand people, in addition to the augmented national orchestra. This is causing a good deal of heart-ache among the music officials at Savoy Hill. But there is no hope for more room.

The next difficulty is that it is already apparent that there will be insufficient accommodation for rehearsals, and probably not enough studios for complete alternatives when London is also contributing to various regional programmes. It looks as if it will be necessary to secure auxiliary accommodation or to keep on Savoy Hill.

I should think that the developments of the next two years will necessitate both.

MARCONIPHONE SCHOOL FOR RADIO DEALERS



The radio dealer finds that as his customers become initiated into the mysteries of radio he is expected to be more and more a technician as well as salesman. Many large radio firms are now giving courses in fault-finding for the benefit of their agents, some of whom are here seen at a lecture.

There was a good deal of evidence that for some years past the policy of the B.B.C. was "pro-European" and "anti-Imperialist." Now, however, it seems as if this tendency has been definitely stopped by Sir John Reith.

The B.B.C. is agitating for the establishment of a permanent 5 S W, capable of giving a 24 hours' service on two short wave-lengths. But the B.B.C. draws the line at finding what Sir John Reith calls the "out-of-pocket expenses," estimated at £40,000 a year.

perfectly unconscious but perfectly clear-cut rendering of one who is himself keenly interested in what he is reading to millions. Apart from a slight tendency at times to be pedagogic, Mr. Wheldon has little to learn about his job, and I, for one, hope that he will see fit to continue in it for a long time.

Television Develops

The television experiment with the broadcast sketch, "The Man With a Flower in His Mouth," marked a new



USING A.C. VALVES

New indirectly-heated cathode A.C. valves are appearing on the market with surprising frequency. Since the old days, when the K.L.1 was the only indirectly-heated valve available, we have completed full ranges of H.F., detector and L.F., power, screened-grid valves, and even pentodes. This is all to the good, because it is undoubtedly cheaper to use main valves, and to derive the whole of one's power from the electric light supply, than to buy batteries and to run ordinary valves.

THE FIRST A.C. PENTODE



Here is the new Mazda A.C./Pen., the first of the indirectly-heated cathode pentodes. It takes a maximum anode voltage of 250 volts and screen voltage of 200. At these pressures the correct grid bias is 10.5 volts. The mutual conductance is 2.2. The magnification factor working out at round about 94.

Mains valves may be slightly dearer to buy than the battery valves, but they are remarkably efficient, and a well-designed three-valve all-mains A.C. set should give results comparable with a good four-valver using battery valves. For instance, the screened-grid valve is capable of giving a very much higher magnification per stage

Do you use batteries for your set, or do you operate it from the A.C. mains? If you have the latter available you are offered a tremendous advantage in running sets over the listener who has the misfortune to have no mains. Some useful hints on the use of A.C. valves are given in this article.

By K. D. ROGERS.

than the battery type of valve, and, following on the recent advances in the design of screened-grid valves, I believe that there is a Six-Sixty and a Mullard which have amplification factors of something like 1,500 or 1,600, with impedances of round about 400,000.

The A.C. Pentode

Quite recently, too, the first pentode of the indirectly-heated type was placed upon the British market by the Mazda people. This valve (type A.C./Pen.) is one which gives quite a fair output, and is very suitable for small sets. As is the case with all the indirectly-heated types, it is supplied with a 4-volt "filament," and consumes 1 amp. The maximum anode voltage is 250, and the auxiliary grid volts 200.

When used under those conditions the grid bias should be $10\frac{1}{2}$ negative. The magnification factor is very high, and the mutual conductance is 2.2.

When using the valve with speakers that do not reproduce the bass very well it is advisable to use a bypass circuit across the output terminals of this valve—that is, of course, between plate and cathode. This can take the form of a resistance of about 20,000 ohms, and a condenser of .0002

mfd. in parallel with it. The condenser, of course, should be capable of working at least 250 volts, as a high voltage has to be placed across it.

Other Types

Besides this pentode it is possible to use the larger pentode valves of the directly-heated type, with A.C. on the filament, with quite a measure of success. Such valves as the P.M.24A

S.G. A.C. VALVES



The Marconi screened-grid two-volter, the forerunner of the MS4V mains valve, and (right) the new Six-Sixty S.G. mains valve, the S.S.4X A.C. This is a special valve with a magnification factor round about 1,500.

and the P.M.24B work excellently with raw A.C. on the filaments.

The drawback here, of course, is that they require a different amperage from the indirectly-heated cathode

Using A.C. Valves—continued

type of valve, although the voltage is the same.

A point to watch is that the transformer which supplies the filament current be of good design, otherwise it is just as well to check up exactly what voltage they are getting, and to remember that on no account should the other valves be removed from their sockets, leaving only one while the filament current is on, otherwise the transformer secondary voltage may rise too much and the filament of the valve be burnt out.

The Cathode Return

In all cases, except the screened-grid valve, when using indirectly-heated cathode valves, the cathode return should be taken either to a

centre point, but to take it direct to one of the heater terminals.

The Detector Stage

In the detector stage, when the indirectly-heated cathode type is used, and leaky-grid rectification is required, it is necessary to apply a *positive* bias to the cathode by means of an ordinary bias battery.

Although we have a very large selection of mains valves from which to choose, I understand that the Radio Show, in September at Olympia, will introduce us to a considerable number of new ones, with even still further improved characteristics, and there is no doubt that as the use of A.C. valves becomes more widely known and appreciated so will battery valves be

screened if feed-back, due to the tremendous amplification of which this valve is capable is to be avoided.

Theoretically, of course, every screened valve should be perfectly screened. In practice this is not done, but the need for screening becomes more urgent when indirectly-heated cathode valves are employed, owing to the tremendously high magnification factors which these valves possess.

Careful Wiring

Another point about indirectly-heated cathode valves is that the heater wiring should be either lead-covered, with the covering earthed, or else it should be of twisted flex and kept as far away from the ordinary wiring, especially the plate leads, of the set as possible.

It is not easy to eliminate every trace of hum when one is completely operating from A.C. mains, but it can be reduced to such an extent that one has to go very near the loud speaker indeed when no programme is on in order to hear the slightest trace of hum which remains after careful screening and wiring have been done.

I say screening because it is often advisable to screen the mains portion of the set, and by that I mean that part which contains the H.T. eliminator and the L.T. transformer, or the all-power transformer, if a combined instrument is used.

This screening should be carried out with iron about $\frac{1}{8}$ in. thick, and not merely aluminium, and it should be well earthed. With regard to the heater connections, it is not a bad plan to run these underneath the baseboard, and to insert between the wiring and the baseboard a sheet of iron the same shape as the baseboard, and connected to earth. This should eliminate any hum which might be picked up from the heater wiring.

With careful screening and a good layout a mains-driven receiver should give every satisfaction.

Worth a Trial

So, therefore, those who are contemplating going over to A.C. in their sets I would advise to consider the problem very carefully indeed and if possible to give it a trial. If they are in any doubt as to the alterations necessary in their set they can write to the Query Department of this journal, which will be very pleased to do all it can to help.

BUILDING AN ELECTRICAL GIANT



Although Messrs. B.T.-H. are well known in radio for their loud speakers, sets, and various components, not to mention the part they play in the production of the Mazda valve, they are mainly famous for their larger electrical apparatus. All sorts of dynamos, motors, and generating plant is constructed by this famous firm, and in this photograph we see a 1,900/3,500-h.p. electric motor in course of manufacture at their Rugby works.

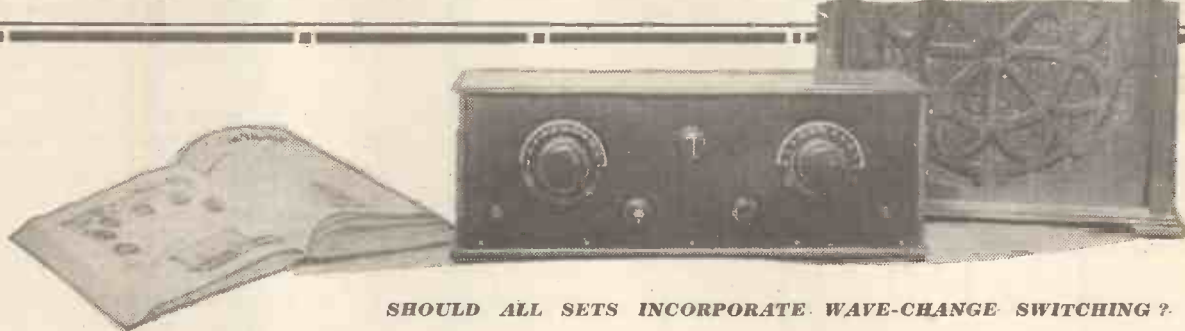
potentiometer connected across the heater circuit (so that a neutral point can be found), or else to the centre of the secondary winding of the filament winding of the transformer.

In the case of the screened-grid valve it is sometimes advisable not to connect the cathode direct to any such

replaced by those who are fortunate enough to have A.C. mains in their homes.

A.C. valves, however, are slightly more tricky to get to operate to the best advantage than the battery valves. The screened-grid type, for instance, has to be very carefully

PANEL CONTROL PROBLEMS



SHOULD ALL SETS INCORPORATE WAVE-CHANGE SWITCHING?

THE panel controls are, in their way, just as important as the circuit of a receiver. They may not bear quite so directly upon its technical efficiency, but they do mean a great deal to the

The questions relating to wave-changing are not quite as simple to answer as might at first be thought. As a matter of fact, there are points where there is some considerable diversity of opinions. Recently the "Wireless Constructor" Ideas Committee attempted a preliminary survey of the subject, not so much with the object of laying down rules and regulations regarding set designs as to obtain a consensus of views. And we await with great interest any comments that readers care to make. Frequently it is to a reader or readers we owe thanks for quite new angles on topics discussed by the Committee.

constructor. They may either please or irritate in their number or arrangement, but a set cannot be called a success unless it completely satisfies the eye as much as the ear. Further, upon the panel controls depends a great deal of the ease or otherwise of the set's operation.

Questions relating to the actual tuning controls and the advantages or disadvantages of single-dial tuning, thumb controls, ordinary dials, and so on, will be left for a future occasion. The recent Ideas Committee meeting was devoted solely to wave-changing, for this runs as a kind of core through the whole subject.

Three Main Wave-Bands

The broadcasting stations of Europe are spread over a very wide wave-band, so wide, in fact, that it is impossible to bring them all within the scope of any simple coil and condenser tuning circuit.

For practical purposes the stations group themselves into three main classes of wave-lengths. These are

the short waves, the ordinary broadcasting wave-lengths between about 250 and 550 metres, and the long waves such as are used by Daventry 5 X X, Motala, Radio-Paris and so on.

The Simplest Plan

As Mr. Victor King pointed out, no one band can be completely ignored by the real enthusiast. The question then arises how can a set be arranged

the possession of two or three sets each of three or four coils, and the lifting of the set's lid every time one wants to go to another wave-band. Instead of coils which have to be removed from the set, it is possible to have special coil units, the wave-changing being carried out by means of switches either in the unit itself or on the front of the panel.

But is that all there is to it? Readers of the WIRELESS CON-

PANELS—"WITH KNOBS ON"



The artistic side of radio set design always receives adequate support at "Wireless Constructor" Ideas Committee meetings from Mr. Bassett (right), our Art Editor. In this particular photo Mr. Victor King (left) is discussing the arrangement of main-unit panel controls with the other members.

so that it can be adapted easily for reception on one or other of the bands?

The simplest plan is to have plug-in coils, but that may necessitate

STRUCTOR should find it interesting to read the following summaries of the opinions expressed by members of the committee at the recent meeting. This is, in brief, what Mr. Kelsey had to say:

Mr. Kelsey's Views

"I consider that all those sets that fall into the DX class should be

Panel Control Problems—*continued*

provided with wave-change switching, and by DX I mean those sets comprising three or more valves which are capable of picking up a fair number of the more distant stations.

"I do not think that wave-changing is so important with one- or two-valve sets, for the simple reason that their distance-getting capabilities are of more limited characters. I consider that the ideal wave-change scheme is that employed by Mr. Victor King in his 'Explorer' series of receivers.

Universal Sets

"I hold the opinion that it is an asset for any set to be able to change down to the very short waves. There are only comparatively few people who can run to two sets, and there is no real need for a separate short-waver to give short-wave results,

not be provided with wave-changing switching between very short and ordinary broadcasting wave-lengths. In such a case the long waves should either be left out altogether or provision made for these by coil- or unit-changing.

"The scheme might be applicable to a modified 'Explorer' circuit, the one coil unit covering the very short and ordinary wave-lengths, and the other unit the long waves.

"In regard to portable and similar sets where frame aerials are employed, I still think that wave-change switching is very desirable, but I consider that it should be carried out by complete change-overs from one frame to another, and not by loading up the short-wave frame.

"I am not particularly keen on ordinary panel wave-change switching, because of (a) the necessary lengthen-

"Special sets should be designed for long-distance reception and ultra-short waves. Where at all possible, one switch should make the change-over of all coils, as to add knobs tends to do away with the main advantage of wave-changing, namely, simplification. Finally, I consider automatic wave-changing by means of condensers with 360-degree movements might receive more attention."

Linking the Controls

And now we come to Mr. Johnson-Randall's suggestions.

"In my opinion, the panel control of wave-change circuits is very desirable. The ideal is for all wave-change circuits to be linked up to one control on the panel, especially in the case of multi-H.F.-valve designs.

"Against this is the difficulty of obtaining satisfactory mechanical arrangements, the cost, which would be high, and the space required for the scheme of levers, etc.

"Panel control of one or two circuits is not difficult in view of the fact that there are suitable coil units already on the market.

"In order to simplify the mechanical problem it is desirable that the coils should be at equal distances from the panel. This tends to make it difficult to secure efficient designs from the radio point of view.

"In the case of wave-changing with plug-in coils in which two sets of coils are required, the problem of panel control is very difficult owing to the danger of stray capacities and consequent efficiency loss.

Convenience Versus Efficiency

"Wave-change by lifting the lid is simple and does not limit the positions of the coil units on the baseboard. It is, therefore, easier to design a receiver having a high electrical efficiency. It is a case of convenience versus efficiency.

"In conclusion, I consider panel controls used with suitable circuit designs to be practical, but rather more expensive. In the case of home-wound or plug-in coils it is a more difficult problem. Independent control of each unit means that the set designer has greater scope."

And that is that! There surely is enough and to spare for readers to ponder over, and upon which to base their own suggestions—which we will be very grateful to receive.



Radio retailers attending a course of wireless instruction held at the Dagenham works of the Marconi-Phonograph Co. The dealers are taught how to handle properly the more common receiver faults that are apt to arise.

for these can be obtained from an ordinary broadcast set of good design."

(WIRELESS CONSTRUCTOR readers have a good opportunity of studying the "Explorer" scheme in detail, as there happens to be an "Explorer" set in this present issue.)

"It must not be forgotten," continued Mr. Kelsey, "that many constructors have almost complete ranges of plug-in coils on hand, so that it is necessary to provide designs where the advantages of wave-change switching can be enjoyed using such accessories. But I regard it as desirable that the change-over be effected by means of ganged switches; 'knobby' panels are not particularly popular these days.

"I see no reason why a set should

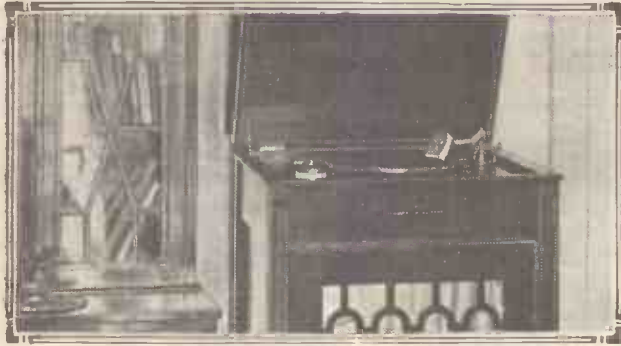
ing of the wiring, and (b) the chances of stray coupling which may result."

And here are Mr. Clark's views:

"Wave-change schemes should not mean more than a very slight loss of efficiency on either wave-band. The obvious way to obtain maximum efficiency in wave-changing is to make a complete change-over from one set of coils to another.

One Switch Only

"Even so, there can be losses in switches, and for this reason it is my opinion that there should be no switching where short waves are concerned. I do not think it desirable to make every set a wave-change receiver. Wave-changing should be one of the main features of general-purpose and home receivers.



WITH PICK-UP AND SPEAKER

Turntable Motors—Pick-ups and Record Wear—Rusty Needles—Amplifiers and Pick-up Sensitivity—A Good Pick-up—The "Gramo" Amplifier.

Conducted by A. JOHNSON-RANDALL.

IN the WIRELESS CONSTRUCTOR Queries Department we receive large numbers of questions on pick-ups. Many of these are applicable only to one particular case, but it is interesting to take some of those of a general nature and to reproduce the gist of them for the benefit of readers.

It is surprising, but nevertheless true, that many radio fans have run away with the idea that something very special in gramophones is required in order to permit a pick-up to be used.

A Mistaken Impression

Apparently these enthusiasts conjure up visions of electric turntables or gramophones of the super type, and think that a powerful driving equipment is essential. This is far from being the case. Any existing gramophone movement can be employed with perfect success. The pick-up merely replaces the sound-box, and the torque necessary to operate with a sound-box is more than adequate for a pick-up.

So if you have a gramophone of any type the purchase of a pick-up will enable you to take full advantage of electrical reproduction, and if your amplifier and loud speaker are reasonably good, to get a marked improvement in the bass register. The modern record gives wonderful results down to about 150 cycles. Below this the response commences to fall off, but you will not notice this unless your speaker is of the best moving-coil type.

Record Life

Readers who have pick-ups which they procured in the very early days of radio-gramophonics are of the opinion that they tend to wear out records fairly rapidly. These listeners have apparently not had any experience with pick-ups of the latest type.

The modern pick-up does not shorten the life of the record, and there is no doubt the playing life with an up-to-date pick-up is at

least as good as that obtainable with a well-designed sound-box.

The other day I happened to come across a photograph of a rusty needle which is reproduced on the next page.

Avoid Rust

The needle-point is, of course, much magnified, but the photograph certainly gives one some idea of the havoc which a small amount of rust, hardly discernible to the eye, can produce.

A few needles of this type and your records would be ruined in a remarkably short period. Keep your needles in a dry place and treat them with every care. There is no doubt that far too little attention is paid to this point.

By the way, don't use "extra-loud" tone needles with your pick-up if the medium type will give you adequate volume. The "extra-loud" needle tends to damage the record on heavy

Now about this question of adjusting the modern pick-up for sensitivity. There was a time when it was possible to carry out adjustments for oneself, but the latest pick-ups are carefully tested before being sent out, and the adjustment should not be tampered with. If you have any doubt as to the efficiency of your particular model, send it back to the makers for examination.

Pick-Ups and Sensitivity

The sensitivity of different types of pick-ups varies considerably. Some makers are of the opinion that the ideal pick-up should not be too sensitive, while others prefer to supply something which is sufficiently sensitive to give good volume with a small amplifier.

The size of your amplifier really determines the choice of the pick-up. For instance, if you are limited to



**EXPENSIVE
EQUIPMENT
NOT ESSENTIAL**

It is not necessary to possess an expensive gramophone in order to obtain satisfactory results with a pick-up. The motors and turntables used in small machines of the portable type are quite adequate, although, of course, the more powerful motors require less frequent re-winding.

passages, and, moreover, there is always a danger of the first L.F. valve being overloaded unless a volume control is interposed between the pick-up and first valve.

two L.F. valves, it is no use buying a pick-up which will only give a minute grid swing to the first valve. You will have to limit your choice to the more sensitive types.

With Pick-Up and Speaker—continued

On the other hand, if you have a powerful amplifier available you should choose one of the less-sensitive types, because otherwise you will get overloading of the second L.F. valve, unless you pay particular



This is a much magnified photograph of a rusty needle. You can well imagine how such a needle would damage a record. So keep your needles in a dry place.

care to the control of volume. In any case, it is advisable to place the strength control across the pick-up itself. If this is done, there is no danger of overloading, but it is chiefly for the benefit of those who already have their control across one of the amplifier valves that I am addressing these remarks.

Improved Models

In something like a month the Show will be here once again, and manufacturers are now feverishly working on new designs for next season. Many of them are overcoming those difficult problems of suspension and damping which will result in marked improvement in the response curves of their pick-ups.

As I recently pointed out, there is a lot to be done in this direction, and I should like to see some of next season's designs with a better response on the upper register. Give us greater brilliancy, because without this the reproduction lacks "life." A lift up at the lower end of the register is also valuable.

A Good Pick-Up

Last month we published the curve of the Burndept pick-up. Now this pick-up has been used regularly for some time by several members of the WIRELESS CONSTRUCTOR technical staff, and they are one and all impressed by its excellent results.

The Burndept pick-up is of the needle-armature type, and, as the response curve shows, it is remarkably

free from peaks. The curve rises at the lower end, and does not fall away between 1,000 and 5,000 cycles.

You get a certain amount of scratch, but we are of the opinion that this is unavoidable if the high notes are to be retained. If you eliminate scratch you reduce the brilliancy. This pick-up is not specially sensitive, and needs a three-valve amplifier for maximum results; but it is certainly an excellent job and one of the best we have tried. The pick-up retails at 50s. complete with tone-arm.

Should pick-ups be light or heavy? The complaint used to be that the average pick-up was too heavy and caused excessive wear on the record. But what happens when the pick-up is too light?

Balanced Tone-Arms

Try a lightweight pick-up for yourself in conjunction with a record giving a good bass rendering. You will find that the needle tends to leave the record grooves, with the result that the reproduction suffers and the life of the record itself is shortened.

Actually it has been found that the mass of the pick-up should not be too small, but that dead weight on the record should be avoided. These days makers are supplying tone-arms with balance weights which can be adjusted to suit individual requirements.

Those who are of an experimental turn of mind can try the scheme for

until the effective dead-weight of the pick-up is at its minimum compatible with proper tracking.

In another part of this issue you will find full constructional details of Mr. Percy Harris' latest — The "Gramo" Amplifier. It is a two-valve L.F. amplifier specially designed for all-mains operation and for use with a pick-up.

Perfect Stability

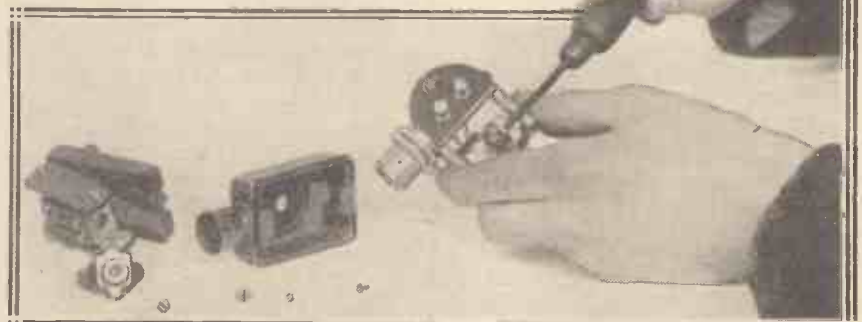
Those readers who are on the mains — by the way, A.C. is essential in this case — can by making up this amplifier equip themselves with a really high-class electrical gramophone outfit.

There is no battery upkeep and nothing to cause trouble. Mr. Harris has taken all precautions against "motor-boating" and other L.F. faults by including a 20,000-ohm resistance and 2-mfd. by-pass condenser in series with the H.T. supply and first valve. Moreover, an output filter is incorporated as a further aid to stability.

A somewhat novel point in this amplifier is the use of alternative input terminals. You can, if you wish, connect the pick-up to the grid of the first valve through a transformer, a scheme which with some pick-ups improves the amplification considerably.

Of course, much depends upon the

DO NOT BREAK THE SEALS

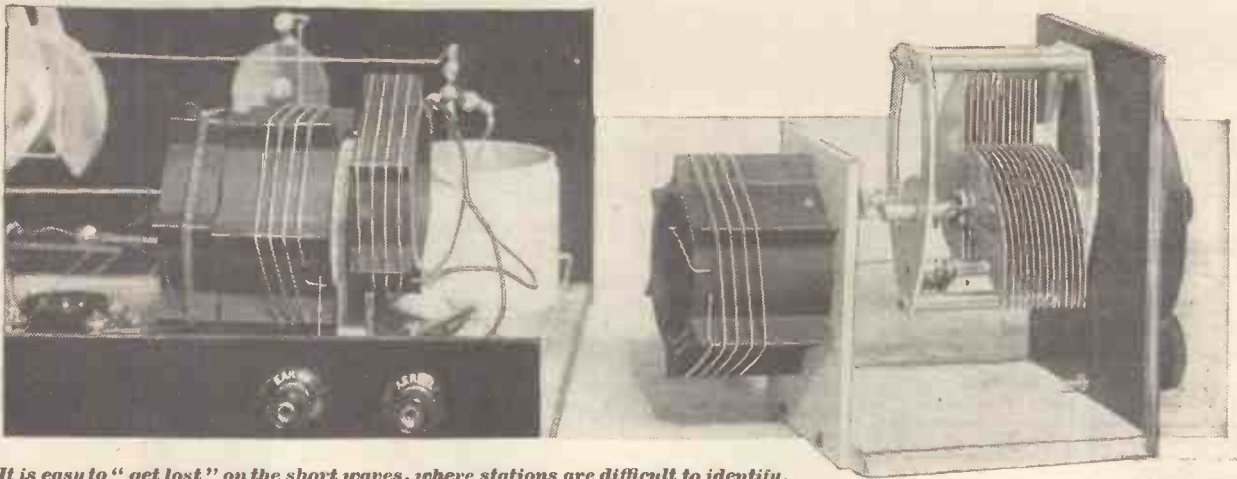


Adjusting a pick-up is a tricky business, and if your particular model gives trouble it is advisable to return it to the makers. The modern pick-up is carefully adjusted before leaving the works and should not require attention unless it is misused. It is much better to leave such a skilled job as this to the makers.

themselves by fixing an extension rod on to their tone-arm and arranging a balance weight to slide along the rod. Different adjustments can be made

windings and design of the pick-up, but if you desire to obtain the maximum volume it will pay you to use this input transformer.

The "Cali-meter"



It is easy to "get lost" on the short waves, where stations are difficult to identify, and a comparatively slight turn of the tuning dial may cause you to flash through a score or more transmissions. This simple wave-meter will end that sort of trouble, and enable you to find out exactly where you are.

Designed and Described by the Research Dept.

THERE is one big stumbling block which almost all of us have met at some time or other when "let loose" in the ether with a strange short-wave receiver. We can hear station after station, and C.W. "chirps" of every description; yet, unless the set happens to be accurately calibrated, we haven't the remotest idea in terms of wave-length of where we have "landed."

"Where Are We?"

We might be listening on 20, 30, or 40 metres (even perhaps not on short waves at all!), and it takes days, in many cases weeks, of systematic searching before sufficient stations have been logged and identified to obtain a rough idea of the band over which the set is capable of being used.

Even then, with the possibility of four or five stations to a single degree of the condenser dial (quite practically possible), the chances of being able definitely to tune to any particular transmission at a given time are, to say the least, somewhat remote.

Overcoming the Difficulty

But there is a way in which this "being lost" difficulty can to a very large extent be overcome, and the solution is to build what is known as an absorption wave-meter.

You have only to glance at the photographs and drawings of the "Cali-meter" to see that an absorption wave-meter of the type suitable for short-wave receivers is about the

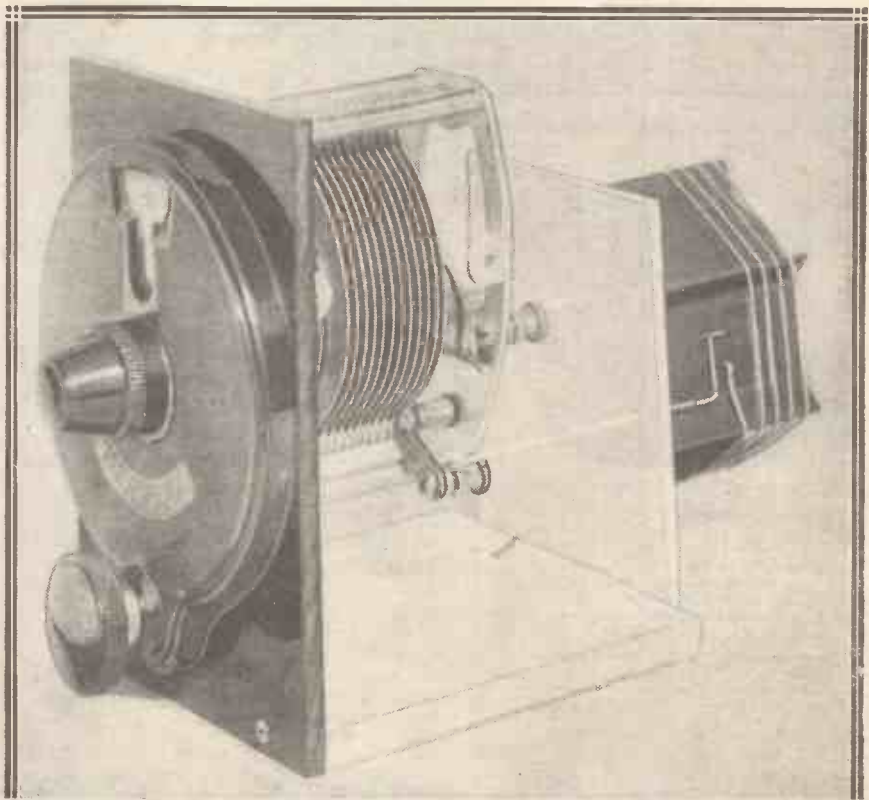
most simple piece of apparatus imaginable.

It is nothing more nor less than a coil tuned by a variable condenser, and although it is not what can justifiably be called a precision instrument,

nevertheless for all normal purposes it makes it possible to adjust the set to within a fraction of a metre of the station it is desired to receive.

Furthermore, if you are doubtful as to the identity of a particular

EXTREMELY SIMPLE TO CONSTRUCT



Nothing much in this little unit, is there? And yet very accurate wave-length readings can be obtained with it if it is used carefully. The heading photo shows the "Cali-meter" in position for operation.

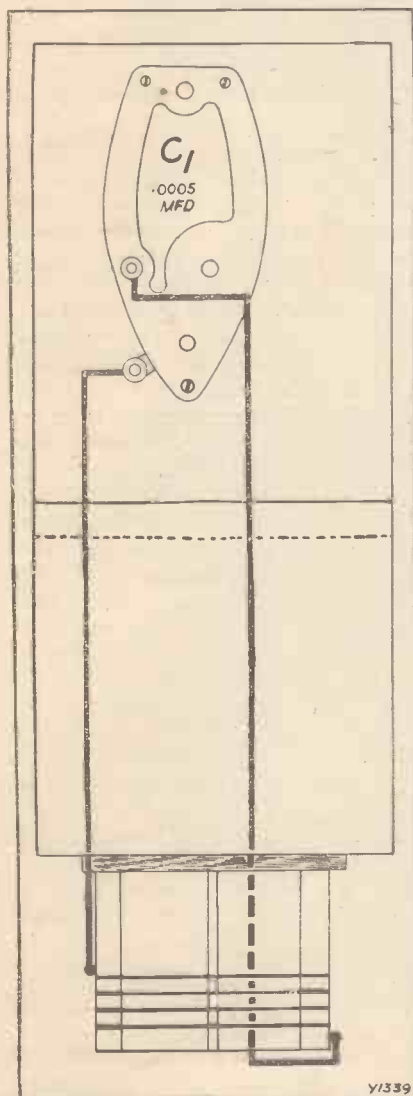
The "Cali-meter"—continued

station, this simple wave-meter can be very helpful in that it will tell you the wave-length on which the transmission is taking place; and then, with details of the world's short-wave stations, such as is contained in "Modern Wireless" each month, the rest is easy.

Accurate Calibration

Naturally, everything depends upon obtaining an accurate calibration in the first case, and to ensure dead accuracy in the original model the

ONLY TWO CONNECTIONS



Two connecting wires—and the wiring is done.

settings indicated for 21, 21.7, 42.08, 43.4 and 63.09 metres were all obtained by special arrangement from crystal-controlled transmitters.

It should not be a very difficult

matter to duplicate the original unit, and if you follow very closely the arrangement of the original model it is more than probable that the readings of your version will be very nearly the same as those of the original "Cali-meter."

True, the readings may alter slightly for different makes and type of condensers, but it is improbable that the variation will be much. In any case, by taking the settings given you can easily determine whether the readings are correct for your particular instrument by listening for stations on or near the waves given, and if you obtain an accurate calibration at, roughly, 20, 40 and 60 metres, it will be a simple matter to prepare a curve by plotting wave-length against dial reading, and drawing a straight line through the points you have been able to obtain.

How It Operates

Naturally, the more points you can find by listening to known stations the more accurate will be the resulting graph, and once the curve is prepared the wave-length can be adjusted to any station or setting you like.

The function of the "Cali-meter" is really very simple. Suppose you desire to adjust your set to a wave-length of 31.5 metres. First you refer to the graph, and find the setting of the wave-meter dial which corresponds to 31.5 metres. Then, with the set oscillating and the wave-meter coil about 6 in. away from, but in the same plane as, the ordinary set coils, the set tuning condenser is very slowly rotated until a setting is found at which possibly for 2 or 3 degrees or so the set ceases to oscillate.

This indicates that the set is roughly tuned to the desired wave-length of 31.5 metres. Now, to obtain a more accurate adjustment, the wave-meter should be moved inch by inch away from the set until the "band" of "no oscillation" is narrowed down to a fraction of a degree.

The "Double Click"

Until you are thoroughly au fait with the function and operation of an absorption wave-meter this process of adjustment must be carried out slowly and with considerable care, because when the dead spot is narrowed down by moving the wave-meter away, the indication that the set is in tune will probably be more

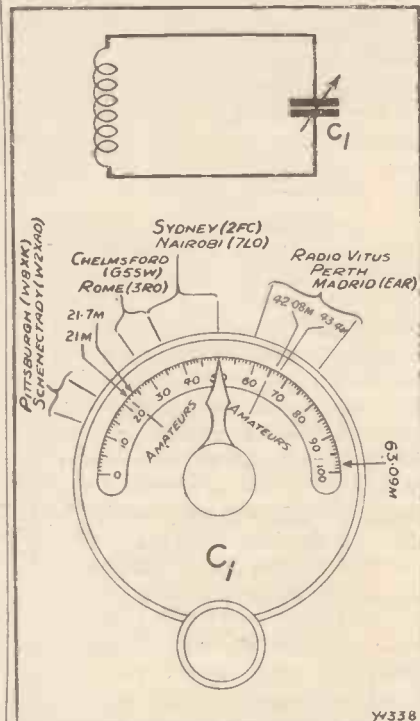
in the nature of a double click than a definite stop and start of oscillation.

By the way, there is a limit to the distance by which the wave-meter and set can be separated, and if they are placed too far apart the former will have no effect.

"Dead Spots"

As those of you with past short-wave experience will know, dead

WHERE THE STATIONS ARE



This diagram shows the relative positions of the short-wave stations on the "Cali-meter" dial.

spots—quite apart from those artificially produced with the wave-meter—are quite common on short waves, and you must be careful not to mistake one of these for the effect produced by the "Cali-meter."

You'll soon be able to tell when you strike the genuine one, because the correct "no oscillation" band is the only one that will be narrowed down by separating the wave-meter from the set.

And now, having told all about the "Cali-meter," what it is and what it does, let us consider the unit for a moment or two from the constructional point of view.

The Variable Condenser

There is very little to say—the unit is so very simple and you have the

(Continued on page 279.)

A PRACTICAL MAN'S CORNER

This is a special section for the set-builder, in which he will find many valuable hints.

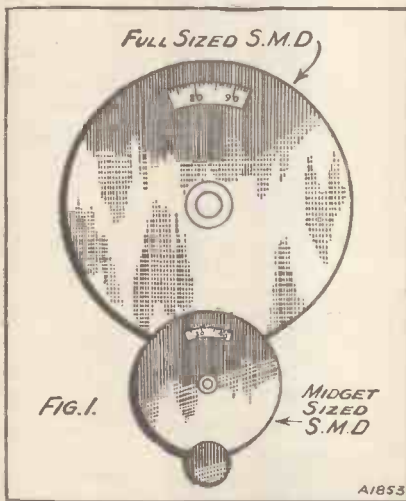
By R. W. HALLOWS, M.A.



Very Fine Adjustments

IN short-wave work particularly it is most desirable to have some means of making very fine adjustments of the tuning condensers. The slow-motion dial and the geared condenser have enormously simplified short-wave work, since they enable delicate tuning to be done by anyone whether he possesses "wireless hands" or not.

VERNIER TUNING



Showing how a small tuning dial can be used to control a large one.

Unless, however, the reduction gearing is of a very high ratio, it often happens that there is considerable difficulty in getting some weak and distant transmission up to the best strength. One of the most satisfactory methods that I have come across for obtaining either a high gear or a low one in condenser operation is that illustrated in Fig. 1.

Instead of a single slow-motion dial, two are used, one being of full size whilst the other is a midget affair. The full-size dial is mounted in the

ordinary way, connected directly to the spindle of the variable condenser.

The actuating knob of this dial is removed, and the miniature dial is used to replace it. The miniature dial is not fixed to the panel, but is left free to rotate. For moderately coarse tuning the small dial is used simply as a knob, being turned as a whole by the fingers.

Now suppose that one of those difficult transmissions has been picked up and that it cannot be tuned in properly with the main dial. Hold the midget with the thumb and forefinger of the left hand so as to prevent it from rotating, and operate its knob with the right hand.

In this way hair's-breadth adjustments can be made without the slightest difficulty. The total reduction ratio obtainable is that of the two dials multiplied together.

If, for example, that of the large dial is 8 to 1 and that of the smaller 10 to 1, then the reduction is 80 to 1. This means that a movement of one degree on the midget dial will produce a change of less than one minute of angle in the position of the condenser's movable vanes.

Points to Remember

For the device to work properly it is essential that the main dial should be a thoroughly sound component, not given to free-wheeling or to moving in jumps and jerks. A dial which possesses any of these faults renders fine tuning impossible.

The midget dial should also be free from these defects, though they are not quite so important as in the main dial. The dials of some midgets can be turned through only one half of a complete revolution.

This does not matter at all so long as the midget is kept normally set,

about half way round its travel. One has thus plenty to play with in the way of fine adjustments when coarse tuning has been done with the main dial.

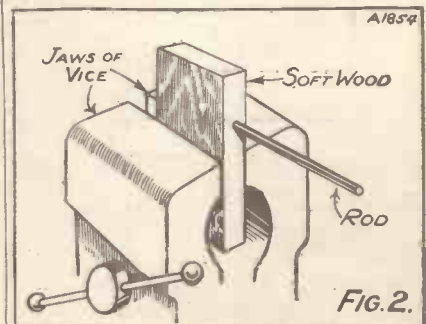
One point in favour of the double-dial device is that tuning is rendered easier, quite apart from the second reduction gear supplied by the midget. The diameter of the small dial will be usually from $2\frac{1}{4}$ to $2\frac{1}{2}$ inches, and, using it as a knob, much finer adjustments can be made than with the standard control knob, which is only an inch or so in diameter.

If, by the way, the short-wave set displays body-capacity effects, some difficulty may be found in tuning, since not one, but both hands have to come near the small dial when fine adjustments are being made. This is readily surmounted by placing the condenser itself some inches back from the panel, and connecting it to the main dial by means of an extension spindle such as the Bulgin.

A Valuable Tip

A job that one frequently has to do in wireless work is that of cutting off equal lengths of rod, tubing, studding and so on. Or, again, it may be that

CUTTING TUBING



How rod is held in wood to prevent crushing.

A Practical Man's Corner—continued

one requires to shorten a number of screws, making all of them exactly the same length.

If each piece is measured off separately two things are bound to happen. First of all the process will be a slow one, and, secondly, the lengths will not be all equal, for one is bound to make small errors.

Here is a simple way of setting about the work and of ensuring accuracy. Fig. 2 gives an indication of the method described. Suppose that you want to cut off a dozen $1\frac{1}{4}$ -in. lengths of ebonite rod in order to make the spacers between the primary and secondary windings of two high-frequency transformers.

Easily Cut

Cut first of all a piece of soft wood $1\frac{1}{4}$ in. in width, and right through it drill a hole into which the rod to be cut is a push fit. Insert the rod into the hole, and push it through until its far end is flush with the surface of the opposite side of the wood.

Now place the wood holding the rod in the jaws of the vice and tighten up. As soft wood is used the jaws will squeeze it and hold the rod tightly without injuring it in the least.

Cut close to the wood, loosen off the jaws of the vice and push out the piece of rod with any suitable tool. Then insert the end of the main piece of rod as before, pushing it through until the end comes against your finger, which is held at the far side of the rod.

Tighten up in the vice and cut once more. The preparation of the simple jig takes very little time, and this is amply repaid by the saving effected over the job.

If you are shortening screws, cut the wood again so that its width is exactly equal to the length needed, make a suitable hole and press each screw through up to its head. In this way one simply cannot go wrong.

A Useful Instrument

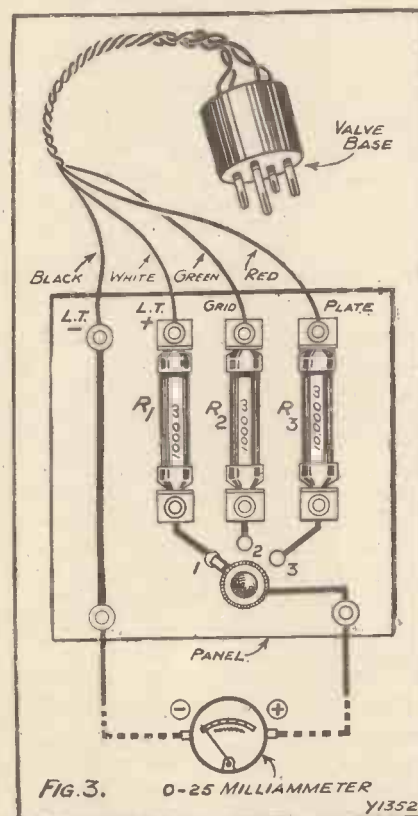
Anyone who possesses a milliammeter reading to not more than 25 milliamperes can easily make up for himself a simple and most useful little set tester, the arrangement of which is shown in Fig. 3. Besides the milliammeter the only components required are a three-point switch, six terminals, three resistances, whose values will be discussed in a moment, and the cap of an old valve.

In the drawing I have shown a 0-25 milliammeter used with R_1 and R_2 , 1,000 ohms each, and R_3 , 10,000 ohms. Since 1 volt drives 1 ampere through 1 ohm, it will drive 1 milliamper through 1,000 ohms.

Hence with a resistance of this value in series the milliammeter reads direct in volts. No account is taken of the instrument's own resistance, and readings are therefore not absolutely accurate.

They are, however, quite close enough for most wireless purposes.

A RAPID TESTER



How the milliammeter is used for rapid circuit testing.

R_3 has a value of 10,000 ohms; which means that 10 volts drives 1 milliamper of current through it, 100 volts 10 milliamperes, and 250 volts 25 milliamperes. The instrument thus gives direct readings, except that the figures on its dial must be multiplied by 10.

Suitable resistances for any milliammeter are easily worked out. Suppose, for example, that its range is from 0 to 2. To measure filament voltages we shall not in any case

require more than 6 volts, but for grid-biasing voltages we may want quite three times as much.

It will be convenient if we allow for one voltage range from 0 to 20 volts (multiplying the dial figures by 10) and a second from 0 to 200 volts (multiplying them by 100). In this case R_1 and R_2 will be 10,000 ohms apiece and R_3 , 100,000 ohms.

Making the Gadget

The resistances themselves may be mounted inside a small shallow box, the panel containing merely the knob of the switch and the six terminals. The resistances could be made by winding fine Eureka wire on bobbins, but I recommend the use of ready-made wire-wound resistances.

Once the panel has been made the only remaining task is to make a pig-tail of leads and to solder these to the contacts of the valve base. Remember that it is most important that L.T. — and not L.T. + should be connected to the low-tension negative terminal of the panel. When therefore you are inserting the tester, place the switch on stud No. 1.

If the meter needle tries to go backwards, then your low-tension leads are connected the wrong way round and must be changed over. It will be seen that placing the switch on stud No. 1 enables current from the filament battery to pass by way of the valve base and the leads through R_1 and the milliammeter.

Positive Reading

The voltage reading of the low-tension battery is thus obtained. If the switch arm is placed on stud No. 2, the grid battery is thrown into circuit, and if the biasing voltage is a positive one it can be read off.

Such a voltage will occur, of course, only in the case of grid-leak and condenser detectors, and it is necessary to short-circuit the grid leak. For anode-bend detectors and low-frequency valves with a negative grid-biasing voltage it is necessary to change over the connections.

Placed on stud No. 3 the device passes current from the high-tension battery. It should be noted that a correct reading of the high-tension voltage will not be obtained unless the resistance, choke or transformer primary in the plate circuit is short-circuited.



PROF. GOOP'S NEW AERIAL

By "WIRELESS WAYFARER"

ZINGGGG! went my telephone bell for the umpteenth time that afternoon.

I had had to get out of my comfortable chair to answer rings intended for somebody else on goodness knows how many occasions, and I was getting a little exasperated.

"Is that Dr. Miggles?" cooed a feminine voice from the other end of the line.

"Yes," I answered simply, thinking that it would probably save time.

"Oh, doctor dear," said the voice, "I am in *such* trouble. I have been out in the sun all the afternoon and my *poor* face is positively *peeling*. Do tell me what to do with it!"

"What sort of a face is it?" I asked.

Only a Joke?

"Of course, you must have your little joke, doctor dear. Just as if you didn't know *my* face. This is Miss Worples speaking. Now what can you suggest I should do with it?"

"Boil it, my sweet!" I cried, hanging up the receiver with a bump. Then with a little sigh of weariness I dropped once more into my armchair.



Those are the chassis of the late chickens.

As I had some rather deep thinking to do I closed my eyes, and just as I was dropping off—that is to say, just as I was really concentrating—"Zinggg" went the telephone bell.

"No, it isn't!" I roared into the microphone, making sure that it must be a wrong number again.

"Highly-tighty, didums wasums, then?" said a voice in the receiver, and I recognised the accents of the greatest radio inventor of the day. I need hardly say that I refer to Professor Goop.

"I suppose they have been putting

all sorts of wrong numbers through to you, haven't they? Umm, I thought so. I have been having some myself. I think I must have frightened some of mine, though, for when they ask: 'Is that Mudbury Wallow 972?' I just say, putting on the proper accent: 'No, it isn't. It's Chicago, Lakeside 74079, and this is costing you five pounds a minute!' But look here!"

W.S.T. or G.S.D.T.?

"Where?" I asked.

"I mean, listen to me."

"I am doing that."

"Can you come round and help me to fix up an indoor aerial to-morrow morning?"

"Early?"

"Oh, rather!"

"Right you are. Don't forget that I go by W.S.T."

"What's W.S.T.?"

"Wayfarer's Summer Time. You put the clock back four hours, so that when you are called at 7.30 it is really half-past eleven. Expect me then at 9 a.m. W.S.T."

"But that's lunch time!"

"Thanks very much. That's jolly kind of you. I shall be delighted."

On the following day I duly presented myself at 9 a.m. W.S.T. with a rattling good appetite. The professor was most cordial in his welcome.

"Such a pity," he said, "that you couldn't have come a couple of hours earlier, that is, two o'clock G.S.D.T."

Exploring the House

"G.S.D.T. ? ? ? ?"

"Goop Self-Defence Time, my dear fellow. On certain occasions we put the clocks forward an hour immediately after breakfast and have lunch at one o'clock G.S.D.T., which is really, of course, 12 B.S.T., or 12 G.M.T. The clocks go back again immediately after lunch to B.S.T., so that I am afraid you will have rather a long time to wait for tea. Still, that gives us all the longer to get on with our work of putting up this aerial!"

"The best thing," I said, "is clearly to explore the house in order to discover a suitable site for it. Now I suggest that we each do so independently, and in half an hour's time we meet to compare notes."

The professor readily agreed to my suggestion, and I need hardly say that the first likely site explored by me was the larder, where I carried out some highly profitable experiments in high-frequency munching. I was, as a matter of fact, just finishing the second of a brace of remarkably good chickens when Mrs. Goop blew in.

Those Cats!

"Good-morning," I said after a hefty gulp. "The professor and I are just trying to find a suitable place for an indoor aerial. And, by the way, do you think that pussy cats really should be allowed in larders? I mean to say, I was just too late to rescue what looked like a pair of chickens from a large black cat and a small spotted one, which came in through the window whilst my back was turned."

"Hmmm, but what are those things on the dish?"



The floor seemed rather uneven.

"Oh, those. Those are the chassis of the late chickens."

"Ummm," remarked Mrs. Goop again. "Pretty neat work for cats. Now, do you know, I rather fancy that there was only one cat, and that I know the name it answers to. Now, if I ever catch it in my larder—"

here she grasped a rolling pin. "Do you know," I said, "I honestly believe that this site is quite unsuitable for the aerial. In fact, really I am quite sure of it. I will just go and see if the professor has discovered something more

In Lighter Vein—continued

suitable. Excuse me, please," and I departed in top gear.

It was quite a long time before I could find the professor, for it turned out that after wandering about several rooms he could not remember why he was doing so, and the only solution he could find was that he must be playing hide-and-seek. He therefore wormed his way under the carpet in the spare bedroom and kept on bellowing "cooe."

Hearing his cries and thinking that he must be in need of help, I burst open the room of the door and dashed in. The floor seemed rather uneven and I became conscious that an eminence upon which I was standing was heaving slightly.

Hastily I moved, and was surprised to hear from beneath me the professor's voice saying in stifled tones: "Thank goodness for that. Now if you will just take your other foot off my neck we can get on." I pulled him out from his hidy-hole and reminded him of our important quest.

We Commence Work

"To be sure, to be sure," said the professor, "and now that I come to think of it, could we possibly find a better site than this?"

A moment's consideration showed me that it would be difficult to do so. The room was lofty, it was at the top of the house, it was large enough to allow for an ample length of wire.

"Splendid!" I cried. "Let's get on with it at once."



"Gas!" yelled the Professor.

We very quickly had the aerial up; and then came the business of the lead-in. This was not so easy as you might think; in fact, when we came to think of it we found that it was going to be something of a teaser.

You see, the set lives in a front ground-floor room and the spare room is at the back of the house in the third storey. We got down all right to the second floor. Immediately below us lay Mrs. Goop's drawing-room.

"Are you going to play for safety for electrical efficiency?" I queried.

"Efficiency!" roared the professor, striking his chest. "Efficiency is my middle name. This lead-in must go straight down. Hasten to the workshop, and bring me the brace and bit, any drills that you can see, a cold chisel, a hammer, and anything else you can find that may be useful."

I returned with an assortment of likely-looking tools, including a coke hammer and a crowbar. We got through the floor all right with a brace and bit, but a short distance beneath the wood we encountered something that seemed rather hard. The professor seized the cold chisel and gave a fine smack with his heavy hammer. The something simply ceased to exist.

Gas!!

As one man we seized our handkerchiefs, pressed them to our noses and leapt to the window.

"Gas!" yelled the professor. "Go and turn it off at the main."

I never can think why plumbers will leave gas pipes just in the place where you are certain to meet them when you are erecting indoor aerials.

Having disposed of the gas, we found ourselves confronted with the remarkable hard ceiling of the room below. The professor explained that this demanded a little care. A small, neat hole must obviously be made.

It would be better, he thought, if we took up a couple of planks in the floor so as to be able to see more clearly what we were doing. We did this with the crowbar. I must say that I do think builders use rotten planks for their floors. These silly things simply flew to pieces when we tried to get them up.

"And now," said the professor, "if you will go downstairs to the drawing-room and climb on top of the china cabinet you will be able to see just where the point of my drill appears."

The Signal

"As soon as it starts coming through knock on the ceiling. Ordinary men would probably make an awful mess of a house in putting up this aerial. But when two scientists, like you and me, do it we can make a really neat job of the thing."

I went down to the drawing-room and climbed on top of the cabinet.

"Are you ready?" came the professor's voice from above.

"Ay, ay, sir. Carry on."

Now by a little careful calculation I had worked out just where the point of the drill must appear. Supporting myself with a hand placed on the ceiling some distance away, I kept my eye glued to the spot. I could hear the churning of the professor's drill.

"Look out," he called presently, "I must be nearly through. Can you see anything?"

"Not yet."

"Watch carefully."

"I'm watching."

Something must have gone wrong in my calculations, for with a sudden awful pang I felt the drill shoot into my supporting hand. In the circum-



"I will just see if I can catch it!"

stances it was natural that my signalling knocks should not have been quite so gentle as was at first intended. My unwounded hand which grasped the coke hammer hit out involuntarily.

Here again I must register a protest against the appalling materials used by those who construct houses. Under the impact of my signal the ceiling just gave way—I can use no other word. Relieved of the pressure, the professor's drill shot through, causing the professor to overbalance and bringing him with it.

That Cat Again!

The china cabinet must have been very badly designed or most insecurely placed, for when he landed on top of it beside me the whole thing simply toppled over with a crash.

Just as we were trying to find out whether we were dead or not the door opened to admit Mrs. Goop.

"Hmmm," she said, surveying the scene. "That cat again, I suppose."

"Exactly," I murmured, observing that she was carrying a rolling-pin in a business-like way. "It went out through that window. I will just see if I can catch it." A carefully tended bed of prize begonias makes a fine soft landing, and, believe me, it is much to be preferred to an encounter with a rolling-pin.

**CLEAN
CELLS
BIG
CELLS
yielding
constant
power**

THROUGH LONG PROGRAMMES—
THROUGH MONTHS OF HEAVY USE
THE SECRET PROCESS OF THE

LISSEN

**H.T. BATTERY GENERATES
PURE CURRENT**

Every Lissen Battery is fresh when you buy it. The big cells are fresh, clean, and packed full of energy put there by the Lissen Secret Process. Through months and months of life the Lissen Battery will give you a steady flow of pure, silent current. There is never a sign of ripple in it, never a trace of hum. Lissen Battery power is famous for its purity—it brings out every note of music, every word of song and speech in sharp and stereoscopic relief.

PRICES		
60 volt (reads 66) ..	7/11 60 volt (Super Power)	13/6
100 volt (reads 108) ..	12/11 100 volt	22/-
120 volt	15/10 4½ volt Grid Bias "	10d.
36 volt	4/6 9 volt " "	1/6
60 volt (For Portable Receivers)	7/11 16 volt " "	2/9
99 volt (For Portable Receivers)	7/11 4½ volt Pocket Battery	5d. each (4/6 doz.)
	12/6 Single Cell Torch Battery	4½d.



10,000 radio dealers sell it. Ask for Lissen New Process Battery in a way which shows you will take no other.

LISSEN LIMITED,
Worple Road, Isleworth, Middlesex.
(Managing Director: T. N. COLE.)

Factories also at Richmond (Surrey) and Edmonton.

MADE
IN
ENGLAND

AS WE FIND THEM



NEW APPARATUS TESTED

Pre-Set Condensers

AMONG the firms now supplying condensers of the semi-variable type may be mentioned Messrs. Wingrove & Rogers, of Arundel Chambers, Strand, W.C.2.



A well-made semi-variable condenser—The Polar. It is obtainable in two capacity values.

We have tested a number of Polar components and have been impressed by the careful design and good workmanship.

The "Pre-Set" condenser is no exception. It is exceedingly well finished in a brown bakelite moulding, and the capacity adjustment screw has a nice silky feel. These condensers can be obtained in two types, one having a maximum capacity of .001 mfd. and the other a maximum of .0003 mfd. The retail price is 2s.

The "Voluvernian"

Messrs. Gambrell Radio, Ltd., Buckingham Street, Strand, London, W.C.2, are now supplying their well-known "Voluvernian" volume control in an improved form.

The resistance has been altered so that a more progressive build up in

signal strength is obtained from a whisper to maximum. The component is nicely made and the movement is exceedingly smooth. Good contact between the moving arm and the resistance strip is ensured by the use of a spring-loaded plunger, and it is interesting to note that the volume control can be mounted on a metal panel, by reason of the special insulating bushes which are provided.

The rated resistance of the "Voluvernian" is 500,000 ohms, and it retails at 6s. 9d. It is a good volume control and can be recommended.

Pick-up Adaptors

The Six-Sixty Radio Co., Ltd., Rathbone Place, Oxford Street, W.1, have sent us one of their gramophone pick-up attachments.

The device consists of a four-pin base with three terminals. One of these is marked red and is connected to the grid socket of the valve.

The adaptor is plugged into the existing detector valve holder after removing the detector valve, which is then inserted in the adaptor.

One lead of the pick-up is joined to the centre terminal on the adaptor, and one of the outside terminals (the one which goes to L.T.—) is connected to the positive terminal of a 1½-volt grid battery. The negative grid-bias terminal is then joined to the other pick-up lead.

We have one criticism to offer, and that is the radio side of the set remains connected in parallel with the pick-up when the gramophone is in use. This could be overcome quite easily by dispensing with the grid pin on the adaptor.

The firm also supplies a gramophone attachment for use with A.C. valves, and both types retail at 2s.

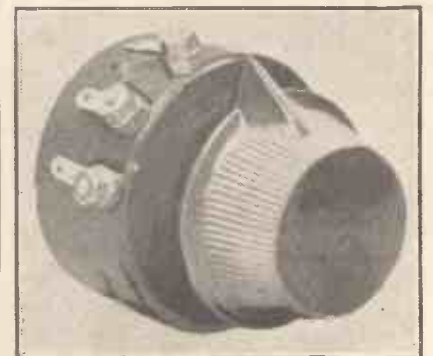
Spaghetti Resistances

Messrs. Burne-Jones & Co., of 296, Borough High Street, London, S.E.1, have sent us a sample of their Spaghetti resistances, which are available in a range of values from 1,000 to 50,000 ohms.

These resistances are somewhat novel, the element being of a flexible nature, enclosed in a length of Systoflex tubing. The component thus combines the functions of connecting lead and resistance and has a further advantage of economising space.

The resistance values up to 40,000 ohms are rated to carry 10 milliamps. and the 50,000-ohm resistance is designed to carry 5 milliamps. The components retail at 1s. 6d.

These Spaghetti resistances should be quite useful in connection with H.T. units and "anti-motor-boating" devices.



This is the Gambrell "Voluvernian," a high-resistance potentiometer suitable for volume control on the low-frequency side of receivers and amplifiers.

TESTS OF TIME

That fine old London landmark..

... the Law Courts, has been standing since 1882—for 48 years! It has stood the test of time and is likely to go on standing it for a long, long time. T.C.C. Condensers too, have stood the test of time—and come through with flying colours. If you want your Set to be a success—you cannot disregard the condenser chosen by experts with such astonishing consistency. Ask for T.C.C.—“the condenser in the green case.” The condenser with a guarantee!



The condenser illustrated is 800 volt D.C. test, 400 D.C. working . . . 8/6

THE LAW COURTS

ADVERT. OF THE TELEGRAPH CONDENSER Co. Ltd. N. ACTON W.3

"Britain's leading Valves



-at Lower Prices!"

As from July 18th the undermentioned reductions in the retail prices of certain types of Marconi Valves were brought into effect.

Type		Old Price	New Price
H 210	HL 210 L 210 H 410 HL 410	10/6	8/6
L 410	H 610 HL 610 L 610	12/6	10/6
P 215	P 410 P 610	15/-	13/6
P 2	P 240 P 425 P 625 P 625A	22/6	20/-
S 215	S 410 S 610	25/-	22/6
PX 4	PT 240 PT 425	30/-	27/6
PT 625		

WHEN BUYING VALVES REMEMBER!

Marconi Valves are used by The B.B.C., Imperial Airways, Empire Communications, Metropolitan Police, Passenger Lines, etc., etc. in fact in almost every important British Service. Remember this when you buy Marconi Valves, you buy British and undoubtedly buy the best.

Buy the Valves the Experts use!

MARCONI VALVES



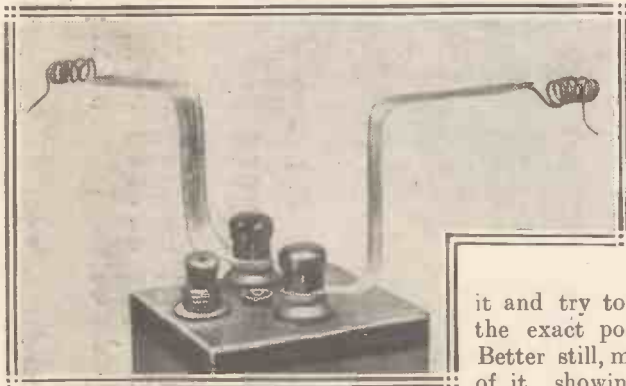
FOR PRACTICAL AMATEURS

Stopping Accumulator Corrosion—Adjusting Loud-speaker Units—
Temporary Plug Sockets.

Stopping Accumulator Corrosion

THE corrosion fiend is often particularly active at accumulator terminals, even when such articles are of the covered and protected type. Such corrosion should not, of course, be allowed to go on; it sets up unnecessary resistance in the circuit, which not unfrequently manifests itself in a loss of volume.

Some accumulators seem more liable to corrode at their terminals than others. The possessor of even the worst offender of this nature in the accumulator world, however, may reach an almost complete immunity from the trouble by securing



“extension strips” to his accumulator terminals, in the manner depicted.

These “extension strips” are merely strips cut from thin sheet lead, about $\frac{1}{8}$ in. in thickness, and three or four inches long. A hole is drilled at one end of each strip in order that the strips may be mounted on the terminals. The connecting wires from the battery are soldered to the free ends of the strips.

Free from Trouble

The lead strips, when securely clamped under the terminals, are covered entirely with a light layer of petroleum jelly, particular attention being given to the accumulator terminals themselves.

It will be found that accumulator connections made in this manner will be almost entirely free from all corrosion troubles, even over very prolonged periods.

When charging the accumulator, the lead extension strips should not

be removed. Connect the current supply to the free ends of the wires soldered to the strips.

Adjusting Loud-Speaker Units

The first business is to remove the armature and, sad to say, this usually means pulling the entire unit to pieces. If you are not very careful you will find when it comes to putting it together again that you are in much the same position as you were in some years ago when as a schoolboy you decided to repair your own watch.

It came to pieces easily enough, but putting it together again was the very dickens! Before you start to take a unit apart have a good look at

Have you ever had trouble with corroding battery connections? Here is a scheme for counteracting such a tendency.

it and try to fix in your memory the exact position of each part. Better still, make a rough drawing of it, showing all the parts as they lie.

Then take a scriber and mark the various parts that come next to one another. Taking out the armature is admittedly a desperate remedy—but then “zizzing” is a very desperate disease. Having removed the armature, clean up the broken joint with emery paper and then apply killed spirits as a flux. Put a few chips of solder in position, and hold the armature in the flame of a spirit lamp until the solder runs.

If necessary, steady the lever or connecting-rod with a second pair of pliers. Allow it to cool down slowly, and then put the unit together again.

Reassembly

The process of reassembly looks much worse than it really is. I have tackled dozens of different units, including such complicated affairs as the drive of the original Kone loud speaker and the up-to-date Wates' Star unit, without being defeated,

and I am sure that the reader will be equally successful if he refuses to let himself be frightened by the apparent difficulties of the job. If, however, he should be baffled by the process of reassembly, the makers will always help him out.

Temporary Plug Sockets

Ordinarily it is a difficult matter to employ plug-in leads with a receiver or other instrument which possesses only terminals of the screw-down type. The plug-in terminals have usually to be fixed to the screw-down ones with bits of wire, or with clamps of one sort or another, and thus they become anything but *plug-in* terminals.

A glance at the accompanying photograph, however, will solve once and for all the difficulty which sometimes crops up in the above circumstances.

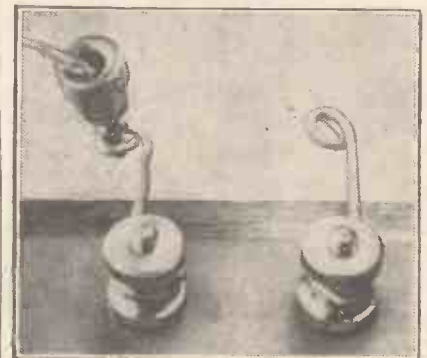
Merely take two or three inches of stout bare copper wire (about No. 16's), bend it into a small loop or “eye” at each end, and then attach one end of it to the screw-down terminal. The free loop or eye will now serve as a socket into which the plug-in terminal may be fixed quite readily.

Useful Device

If, of course, plug-in terminals have to be attached to push-through terminals instead of to those of the screw-down variety, merely make one small loop on the piece of stout copper wire, leaving the other end straight for ready insertion into its terminal on the panel.

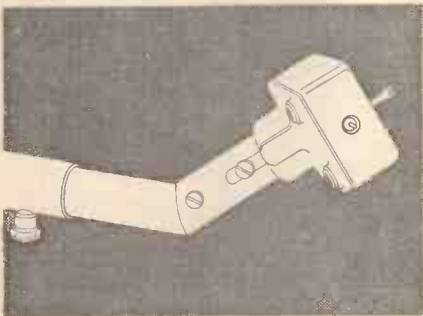
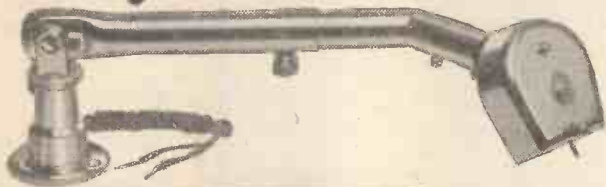
The above notion is also of much use when applied to the connecting of plug-in terminals to isolated flash-lamp and other batteries. In such instances a short piece of stout wire, looped at one end, is secured to the battery electrodes, the plug-in leads then being inserted into the vacant loops.

LOOP SOCKETS



A simple method of making reliable connections between plugs and screw-down terminals.

An additional refinement



STILL THE SAME PRICE

45/-

RADIO EXHIBITION OLYMPIA, 1930. STAND NO. 105



The B.T.H. pick-up holds a reputation second to none for excellence and efficiency. Now, with this latest development in the design of the B.T.H. Tone Arm, the complete accessory forms a masterpiece of ingenuity, combining perfect tracking, a feature of B.T.H. pick-ups, with the new arrangement which facilitates the changing of needles. The combination of the B.T.H. pick-up and the B.T.H. Tone Arm ensures a minimum of record wear and excellent tonal quality.

PICK-UP & TONE ARM

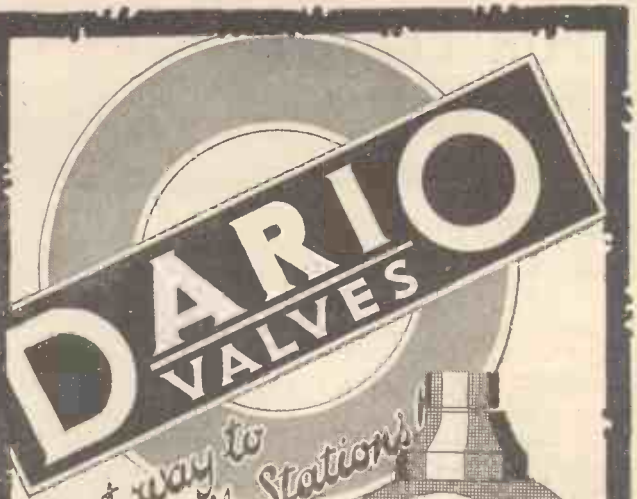
From all Radio Dealers.



THE EDISON SWAN ELECTRIC CO., LTD.,
Radio Division,
1a Newman Street, Oxford Street, W.1.
Showrooms in all the Principal Towns.

EDISWAN

W.78



Best way to all Stations!

Buy one of the new Dario Screenodions and save money. Dario Screenodions cost only 15/6 because they are made in huge quantities in one of the world's largest valve factories and sold at a price free from control.

CHARACTERISTICS

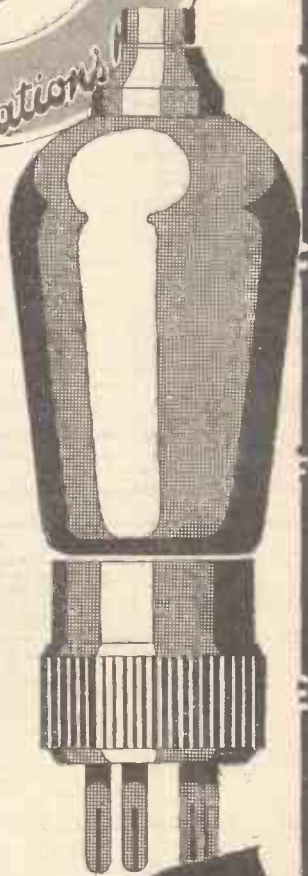
BIVOLT 1.8 volt, .15 amp.
FORVOLT 3.5 volt, .075 amp.

Impedance - 250,000 ohms
Anode Voltage 80-200 volts
External Grid 80-100 volts
Coeff. of Amplification - 250
Grid Bias - - 0-1½

PRICES of the other DARIO VALVES:

Universal, Resistor, Super H.F. - 5/6
Super Detector - 6/6
Super Power - 7/6
Hyper Power - 9/6
Super Power Pentodion - 18/6

Two- or Four-Volt



15'6

SCREENODION

Ask your dealer or write for free Dario folder:

IMPEX ELECTRICAL, LTD.

(Dept. L),
538, High Road, Leytonstone, London, E.11

WEARITE COMPONENTS

SOMETHING REALLY NEW FOR YOUR SET—

Write for special leaflet:

AN ENTIRELY NEW L.F. COUPLING UNIT

which will make a remarkable
difference to your reproduction:

COMPLETE WITH SWITCH
FOR TONE CONTROL.

PRICE

20/-

*Have you our free
Illustrated List?*

WRIGHT & WEARE LTD.,
740, HIGH RD., TOTTENHAM, N.17

Telephone: Tottenham 3847/8.

LOOK OUT FOR OUR OTHER NEW LINES

235

The **BENJAMIN** Turntable with folding legs is unique

A NEW ball-bearing turntable combining several new features, folding legs, which can be opened out for outdoor use, considerably reducing capacity of set to earth, and folded up for indoor use. Fitted with rubber buffers—preventing damage to the polished receiver or article on which the receiver is placed. The smooth running ball bearings make "direction finding" easy.

Price **7/6** complete.

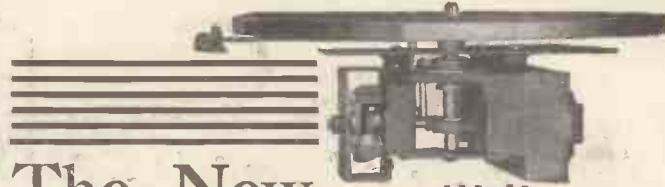
Write for illustrated leaflets on all Benjamin radio products.

Buy

BENJAMIN

and buy the Best!

THE BENJAMIN ELECTRIC LTD.
BRANTWOOD WORKS, TOTTENHAM, N.17



The New Green Flyer Induction Motor

Here at last is a thoroughly dependable induction type electric gramophone motor that will give you faithful service. There are no brushes or commutators to cause sparking and spoil reproduction. The Green Flyer is used as standard equipment by leading manufacturers and is undoubtedly the motor of the future.

For 110-volt A.C., with 10" table	£3 15 0
.. 220/240 .. " " 10" ..	£3 15 0
.. 110 .. " " 12" ..	£3 18 6
.. 220/240 .. " " 12" ..	£3 18 6

Nickel-plated fittings and complete with speed regulator. Write for Bulletin.

The Rothermel Corporation Ltd.

24, Maddox Street, London, W.1.

Phone: MAYFAIR 0578/9.

Continental Sales Office: 27, Quai du Commerce, Brussels, Belgium.

NEXT MONTH!

The OCTOBER Number of
"THE WIRELESS CONSTRUCTOR"
will be a
SPECIAL EXHIBITION NUMBER
including also a full description of
THE "EXPLORER" FOUR


VICTOR KING'S GREATEST SUCCESS.

Avoid disappointment and order your copy now.
On Sale September 15th. Usual Price.

VARLEY

FOR EVERYTHING
GOOD IN RADIO

All-Electric Sets and
Radio-Gramophones

Components  Accessories

Varley

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



Some facts about fuses that will interest constructors and help them to avoid those terribly costly valve burn-outs.

By H. S. MILNES.

It is no doubt a noble thought that when one blows up two or three valves by an accidental short-circuit one has been living actually at the rate of several millions a year for a brief instant. Personally, though, I have never found the idea very consoling; at any rate, when they were my valves and I was responsible for the pyrotechnics.

A Question of Wiring

In the set of to-day, where high voltages are the rule, and where screening is often extensively employed, it is rather important to take steps to safeguard the apparatus from the effects of possible short-circuits.

It must not be forgotten that screens, metal panels and the vanes of tuning condensers may be connected both to earth and to low-

contact occurs even for an instant between these and other parts at different potentials, short-circuits will occur, which may have exceedingly expensive results.

The Old-Fashioned Method

In the early days of wireless it was customary to connect the filament and plate batteries in series, as shown in Fig. 1A. The underlying idea appeared to be to make use of the filament accumulator to increase by a few volts the potential difference between the negative end of the filament and the plate.

There was something to recommend it when high-tension batteries were very costly, but to-day nothing can be said in its favour, though one still finds this kind of connection used by some home constructors. Actually, it is exceedingly risky, as an examination of the diagram will show.

If any earthed part comes into contact with a lead or a terminal connected to high-tension positive there is a path via the filament from H.T. positive to H.T. negative. The filament is, therefore, bound to "go." Further, both batteries are short-circuited, so that extensive damage to each may occur, for the short does not cease to exist when the filament has given way.

"Neg-to-Neg" Advantages

A consideration of the circuit with H.T. - connected instead to L.T. - (Fig. 1B) discloses that a short-circuit of the kind referred to does not involve the filament. Only if a positive low-tension point makes contact with something connected to H.T. positive will the filament be damaged.

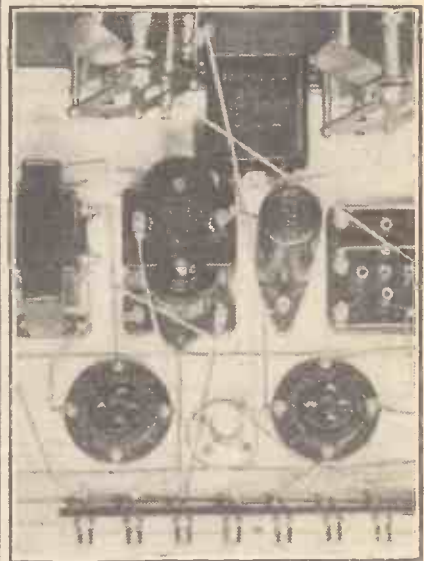
As we have seen, it is filament negative, and not filament positive, that is the main danger, since uninsu-

lated places connected to low-tension positive are comparatively few and far between.

By connecting the batteries in opposition we can make fairly sure that a short-circuit will not burn out a filament, whether the set contains one valve or many. But a short-circuit can do harm in many other ways. Consider the batteries first of all.

Even a standard-capacity dry-cell battery, when in good condition, can deliver for a few moments a current of about 5 amperes. If 100 volts are driving this we have a power of half

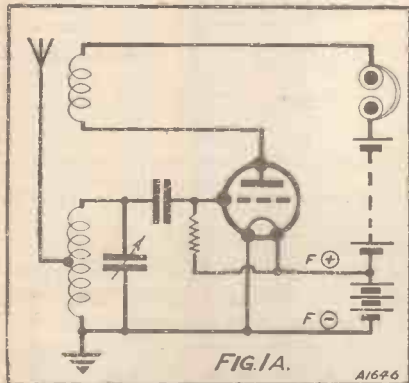
PROTECTION



The little flash-lamp bulb you can see between the two valve holders prevents the H.T. from burning out the valves should a short-circuit occur.

a kilowatt, or '67 horse-power. A quadruple-capacity dry battery can deliver for a short time 15 amperes or more on short-circuit. Very few moments under such a heavy load are needed to wreck a dry battery completely.

BATTERY CONNECTIONS



The old-fashioned way of connecting the H.T. and L.T. batteries.

tension negative. In addition to these there is a considerable amount of wiring at the same potential, and not infrequently the casings of low-frequency transformers, and so on, are also earthed.

There are, therefore, in any receiving set numerous danger points, for if

Safeguarding the Set—continued

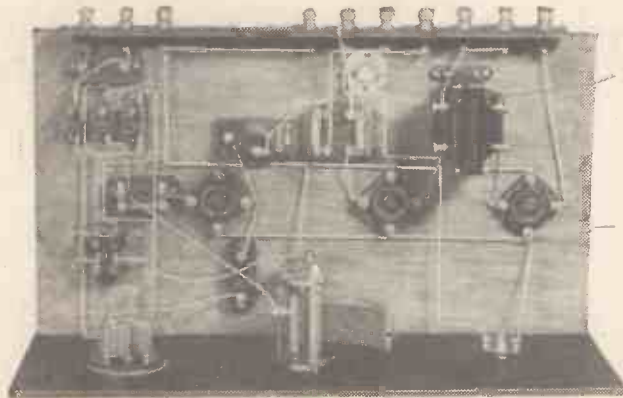
With an accumulator H.T.B. a short-circuit may have still more serious consequences. The internal resistance of secondary cells is much lower than that of dry cells, so that a far heavier current is delivered on short-circuit.

Though I cannot claim to have measured the flash amperage of a small H.T. accumulator, since to do so is likely to be distinctly bad for the battery, it probably runs to 30 or 40 amperes in the case of a battery made of good quality cells and fresh from the charging station. The filament accumulator can certainly supply well over 100 amperes, for such a current is often taken from car-starting batteries of similar capacity.

A Satisfactory Method

It is clearly advisable, then, to adopt some means of safeguarding the batteries, for those made up of dry cells are expensive enough, whilst accumulators are still more costly.

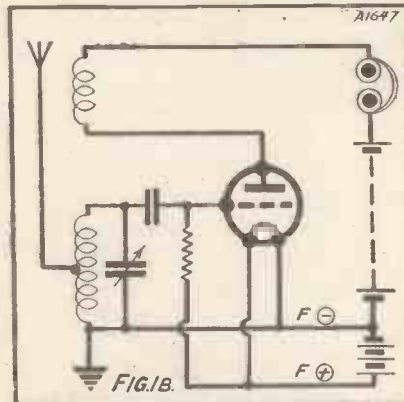
The most satisfactory method of accomplishing this desired end is that illustrated in Fig. 2, which shows the use of fuses in the high-tension leads. The circuit is purposely shown in simplified form so that the position of the fuses is clear.



In the high-tension parts of the wireless set fuses are desirable which will "blow" at something less than 100 milliamperes. Since the valves are guarded by the series connection of batteries, this amount of current flowing for a fraction of a second is not likely to do any extensive damage; but we must make sure that there is something that will give way and cut off the flow of current almost instantly, for if it were allowed to flow even for a matter of seconds something serious might happen.

Some time ago I began to make use of flashlamp bulbs as fuses in all my own wireless sets. The bulbs obtainable a year or two ago were satisfactory for this purpose up to a point. A series of tests consisting in the deliberate blowing up of a

NEGATIVE TO NEGATIVE



Nowadays it is customary to join the negatives of the H.T. and L.T. batteries together.

number of bulbs showed that the instant breakage of a circuit can be ensured by a current exceeding about .4 ampere by the use of bulbs rated at 2 volts .2 ampere.

This receiver includes a flashlamp fuse in the common H.T.-L.T. neg. lead. This may be adequate protection for the valves, but it is worth while considering the use of several others to protect the batteries, as our contributor points out.

This amount of current is not likely to damage either battery, and so completely was the set safeguarded by them that I have often demonstrated their efficiency by letting friends see the effects of a deliberate short-circuit.

By Ohm's law, though, such bulbs have a filament resistance of $\frac{2}{.2}$, or 10 ohms, and if one is used in each positive H.T. lead, as well as in the common negative H.T. lead, 20 ohms

of resistance are added to each high-tension circuit.

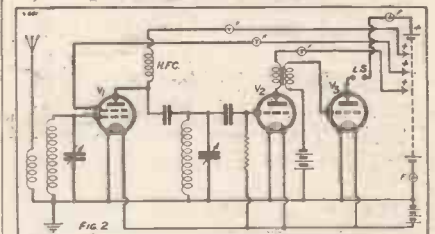
To-day flashlamp fuse bulbs are available for which a blowing load of 70 milliamperes is claimed. Some of them, as tests disclosed, will stand up to a load rather higher than this, but on the whole they may be regarded as useful components. Their resistance, however, is even higher than that of the 2-volt .2-ampere bulbs, and when they are used it is sometimes desirable that decoupling circuits should be employed.

Good Investment

Fuses should be fitted in each high-tension positive lead, and in the common negative lead between H.T. and L.T. The H.T. parts of the set are then perfectly safe. There are those who rely upon a single fuse in the common H.T. negative lead, but this is apt to be a delusion and a snare.

Look at Fig. 2. Suppose that, as sometimes happens, an internal short-circuit takes place between the plate and the screening grid of V_1 . The

USING FUSES



Here fuses are shown inserted at all strategic points.

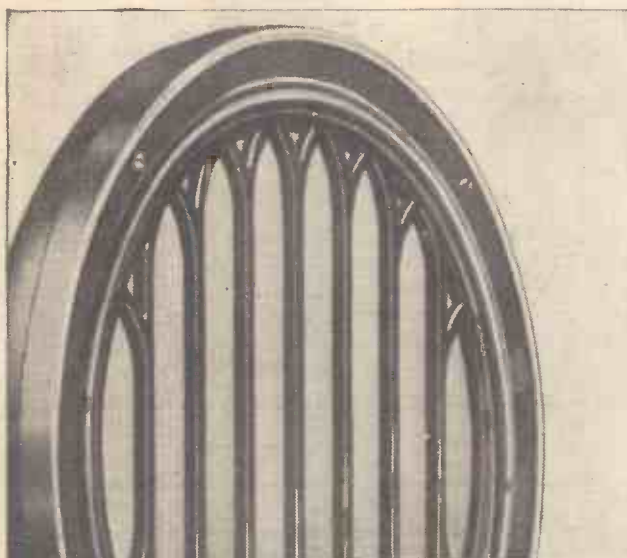
former is connected probably to H.T. + 150, the latter to H.T. + 75. There is thus a short-circuit between the 75-volt and the 150-voltappings of the H.T.B. A fuse in the common H.T. negative lead will not burn out—but the high-frequency choke will. I know that it will, because I once had this experience in an un-fused experimental hook-up.

High-tension fuses should be placed at points as near the battery as possible; they will then safeguard the components and the set and the batteries themselves. Don't forget that a fuse cannot help you if a short-circuit takes place at a point intermediate between it and the battery tapping involved.

But a few shillings spent in safeguarding the set may save pounds' worth of damage.

YOU'LL HEAR THE PROGRAMME BETTER ON A

**B
T-H** **CONE**



Talks, opera, revue, dance music—all will assume a new interest for you if you listen on a B.T.H. cone. You'll hear the full-throated Contralto and mellow baritone—the rippling soprano and golden voiced tenor as you've never heard them before outside the concert platform. Your friends will wonder how you do it.

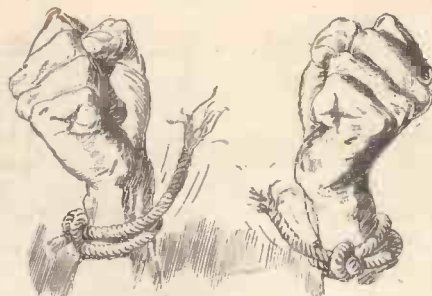
PRICE £3



THE EDISON SWAN ELECTRIC CO., LTD.
Radio Division
1a Newman Street, Oxford Street, W.1
Showrooms in all the Principal Towns

EDISWAN

V.53



Break Those Bonds

Don't be a slave to circumstances all your life. Break loose! All around you are people with no more intelligence than yourself who have climbed out of the routine class and

are occupying good positions because they availed themselves of specialized training.

Waiting for you at this moment is a bigger and better position. You can have it as soon as you have secured the training that will qualify you for it. And you can get that training in the spare time that you now let go to waste.

No matter where you live, the International Correspondence Schools will come to you. No matter what your handicaps, or how small your means, we have a plan to meet your circumstances.

To thousands of men like you—hands tied, but eager to break free—I.C.S. training has brought success.

We have nearly 400 Standard Courses, including many in the following subjects:

Accountancy and Book-keeping	Engineering, all branches	Salesmanship
Advertising	French, Spanish, and Italian	Scientific Management
Architecture and Building	General Education	Shorthand-
Chemistry	Insurance	Typewriting
Commercial Art	Plumbing	Showcard Writing
Commercial Training	Railway Equipment and Running	Textiles
Draughtsmanship		Window Dressing
		Wireless Engineering
		Woodworking

ALL EXAMINATIONS—Commercial, Technical, Matriculation and Civil Services.
Write to-day for free Booklet containing full information regarding the Courses in which you are most interested.

International Correspondence Schools, Ltd.,
172, International Buildings, Kingsway, London, W.C.2.

Weston sets the world's standard

MODEL 506 Panel Voltmeter ensures permanent accuracy on your radio receivers. Experimenters and radio enthusiasts find it necessary for checking the electrical operation of their sets.

Having a high internal resistance of 125 ohms per volt, it makes practically no load on the batteries. It is compact and neat in appearance.



MODEL 506
PANEL VOLTMETER.

Prices: £1-15-0—£2-15-0

WESTON
STANDARD THE WORLD OVER
Pioneers since 1888

WESTON ELECTRICAL INSTRUMENT CO., LTD.
15, Great Saffron Hill, London, E.C.1

A.4



Valve Price Reductions

EVERY amateur will be glad to hear that the British Radio Valve Manufacturers' Association has decided to reduce the price of valves. The 10s. 6d. valve has been reduced to 8s. 6d., power valves from 12s. 6d. to 10s. 6d., super-power valves from 15s. to 13s. 6d., screened-grid valves from 22s. 6d. to 20s., pentodes from 25s. to 22s. 6d., and from 30s. to 27s. 6d.

Bootleg Broadcasters

Prohibition agents patrolling Long Island in motor-cars recently were searching for the source of continual but mysterious wireless messages. These were thought to be communications between liquor smugglers on shore and liquor ships at sea. The

agents raided three big country houses and found a secret transmitting station, with the power of communicating with Bermuda, Havana, the West Indies and even Europe.

Mysterious Messages

Details of the wave-length used by this transmitter are not given, but we wonder whether any of our readers have heard these mysterious messages.

It appears the sets were concealed in cabinets; one was in a garage three hundred yards from the house.

A Sham S.O.S.

It is thought that one of these wireless stations was the source of the sham S.O.S. recently sent out saying that the yacht in which the Mayor of New York was sailing was in serious danger.

Of course, nothing was wrong, and the trick now seems to have been explained.

Harrow Leads the Way

Harrow is the first Public School in England to prepare young men for public speaking. A prize has been given to be awarded for clear speaking, and Harrow boys will be able to have the advantage of listening to various voices on the radio, in order to familiarise themselves with the correct method of speaking in public.

Radio Receiver in Exchange

A debtor recently wrote to Judge Spencer Hogg at the Lambeth County Court admitting that he owed the sum of £7 10s., and offered a sixteen-guinea wireless set in full settlement. The Judge's comment was: "This seems a very fair offer."

For Overseas Listeners

We understand that in response to a big demand from listeners overseas, and from members of the Radio Trade, the B.B.C. has decided to publish advance details of their programmes.

Advance copies have already been published, and have been rushed off

(Continued on page 272.)

**USE YOUR A.C. MAINS—
AND A WESTINGHOUSE RECTIFIER**

**TO GET THE BEST OUT OF
YOUR SET IN THE EASIEST WAY**



METAL RECTIFIERS have a higher efficiency than any other form of rectifier.

They have nothing to wear out—no fragile filaments—no chemical action—and therefore do not require periodical replacement.



Type A3
D.C. Output 9 v. 1 amp.
23/6

Most of the leading manufacturers are incorporating the Westinghouse Metal Rectifier in their sets and eliminators.

There are units for all purposes—high tension, low tension, battery charging, grid bias, etc.

The Westinghouse Brake & Saxby Signal
Co. Ltd.
82, York Road, King's Cross, London, N.1.

Send a 2d. stamp for our 32-page Booklet "The All-Metal Way, 1930," which gives circuits and full details.



It would be FATAL to Lose CONTROL



Write for free booklet, "Volume Controls, Voltage Controls—their uses."

Barbed wire—trenches—dug-outs—a field set and a thin strand of wire. The difference between control and lack of control may spell life or death to an entire brigade. It's a far cry from No Man's Land to the comforts of your home. But even in your radio set . . . control plays a vital part . . . and it has been the privilege of CENTRALAB to furnish the volume controls of millions of radio receivers. Is your radio CENTRALAB equipped?

Centralab

The Rothermel Corporation Ltd.
24, Maddox Street, London, W.1.

Phone: MAYFAIR 0578/9.

Continental Sales Office: 27, Quai du Commerce, Brussels Belgium.

The PRIVATE ADDRESS AMPLIFIER

- 1 Magnium Aluminum Chassis, as used in
- 1 Amplifier described
- 1 Rectifier
- 1 Hypocrite Transformer, as specified
- 1 L. Hypercore Choke, 29/20 H.
- 1 Airy Dial C.P.C. L.F. Transformer
- 1 Lissen A.F.3 L.F. Transformer
- 1 C.C.C. 4-mid. Condenser
- 1 Hydra 2-mid. Condenser
- 1 W.B. 5-pin Valveholder
- 1 100 ohm Stopper
- 1 Organic Megostat
- 1 Belling Lee Terminals
- 1 Glazite, Flex, Screws and Nuts

£ 8 10 0

TOTAL COST

DESIGNED BY MR. P. W. HARRIS.

BURNE-JONES & CO., LTD.

"MAGNUM" HOUSE,
296 BORO' HIGH ST.,
LONDON, S.E. 1.

WE specialise in all apparatus described in "The Wireless Constructor". An interesting range of literature, including "Volume Controls and Dissolbers and How to Use Them", also a list of leading short-wave stations, free on request.

ANY PARTS SUPPLIED SEPARATELY AS REQUIRED.
THIS AMPLIFIER can be supplied READY WIRED and TESTED. PRICE £9 VALVES EXTRA.

REGENTONE

D.C. or A.C. 'Portable' Combined Units (H.T. with L.T. Charger)

They fit inside any portable and are equally suitable for all popular 2-, 3- & 4-Valve Receivers. Write for new FREE BOOKLET, S.M.1. REGENT RADIO SUPPLY CO., 21, Bartlett's Buildings, Holborn Circus, London, E.C.4. Telephone Central 8745 (3 lines.)

Cut this out!

Send CAMCOS 24 page catalogue

NAME _____

ADDRESS _____

To CARRINGTON MANUFACTURING CO., LTD.,
24, Hatton Garden, London, E.C.1. Tel.: Holborn 8202.

for Cabinets!

OUR NEWS BULLETIN

—continued from page 270

to all parts of the Empire. This will undoubtedly give distant listeners an opportunity of ascertaining future star items in the B.B.C.'s transmissions.

Announcer Assassinated

The extraordinary case of a wireless announcer being murdered was reported in the press the other day, when Mr. Gerald Buckley, of Detroit, U.S.A., had just finished broadcasting a talk on political subjects, and condemning vice conditions in Detroit.

Threatening Letters

During his broadcast talk, Mr. Buckley had made special reference to various gambling resorts, and it was known that he had received threatening communications. Just after his talk, when he was using the telephone in the hotel foyer, Mr. Buckley was shot by three men who came suddenly into the hotel.

Lonely Labrador

The Parish of Forsbrook has given the Reverend Sidney Lawton, who lives at Silverdale, a four-valve wire-

less set to take back with him to Labrador, where for eight months of the year there is no post and no newspaper obtainable.

Mr. Lawton arranged to send a message to the donors of the wireless set if, when he got to Labrador, he was successful in picking up the London wireless programme.

We understand this cable has just been received, bearing a brief message: "Got it well."

First Woman Announcer

The first B.B.C. woman announcer has arrived. She is Miss Gladys Ward, of Wolverhampton, who joined the Midland Regional station early in June this year. Officially, she was the Assistant-Director of Information, but later on she was asked to assist with announcing, and she now acts officially in that capacity two or three times a week.

Miss Ward is the only woman acting in this capacity in England. She gave her first broadcast six years ago.

A Peculiar Phenomenon

It was recently reported in the "Birmingham Evening Despatch," by a reader, that listening in the other evening at 5.15 he heard something never heard before. When Big

Ben chimed the quarter there was a short pause during which the reverberations were dying away, but during this time the correspondent distinctly heard what was either an echo of Big Ben, or another clock nearby, chiming the quarter. Musically speaking, the tempo of the second chime was exactly the same as that of Big Ben.

We wonder whether any of our readers have ever experienced this interesting phenomenon.

Political Broadcasts

According to the "Daily Telegraph," there is no strong evidence of any urgent public demand for the broadcasting of Parliamentary debates and speeches, etc. The question of broadcasting from the House has been raised many times, but it has always failed to materialise in anything satisfactory because the various Parties could never agree as to the allocation of talking time.

The same really applies to the broadcasting of political speeches by well-known politicians from Savoy Hill.

A "Minor Consideration"

Enquiry at the B.B.C. reveals the fact that hardly any letters on the
(Continued on page 274.)



THE NEW POLAR UNIVERSAL

·0005 - 7/6 :0003 - 7/-

THE POLAR PRE-SET

This condenser has easy and accurate knob control, always giving the same capacity for the same number of turns. Setting is secured by locknut. Neat, compact, totally enclosed in moulded case. Strong terminals. Baseboard mounting.

Max. Capacities, ·001 or ·0003. 2/- each

GANGING

Accuracy with Simplicity

THE NEW POLAR "UNIVERSAL"

With this new Polar Condenser, which is specially adapted for ganging, you can vary the space between each condenser.

Each "Universal" is fitted with four lugs, ensuring a rigid fixing which is so important if matching is to be in any way accurate.

A steel spindle of suitable length for ganging 2, 3 or 4 condensers, or a spindle to operate 1 only, is supplied. The condenser is unaffected by the withdrawal of spindle.

Obtainable from all Dealers.

POLAR TUNING GRAPH

A 2½d. stamp (to Dept. C.) will bring you, post free, this Tuning Graph which enables you to record and immediately identify any station by its wavelength.

WINGROVE & ROGERS Ltd.
188/9, STRAND, LONDON, W.C.2
POLAR WORKS - OLD SWAN - LIVERPOOL





THE train telephone system inaugurated for public service by the Canadian National Railways is the first successful two-way telephone system to be established with a moving train; direct telephonic connection between trains and any point in Canada or the United States being possible.

Suppressed Carrier

A system of carrier telephony is employed in which the carrier is suppressed and only the lower side-band is used. This means that the output is 100 per cent voice modulated and that fading and noise interference is reduced from that encountered with a carrier-transmitted system. Very high selectivity is necessary to separate the lower side-band from the carrier and upper side-band.

There are two communicating points between Toronto and Montreal—the first at Cobourg, 70 miles from Toronto, and the second at Morrisburg, 171 miles farther east and 93 miles from Montreal.

How It Operates

The equipment at these points is practically the same as on the trains. On account of the single side-band feature, double modulation is used. Take, for example, carrier-frequency 100 kilocycles, upper side-band 101 kilocycles, and lower side-band 99 kilocycles. Suppose it is desired to eliminate everything but the lower side-band. It is a very difficult problem to build a filter which will discriminate sufficiently between these frequencies. On the other hand, if the carrier frequency were, say, 30 kilocycles, the upper side-band 31 kilo-

From a Correspondent

A description of the system by which it is possible for passengers on the Canadian Pacific Railway to call up any ordinary telephone subscriber.

cycles, and the lower side-band 29 kilocycles, it would be a comparatively simple proposition to build a filter having the required discrimination between the lower side-band and the unwanted frequencies. This is the method used in the train telephone system. The voice frequencies first modulate a carrier frequency of 28.6

kilocycles, the lower side-band is selected and modulates a carrier frequency of 100-150 kilocycles. The lower side-band is again selected, and it is this which is transmitted.

Novel Aerial

The train aerial consists of seven strands of copper wire strung on insulators about 12 in. above the car roof. The three centre strands are used for transmitting, and the other four wires for receiving. Both transmitter and receiver are coupled to their respective aerials by variometers which provide very sharp tuning of the aerial. "Earth" is made to the steel trucks of the car.

THE HEART OF THE SYSTEM



The generators and main apparatus for the railway telephone system is mounted below one of the cars, and can be seen in this picture.

"EXPLORER" TWO

By VICTOR KING.

PRICE LIST OF ALL THE CORRECT PARTS

	£	s.	d.
1 Ebonite panel, 14 x 7		4	6
1 Hand-polished Oak cabinet	1	2	6
1 Ready Radio '0005 variable condenser		4	6
1 Ready Radio '00015 differential condenser		5	0
1 Igranite indigraph dial (S.M.)		6	0
1 Ready Radio '0005 Brookmans condenser		3	6
1 Ready Radio "on-off" switch		10	
1 Ready Radio wave-change switch		1	6
1 Lewcos 6-pin coil holder		2	3
1 Set coil formers		6	6
1 oz. 22 D.C.C.			9
1 oz. 34 D.S.C.		1	6
2 oz. 26 D.S.C.		2	0
2 W.B. valve holders		2	6
1 Dubiller '0003 fixed condenser		2	6
1 T.C.C. '0005 fixed condenser		1	6
1 Lissen 2-megohm grid leak and holder		1	6
1 Lewcos H.F. choke		7	9
1 Ready Radio H.F. choke		4	0
1 Lissen super-transformer		19	0
1 Terminal strip		1	9
9 Belling-Lee terminals			3
2 Valves as specified		19	0
Wire, screws, flex, etc.		1	5
Total (including valves and cabinet)	£6	4	6

Any of the above components can be supplied separately if desired.

KIT A less valves and cabinet **£4 : 3 : 0**
or 12 equal monthly payments of 7/9.

KIT B with valves less cabinet **£5 : 2 : 0**
or 12 equal monthly payments of 9/6.

KIT C with valves and cabinet **£6 : 4 : 6**
or 12 equal monthly payments of 11/6.

THE "GRAMO" AMPLIFIER

Special aluminium chassis, drilled for valve holders and terminals, as specified and used in original set.

Price **10/-**

READY RADIO IMMEDIATE DESPATCH SERVICE.

TO INLAND CUSTOMERS. Your goods are despatched post free or carriage paid, cash with order. If desired you can avail yourself of the C.O.D. system on orders over 5/-.

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

Write, Wire or 'Phone.

1930 Illustrated Catalogue, Post Free, 1/-.

Ready Radio

159, BOROUGH HIGH STREET, LONDON BRIDGE, LONDON, S.E. 1

Telephone: HOP 5555 (Private Exchange)

OUR NEWS BULLETIN

—continued from page 272

subject are ever received at Savoy Hill, which seems to indicate that politics are a matter of minor consideration to the average listener. Which is a pity.

Set for the "House"?

Apropos of broadcasting of political debates, Mr. E. Edwards, the Socialist M.P., is going to petition the authorities for the installation of wireless in the House of Commons, for he believes it would be a valuable alternative for the Smoking Rooms when debates are dull but attendance necessary at the House.

This proposal is warmly supported by Miss Ellen Wilkinson, M.P. Mr. Lansbury, the First Commissioner of Works, is reported to be not unsympathetic to the idea, but he is

Thirty Days!

There was a letter in the "Times" the other day from a reader who said he was in possession of a wireless licence which expired on July 31st, 1930, and, in order to be prompt in renewing it, applied on July 21st for a new licence, which was issued on that date to expire on June 30th, 1931.

The writer pointed out that, in effect, the Post Office had given him a licence for eleven months in exchange for the fee for twelve months, and he was informed that in future thirty days' grace would be given for renewal and that, to enable them (the Post Office) to send a post card intimating expiry on the date, the licences are marked with the date on which the post card is to be sent.

His Licence Endorsed

The "Times" correspondent pointed out to the Postmaster of his local Post Office issuing the licence that he was not concerned with the

Special Radio Exhibition Number

The next issue of the "Wireless Constructor" will be largely devoted to a comprehensive, illustrated description of the wireless exhibits at Olympia. It is the one issue of the year

NO ENTHUSIAST CAN AFFORD TO MISS.

Make sure you get your copy. It will be on sale **Everywhere - - - Price Sixpence**

afraid that some of the rules for Westminster will have to be examined before permission can be given for the installation of a set.

Bigger than Ever

It is reported that this year there will be 365 stands at Olympia and the organisers have not only taken the New Hall, but also the first floor of the New Empire Hall. The stands will be representative of the whole industry, and there are also 25 demonstration rooms.

The B.B.C. at Olympia

The B.B.C. contribution will include the designing and building of a special amplifier to operate the loud speakers in the demonstration room, and on the various stands. The Exhibition will be open from September 19th to September 27th.

Post Office's internal arrangements, and he insisted on receiving a licence for twelve months.

The expiry date was altered to July 31st, 1931, but on the back of the licence the following was endorsed:

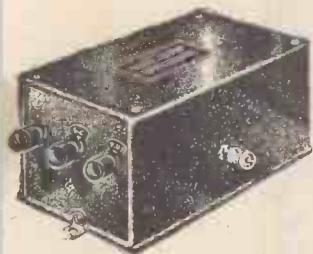
"Original licence marked to expire July 31st, 1930. Date of renewal July 21st. Original licence inspected."

What Is It?

The "Times" correspondent says he does not know whether he is in possession of a licence for twelve months to expire July 31st, or one that is ten days short of the full twelve months, but in any case he says he cannot see that it is reasonable for the Post Office to issue an eleven months' licence in exchange for twelve months' licence fee.

This is a pretty little point, and just shows what the Post Office organisation is in connection with licences.

The NOVOTONE COMPENSATOR



This is the only device which gives perfect compensation for the huge losses in recording and pick-ups.

WITH THE NOVOTONE YOU DO GET "REALISM FROM RECORDS."

If you reproduce records electrically, you must have a "Novotone."
Price £5 Complete.

Write for 16-page book. Free, if you mention this publication.

THE "VOLUVERNIA" VOLUME CONTROL

The correct way to control volume is to place a "Voluvernia" on the low-frequency side of your receiver or amplifier. Try it, there is nothing better and you are sure to be thoroughly pleased with results.

Price 6/9

See report in this issue.

GAMBRELL RADIO LTD.,
6, BUCKINGHAM ST., LONDON, W.C.2

for all CONDENSERS

CERTAINLY

3/-
VERNIER DIAL

15/6
DUAL GANG

FORMO-DENSOR

CAPS. .0005 .00035 .00025 .00015

3/9
DIFFERENTIAL

CAP. 00015

CAPS. 0002 0001

4/6
MID LOG LINE

GOLDEN SQUARE
PICCADILLY CIRCUS
LONDON

2/9
MIDGET REACTION

MAX. F .0001 2- J .0003 2- C .001 2- H .002 3-

GERRARD 1863

EXPLORE THE ETHER

with one of VICTOR KING'S famous "Explorer" Receivers, and with the aid of

"The World's Programmes"

This special feature for the long-distance listener and short-wave enthusiast appears regularly in

"MODERN WIRELESS"

and is an invaluable aid to DX Reception.

Get a copy of "M.W." and see for yourself.

Out Every Month.

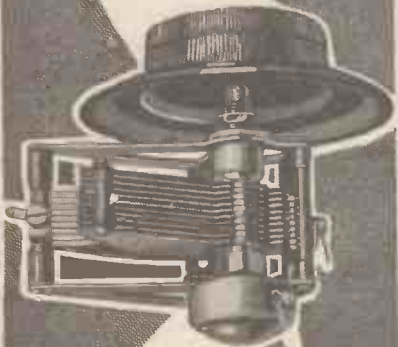
Price 1/-

Good points in a good Condenser

The Epicyclic Friction Drive employed in this "D" Type Slow Motion S.L.F. makes tuning an exceedingly smooth and accurate business. This precision instrument boasts a finish as good as can be found anywhere. Available in capacities from '00015 to '0005—prices from 12/6 to 14/-. Complete with dial.



Height of knob and dial together is only 1 1/2 in.—no more than the ordinary single dial.



Slow Motion Mechanism.
(Ratio 40-1).
An exceptionally neat, efficient mechanism ensuring very smooth tuning. Enclosed in highly finished dustproof cover measuring only 3/4 in. deep.

Note simple method of adjustment—slacken screws and rotate cover to vary tension.

Advt. of Jackson Bros., 72, St. Thomas' Street, London, S.E.1. Telephone; Hop 1837.

THE "GRAMO" AMPLIFIER

—continued from page 233

terminal, and if it is 240, use the 250 terminal. Remember that the set cannot be used on D.C. mains, as it is designed for A.C. mains only.

Be sure when ordering the transformer to state the voltage of your own mains, as there are also transformers for 100- and 110-volt mains which can be obtained by ordering specially. Otherwise you will get one designed to take voltages from 200 to 250.

Switching Off

Notice particularly that no on-and-off switch is provided on the set. The most advisable way of turning it off is, of course, from the electric-light socket, when you can be sure of the whole outfit being "dead," including the mains transformer. The four terminals marked A, B, C and D are seen at the back of the chassis, and two of them are joined by a link.

Looking from the front, the two left-hand terminals are linked when it is desired to use the transformer input, the pick-up then being joined to the two right-hand terminals. When it is desired to work the pick-up directly on to the grid of the first valve, the link is removed and the two outer terminals are then used.

The Pick-Up Input

The Marconiphone pick-up, for example, has been found to work best directly on to the grid, whereas the B.T.-H. will generally work better through the transformer—it is all a matter of trial with the particular pick-up you use.

As far as the loud speaker is concerned this should be of good make—the best you have. Do not expect to get a silk purse from a sow's ear; at the same time, you will be agreeably surprised at the excellent reproduction given by even a cheap loud speaker if it is well chosen, and any of the home-made variety, using one of the many excellent balanced-armature movements, will astonish you, particularly with the excellent bass reproduction obtainable.

The A.C. Valves

If you have not used A.C. valves before, remember that they take about a minute to heat up, so do not be disappointed if when first switching on you do not hear anything. Wait at least a minute.

In some cases it is advisable to earth the chassis, but in the majority

of cases this will be found unnecessary. In some houses where there always seems to be trouble with hum, earthing the chassis may be an advantage.

I am sure you will like this amplifier. It has astounded most people who have heard it, and will help you to while away many hours when the broadcast programme is not to your particular taste.

THE "EXPLORER" TWO

—continued from page 241

It should be started quite close to the end of the paper, and the turns kept quite close together. The ends of this winding should be secured to the paper by sealing wax or Chatterton's compound before being threaded through holes in the former.

The reaction windings go on the smaller former, and are separated by 1/4 in. Their disposition can be clearly seen in the diagram.

Connect the windings up as directed on the diagram, on which you will also see clear instructions regarding the directions of the various coils. It is very important to wind each section in the right direction, so pay particular attention to this point.

NEXT MONTH

FULL DETAILS OF
VICTOR KING'S
GREATEST SET

THE
"EXPLORER" FOUR

The short-wave coil is very simple, and the diagram of it is practically self-explanatory. Starting at the top of each winding, wind them all in the same direction.

The Panel Chart

The spacing shown in the diagram should be followed. Also be careful to make the connections to the pins correctly.

There is no need to say very much about the accessories required here, because they are given in compact form in the special operating chart. This chart also contains abbreviated operating details, and therefore forms a useful "instruction sheet" for fixing inside the lid of the cabinet.

It will then always be at hand when and where it is mostly required,

(Continued on page 277.)

SURPRISE THEM TONIGHT!

WATES



STAR LOUD SPEAKER

WATES DOUBLE CONE CHASSIS Pat. No. 309214

Surprise yourself and the family to-night by fitting a Wates Double Cone Chassis. The 12" and 14" models, being fitted with a supporting leg, complete a speaker ready for use of wonderful tonal purity and vivid realism. A silk-lined fret can be supplied for these models which greatly improves their appearance.

PRICES.

- Wates Chassis 12" 11/6
- 14" 12/6
- 20" 17/6
- Above chassis are complete with Universal Bracket.
- Wates 14" Star Speakers Oak £3:10:0
- Mah. £3:15:0
- Wates 20" Complete Speakers Oak £4:10:0
- Mah. £4:15:0
- Wates Star Unit 30/-
- Universal Bracket (only) for fitting various units to speakers ... 2/-
- Silk lined frets ... 4/-
- for 12" Chassis 4/-
- for 14" Chassis 5/-

The Wates 20" super Chassis is capable of great volume, coupled with a purity and realism that surpasses any moving-coil speaker.

The Wates Star Unit, sold separately at the reduced price of 30/-, is the acknowledged acme of unit perfection.

The man who wants the finest reproduction obtainable will invariably choose the Wates range.

WARNING.—When buying the Wates Patent Chassis, beware of imitations with the cones fixed to the bames, insist on seeing the name Wates before purchasing.

THE "EXPLORER" TWO

—continued from page 276

and there will be no fear of its becoming mislaid.

The handling of the "Explorer" Two is similar to any more ordinary type of two-valver. We will consider it on broadcast waves first.

Tuning In

Connect the aerial, earth, L.T., loud speaker, and H.T. In connection with the latter, H.T. + 2 should receive the maximum voltage available; providing, of course, that it is not above the maximum rating of the second valve.

Insert the broadcast coil and short the condenser C₃. This may be done with a piece of wire, but it is more convenient to arrange grid-leak clips on C₃ and insert a grid leak wrapped in silver paper in them. Alternatively, a short length of copper tube of a suitable diameter could be employed.

Set C₂ at its maximum and C₃ at the position for zero reaction, and see what stations you can hear with about 60 volts on H.T. + 1.

Now gradually apply reaction, and note whether it is nicely progressive. If it is not, adjustment of the voltage on H.T. + 1 and the capacity of C₂ will be helpful. Selectivity can also be improved, if necessary, by reducing the capacity of C₂.

For short waves the operation is just the same. Don't forget to remove the C₃ shorting strip when making the change-over.

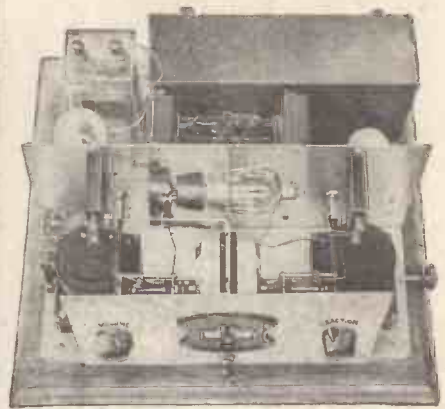
You may find further adjustments of C₂ and the value of H.T. on H.T. + 1 necessary before reaction control is just right on the short waves. The tuning will be much more critical on this band, so you must go about it more gently. Also adjust the reaction condenser carefully.

"Longer" Short-Waves

The coil described covers all the most interesting short-wave transmissions, but if you wish to experiment on slightly higher waves you can do so quite easily. Use seven or eight turns for the middle coil, five for the top coil, and six or seven for the bottom coil.

Just a final word. Don't forget that full details of the world's programmes are given each month in "Modern Wireless." You will find this information of great help when searching for either short-wave or ordinary stations.

Success is assured!



Build the Lotus S.G.P. Battery Set

The success of a set depends on the efficiency of each individual component. The Lotus S.G.P. Battery Kit uses the famous Lotus Components, each one of which works in complete harmony with its neighbours. This remarkably efficient 3-valve set is simple to build: all the main components are already mounted in position to save you time and to ensure success.

Full diagrammatic details supplied with each Kit.

Price: £7-12-6 (excluding valves, cabinet and batteries), or 14/9 down and 11 similar monthly instalments.

Full details on request.

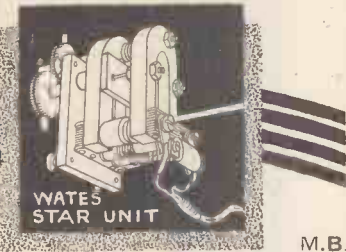
LOTUS 3-VALVE SET KIT

Garnett, Whiteley & Co., Ltd.
(Dept. W.C.5),
Lotus Works, Mill Lane, Liverpool.

Causton

WATES RADIO PRODUCTS

THE STANDARD BATTERY Co. (Dept. W.C.),
184/188, Shaftesbury Avenue, London, W.C.2.



WATES STAR UNIT

M.B.

EASY TERMS

We SPECIALISE in the supply of all Good Quality Radio Sets, Components and Accessories on Easy Terms. We will give you efficient service. Send us your list of requirements and a quotation will be sent by return.

London Radio Supply Company,
11, OATLANE, NOBLESTREET, LONDON, E.C.2
NATIONAL 1977.

PLEASE be sure to mention "Wireless Constructor" when communicating with Advertisers. THANKS!

SAFEGUARDS YOUR VALVES AND PURSE



Expensive Screened Grid and Pentode Valves are all protected by these wonderful fuses. Don't experiment with unknown makes, insist upon the original "Competa" fuses in the little orange boxes. They are instantaneous in action. From all dealers, or direct in case of difficulty.

COMPETA FUSES

LOOK FOR THE TRADE MARK

A. F. BULGIN & CO., 9-10-11, Cursitor Street, Chancery Lane, London.

Hand CRAFTSMANSHIP!

BUILT LIKE A PIANO

"Patented" Sound Chamber - equals 3-ft. baffle.

To house YOUR SET - or RADIO-GRAM.

The outcome of seven years' experiments followed by exceptional demand - leading Experts - Famous Engineers - 3,000 users.

The fine beauty of Tone and Style brings a thrill that no words can convey. You may have ON APPROVAL FREE TEST, and return at our expense if you wish to part with it.

Prices run from £5-5-0 (or £10 to £15-15-0 for Exclusive models) Cash or Easy Payments.

Photographs and full particulars FREE.

PICKETT'S, Radio Furniture Makers (W.C.), Albion Road, Bexleyheath, Kent.

The best Eliminators

The best Mains Sets

Use

**HYDRA
CONDENSERS**

LOUIS HOLZMAN, LTD.,
37, NEWMAN STREET, W.1
Telephone - - Museum 2641

Make

The DAILY SKETCH

YOUR Picture Paper

THE B.B.C. REFERENDUM

—continued from page 228

There will be a special "British Composers' Night" every Thursday throughout the season, and in some cases the composers themselves will conduct in person. They include Dame Ethel Smyth, Dr. Vaughan Williams, and Mr. Gustav Holst.

Among new works to be performed are an Oboe Concerto by Eugene Goossens and a Pianoforte Concerto by John Ireland. Compositions by Villa-Lobos, Janacek, Percy Grainger, and Marcel Dupré will be played for the first time in this country.

Propaganda by Radio

According to the "Daily Telegraph," a Bolshevik plot to stir up a world-revolution by broadcasting has been discovered. It is stated that the most powerful sending station in Russia is being regularly and cleverly used for the diffusion of Bolshevik propaganda throughout Europe.

For obvious reasons, special efforts are being made to infect the artisan and peasant population of Germany, but the English, French, and Dutch languages, as well as Esperanto, are also used as channels for the dissemination of the Bolshevik virus.

Diplomatic protests have been made in Moscow against these attempts to promote sedition in other countries, but so far they have only evoked the response that the broadcasts complained of are intended only for the enlightenment of Russian subjects of German race and speech.

Three Times a Week

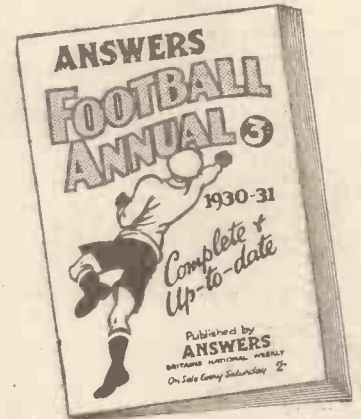
This evasion is all the more audacious because, according to the "Vossische Zeitung," a message broadcast by the Bolsheviks on May 1st was openly addressed to "the police and soldiers of Germany," who it called upon to "remember that they are only proletarians in uniform," and concluded with the words, "Long live the German Soviet Republic."

The usual propaganda which is sent out in the German language three times a week consists of an ingenious mixture of attractive musical items, with descriptive and political harangues. In these addresses the present conditions in Russia are painted in the fairest of colours, and Bolshevik "freedom" is contrasted with the "slavery" of the German workmen.

It is stated that Roumania has provided an antidote to the Bolshevik

(Continued on page 279.)

Football Again!



This handy book tells you everything you want to know about the coming Football Season.

Be ready for the coming Football Season! Be up to date and buy OUR Football Annual. It is packed with facts and figures which every football enthusiast will want to know. It gives all the English League and International fixtures, Cup Tie dates, and details about new players. This useful book is so arranged that you can fill in the results of your favourite team's matches throughout the season.

Be sure to ask for

Answers Football Annual 3^d.

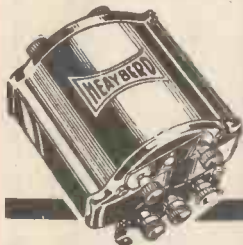
On Sale Everywhere.



SILENCE

Silence is at times a great asset, especially in machinery, electrical components and delicate apparatus. Heyberd Power Transformers, too, are as silent as the Sphinx. They possess the long life of a smoothly working piece of mechanism. There is no mains hum from these transformers—just perfect power, no jarring or crackling.

For silent, steady power use



The type illustrated is W.14, Price 21/-, for A.C. mains 200-250 volts, 40-60 cycles. Other types for other mains. For leaflet write to-day to

F. C. HEYBERD & CO.

10, FINSBURY STREET, E.C.2

'Phone: Clerkenwell 7216

THE B.B.C. REFERENDUM

—continued from page 278

wireless propaganda by building a "jamming" station. This is set into operation whenever the Russian station begins to broadcast in the Roumanian language and renders their messages unintelligible. Germany, with her more elaborate system of wireless, is, however, precluded from making use of this weapon, because it would interfere with reception from her own numerous stations.

If any of our readers make a regular habit of listening to the Russian stations we should like to have reports from them. Although we receive hundreds of letters a week from readers of this and our contemporary radio papers, it is surprising how few mention the Russian stations. Of all the Continental broadcasters, the Russians seem to be the most ignored. Letters from readers on this topic will be welcome.

THE "CALI-METER"

—continued from page 256

detailed drawing from which to work; but, for all that, there are just one or two points which are worth mentioning.

First of all, about the condenser to be employed. This should be of a thoroughly reliable make and should have a maximum capacity of .0005 mfd. (The one used in the original was a Lissen, although, obviously, many of the other well-known makes will answer the purpose.

Sound Dial Essential

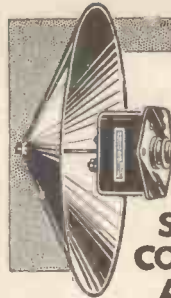
The dial also must be of a very sound design, for if this slips when once the wave-meter has been adjusted, the whole process of calibration will have to be done again. A dial of the slow-motion type is indispensable, but there are several excellent ones now available from which you can choose.

For the coil you will require a 2-in. length of 3 in. diameter ribbed ebonite former (the measurement is to the outside of the ribs), and the winding consists of 4½ turns of No. 20 tinned copper wire, with a space of ⅓ in. between each turn "centre." Not such a very difficult job, is it?

It would have been something of a risky procedure to have indicated

(Continued on page 280.)

REALISTIC REPRODUCTION



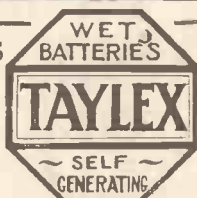
This **SIX-SIXTY CONE SPEAKER ASSEMBLY**

True-to-life realism is a feature of a cone-speaker made with the Six-Sixty Cone-Speaker Assembly. Many well-known set manufacturers standardise it for its fine performance—you will get the same unspoiled reproduction in your cone-speaker if you use the Six-Sixty Cone-Speaker Assembly. Make your own cone-speaker—in your own home—but be sure to use the Six-Sixty Cone-Speaker Assembly. Price 15/-

SIX-SIXTY CONE-SPEAKER ASSEMBLY

Made by the makers of the famous Six-Sixty Valves.
Six-Sixty Radio Co., Ltd., Six-Sixty House, 17/18
Rathbone Place, Oxford Street, W.1
Telephone: Museum 6116/7.

SOLVE ALL H.T. TROUBLES



Per doz.	No. 1.		No. 2.	
	s. d.	s. d.	s. d.	s. d.
Jars (waxed)	1 3	1 6	1 2	1 9
Sacs	1 2	1 9	10	11
Zincs	10	11	4	4
Rubber Bands (24)	4	4	6	10
Terminals	6	10		

Trade Supplied.



LONG LIFE : SILENT : ECONOMICAL

Sample doz. (18 volts), complete with bands and electrolyte. No. 1, 4/1; No. 2, 5/-; post 9d.; terminals extra. No. 3 with terminals, 7/6 (10,000 milli-amps), sample unit 6d. Orders 10/- carr. paid. New illustrated catalogue post free.

FREE Bargain List of Receivers, Amplifiers and Components.

C. TAYLOR, 57, Studley Road, Stockwell, London.

Please be sure to mention WIRELESS CONSTRUCTOR when replying to Advertisements.

15,000 SUCCESSES

Is the record of The T.I.G.B.

If you, too, wish to advance to a well-paid post in any branch of engineering, T.I.G.B. home-study training offers you the surest means of achieving the success you desire.

ENGINEERS

This 124-pp. book furnishes the most complete information ever published about the many professional qualifications open to engineers such as A.M. Inst. C.E., A.M.I. Mech. E., A.M.I.E.E., A.M.I. Struct. E., etc.; describes nearly 200 Courses; the widest selection of engineering courses in the world; and is crammed with matters of interest to every engineer. If you are ambitious, The T.I.G.B. can help you—write TO-NIGHT for your FREE copy of "The Engineer's Guide to Success," stating branch, post, or qualification that interests you.

The Technological Institute of Great Britain, Established 1917.
21, Temple Bar House, London, E.C.4.



124 PAGES

BELLING-LEE
The World's Greatest
WANDER PLUG
NOW ONLY 3d.

Belling-Lec Battery Cord specified in "Radio for the Million."
Price 5/9

BELLING-LEE FOR EVERY RADIO CONNECTION

Advt. of Belling & Lee, Ltd., Queensway Works, Ponders End, Middlesex

THE PICTURE PAPER WITH THE MOST NEWS
-SUNDAY GRAPHIC-

ALL APPLICATIONS for ADVERTISING SPACE in "WIRELESS CONSTRUCTOR" must be made to the Sole Advertising Agents, **JOHN H. LILE, LTD., 4, LUDGATE CIRCUS, LONDON, E.C.4.**

THE EDITOR'S CHAT

—continued from page 227

will, I am sure, be interested to read the proceedings of the Ideas Committee, which at their last meeting discussed panel-control problems and a whole host of questions relating to wave-change schemes. If you already have a wave-change switching arrangement, no doubt you will be interested to hear about many different forms.

Better Conditions

By the time this issue appears wireless conditions will again be improving as the sun sets earlier. Within a month or two conditions will be at their best, for, as the more experienced reader knows, the best results are always obtained during the hours of darkness.

If you have not been using your set during the summer, take it out and give it a good overhaul so that as conditions improve you will be able to take full advantage of them. In particular consider the question of buying new valves, for if those you use have been employed for a year or two you can be perfectly sure, firstly, that they have lost much of their original "brilliance," and, secondly, they are not so good as those now produced.

Improved Quality

Since valve prices have again gone down the cost of replacement is far less than you would think, and if you feel inclined to get only one new valve I suggest you get the best output valve you can afford.

You will be agreeably surprised at the great improvement in quality, and many of your friends may think you have purchased a new loud speaker.

*
* **A TERMINAL** *
* **TEMPLATE** *
*

THE usual method of marking out the positions of terminal holes is to scribe a line on the underside of the panel and to mark off the terminal positions on this.

A more straightforward method of effecting the same object consists in the use of a simply-made terminal template. This device consists of a piece of fairly stout celluloid sheet which has been softened by immersion

ALWAYS USEFUL



This simple gadget makes it easy to drill a series of holes for terminals.

for a moment or two in warm water and then bent over a straight-edge to form a right-angle.

After bending, the celluloid is immediately plunged into a basin of cold water in order to harden it once more.

The edges of the celluloid are now trimmed with a pair of scissors to any convenient size or shape.

Holes are drilled in the celluloid sheet at suitable positions to form the template. The holes should not be more than 1/4 in. in diameter; 3/8-in. holes are better for most purposes.

Drill the holes very accurately at varying distances from the right-angled edge of the template. Thus holes may be drilled at distances of 1/4 in., 3/8 in., 1/2 in., 1 in., and so on, from the edge of the template.

By using a terminal template of this nature, a hole or a series of holes

can be drilled in a panel quickly and readily, and at any precise distance from its edge.

Such a template has an advantage not possessed by any others. It is quite transparent, and, therefore, when placed over the surface of the panel does not obscure other markings, but enables relative distances to be judged with ease.

THE "CALI-METER"

—continued from page 279

definite station settings on the diagram of the wave-meter, because of the possibility of variations in readers' versions of this unit.

By far the best scheme is to give three or four definite settings as a foundation from which to build up a curve, and merely to indicate just roughly the bands of the tuning dial where some of the more important stations are likely to be found.

Actually, it is doubtful whether you will find it necessary to refer to these latter at all, because once your own wave-length chart is prepared you will know exactly where you are from the graph. But you may just find them handy for reference purposes.

Measuring Wave-length

The use of the wave-meter for measuring the wave of a station you are receiving is nothing more or less than a reversal of the process already described.

You merely leave your set in an oscillating condition on the station it is desired to measure, and then slowly rotate the wave-meter condenser until you find the setting at which oscillation is stopped. Then, by reading the wave-meter setting and referring to the graph, you will know in an instant exactly where you are.

The "narrowing-down" procedure holds good, of course, in this case just as in the reverse process.

INDEX TO ADVERTISERS

"Answers Football Annual" .. .	Page 278
Burne-Jones & Co., Ltd.	271
Belling & Lee, Ltd.	279
Bulgin, A. F., & Co., Ltd.	278
Benjamin Electric Co., Ltd.	266
Carrington Manufacturing Co., Ltd.	271
Edison-Swan Electric Co., Ltd.—	
Mazda Valves	Cover ii
B.T.-H. Pick-up	265
B.T.-H. Cone Speaker	269
Forno Company	275
Garnett Whiteley & Co., Ltd.	277
Graham Amplion. Ltd.	225

Gambrell Radio, Ltd.	Page 275
Hughes, F. A., & Co., Ltd.	Cover iii
Heyberd, F. C., & Co.	279
Holzman, Louis	278
Impex Electrical, Ltd.	265
International Correspondence	
Schools, Ltd.	269
Jackson Brothers	276
Lissen, Ltd.	261
London Electric Wire Co. & Smiths, Ltd.	226
London Radio Supply Co.	277
Marconiphone Co., Ltd.	263
"Modern Wireless"	275
Pickett's Cabinet Works	278
Radio Instruments, Ltd.	Cover iv
Rothermel Corporation, Ltd.—	
Centralab	271
Induction Motor	266

Ready Radio	Page 274
Regent Radio Supply Co.	271
Six-Sixty Radio Co., Ltd.	279
Standard Battery Co., Ltd.	277
Telegraph Condenser Co., Ltd.	263
Taylor, C.	279
Technological Institute of Great Britain	279
Varley Products	266
Wingrove & Rogers, Ltd.	272
Westinghouse Brake and Saxby Signal Co., Ltd.	270
Weston Electrical Instrument Co., Ltd.	269
Wright & Weaire, Ltd.	266

All communications concerning advertising in "Wireless Constructor" must be made to John H. Lile, Ltd., 4, Ludgate Circus, London, E.C. 4. Telephone: 7261.



BLUE SPOT'S MASTERPIECE

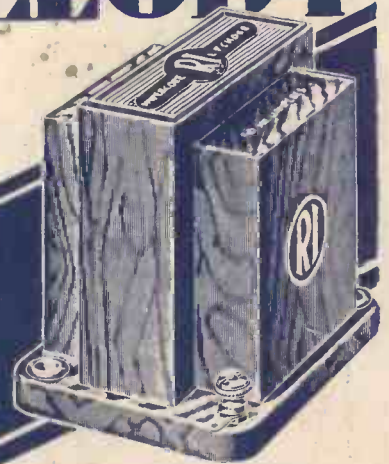
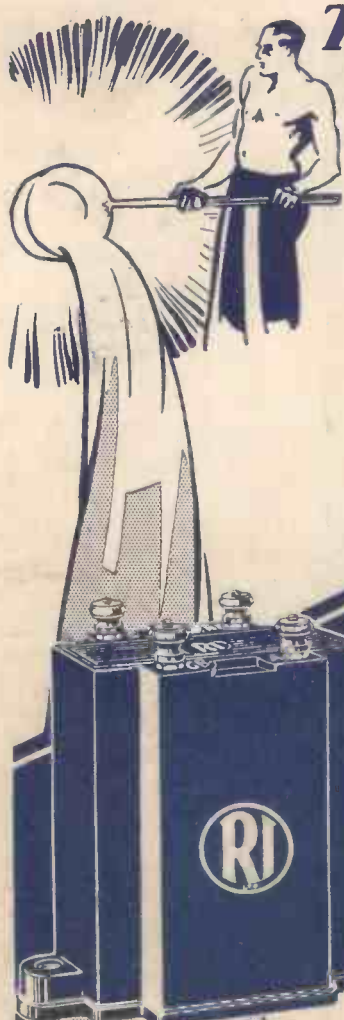
351-

F. A. HUGHES & CO., Limited, 204-6, Great Portland St., London, W.1

Distributors for Northern England, Scotland and North Wales: H. C. RAWSON (Sheffield and London), LTD.,
100, London Road, Sheffield. 22, St. Mary's Parsonage, Manchester.

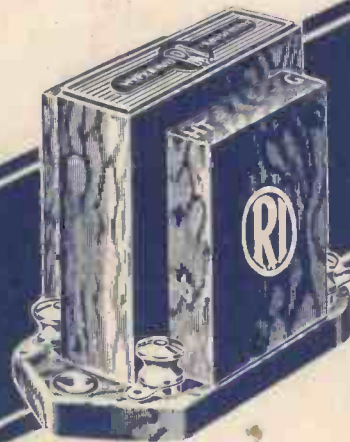
The METAL of MELODY

This is the nickel age. As in all branches of science so in radio, nickel is the symbol of efficiency—it is the key to perfect radio reception.



HYPERCORE

HYPERCORE The first L.F. choke with nickel-iron core. Less than half the size and weight of chokes with silicon iron cores, yet has inductance of 30 henries. **17'6**



HYPERMITE

HYPERMITE A transformer with core of new nickel alloy, yet sold at a price within the reach of all. Amazingly high inductance—over 50 henries. **12'6**



HYPERMU

HYPERMU The world's best transformer for modern circuits—a statement which has been tested and proved by experts and amateurs all over the world. **21'-**

Nickel-Alloy Cores

are the secret of the success of the famous R.I. trio—"Hypermute," "Hypermite," and "Hypercore."

Your set needs their help. You cannot know what your set is capable of until you have equipped it with the nickel-iron trio. Fit either or all of the three to-day, and you will be amazed at the tremendously improved reception—the lifelike fidelity, the tremendous volume and the purity of the sound.

Write for illustrated leaflets describing these wonderful components.



RADIO INSTRUMENTS LTD., "MADRIGAL" WORKS, PURLEY WAY, CROYDON.