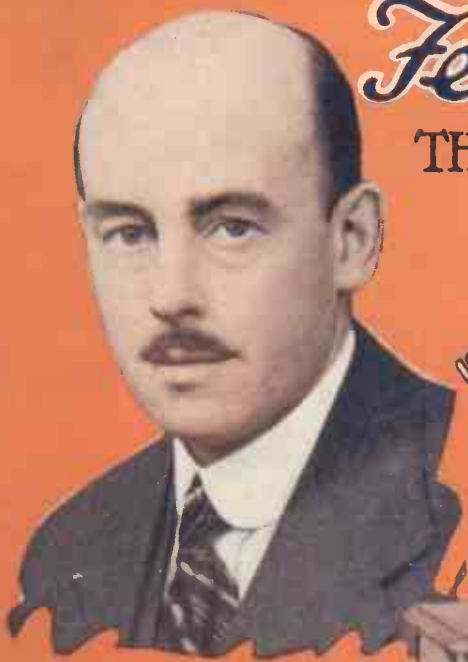


The Wireless Constructor

6^D
MONTHLY

EDITED BY
PERCY W. HARRIS, M. I. R. E.
Vol. IX. APRIL, 1930. No. 42.

Features in this Issue



THE CHIEF ENGINEER OF THE B.B.C
NOEL ASHBRIDGE

B.Sc.(Eng), A.M.I.E.E

WRITES ON

"THE NEW LONDON
STATION"

Something
Quite New
In All-Wave
Receivers!

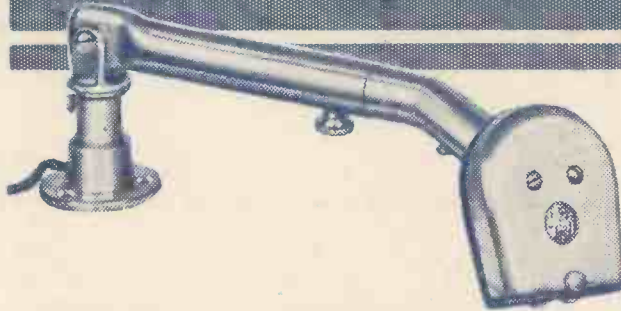


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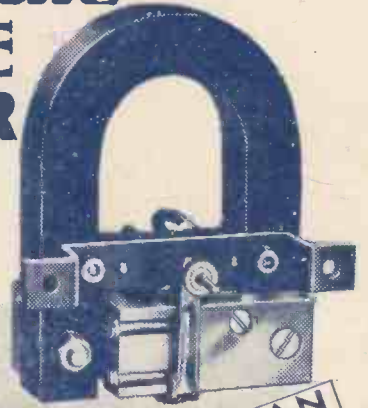


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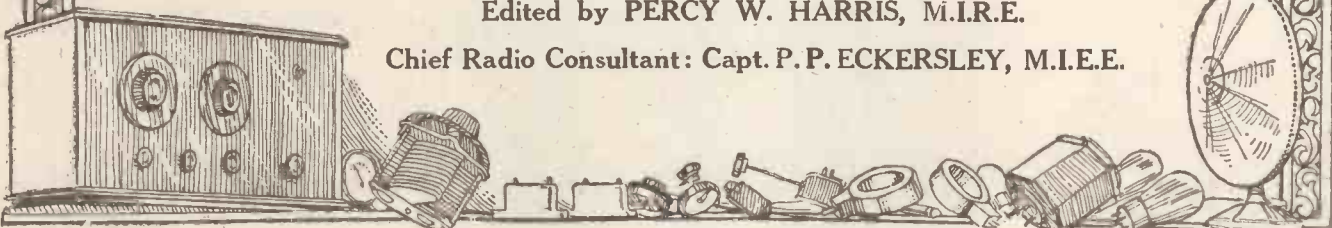
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As some of the arrangements and specialities described in this Journal may be the subject of Letters Patent the amateur and trader would be well advised to obtain permission of the patentee to use the patents before doing so.

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

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



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THE WIRELESS CONSTRUCTOR

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

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

THE EDITOR'S CHAT

Well-designed sets, with just those features for which the reader is looking, have always been foremost in the "Wireless Constructor," and you will read with interest the details of new sets described in this issue, and especially of the "Vi-King" Three, a very special and ingenious design by a new Contributor.

THIS month in the "Vi-King" receiver, designed and described by Victor King, whom I have much pleasure in introducing to WIRELESS CONSTRUCTOR readers as a regular contributor of high merit, we have a set of distinction which solves a number of problems simultaneously.

Something Really New

This "Vi-King" set is something radically new in *all-wave* receivers. With it you can tune in short waves or another broadcast station while the family are listening to the local—all on the one set! It is a remarkably simple outfit, both easy to build and operate. The two sides operate quite independently, although only one aerial and one set of batteries are required. An L.F. amplifier is incorporated so that loud-speaker reception can be enjoyed. These features alone will make you turn at once to the article. Others will hold your attention to the end.

In the "Skyscraper" Two we have an H.F.-Det. set especially designed for the WIRELESS CONSTRUCTOR Electric Gramophone, which has enjoyed remarkable popularity. It can, however, be used independently or with any standard L.F. amplifier with great success.

Sensitivity and Selectivity

These two sets alone would justify our description of the present number as one of outstanding interest, but there are still other tasty items on the menu. The "S.S." Unit, for example, will save innumerable older sets from being discarded, as it effectively cures

that "congested feeling" from which so many sets have suffered since the Brookmans Park twins took the air. At the same time, it gives just that additional "pep" which is so attractive a feature of a really sensitive set.

Some people say crystal sets are dead. Don't you believe it! The WIRELESS CONSTRUCTOR has consistently refused to countenance this false idea, as the crystal set is the only type of receiver which renders broadcast reception possible to those of limited funds. In the "Crystap" this popular form of inexpensive

LISTENING ON THE WAY



Radio is now fitted to some of the main-line trains in France. Instead of "taking" a novel to read on the journey, passengers simply have to hire telephone receivers to have a varied entertainment while travelling.

receiver is brought up to date with a selective and sensitive circuit which is the result of much experience.

Wireless is a fascinating hobby at any time of the year, but like all hobbies its greatest fascination appears when there is a problem to solve. In the early days the main problem was to get anything at all, for everything

had to be home-constructed, and circuit knowledge was hazy and confined to the few.

Next the logging of the maximum number of stations held the field, reaction and high-frequency circuits were explored to their depths, and the enthusiast, facing without a fear a panel bristling with knobs and controls, was able to pick out of the ether as many as a dozen transmissions.

With the coming of better and more efficient valves, new high-frequency circuits, and more particularly the wonderful screened-grid valve, mere distance has lost some of its thrill, and good quality on distant reception became our aim. The WIRELESS CONSTRUCTOR has pioneered many sets and circuits which have helped to solve this problem, notably the "Straight-Line" Four, which was the first popular design to incorporate two screened-grid valves.

Coming Shortly

In this set not only was sensitivity brought to an extremely high degree, but quality on distant stations was strictly comparable with that obtainable from the local—a feature which accounted for much of its popularity. The 1930 edition of the "Straight-Line" Four is now undergoing the usual extended and drastic tests, and full particulars will appear in an early issue. This set will mark a further big step forward.

Finally, may we express our appreciation of the kind letters constantly received regarding the earlier WIRELESS CONSTRUCTOR receivers, which are still doing good service, as well as about the more modern sets.



Some typical radio faults reviewed and questions answered.

By P. R. BIRD.

Who Did It?

"THE set has not been touched." Quite a good proportion of the queries which arrive begin with these words, or with some similar statement, and it must be admitted right away that faults which arise in the silence of the night, or which come to a head although nobody has touched the set or interfered with the wiring, etc., are apt to be the most puzzling faults of all.

Here is a nasty case which a Berkshire reader has described, and I will give you the problem in his own words.

"I am a methodical sort of chap, and mine is a methodical household. For over two years I have charged my own accumulators, taken my H.T. from the mains, and run the set without any trouble of any kind whatever. In fact, I have been unwise enough to boast about it!

"There has been no crackles, no motor-boating, no trouble with charging, no unwanted noises; in fact, nothing but programmes and perfect peace. But about a week ago the quality of reception, always perfect, seemed to fall off a little.

Weak, and no Reaction!

"The next night it was worse, and, moreover, was noticeably weak; and, to cut a long story short, I can now get no foreign stations at all, and the 'local' is not worth listening to! No reaction with the condenser full in, and, worst of all, no idea of where to look for the trouble. For, amazing as it may seem, I am quite certain that *the set has not been touched.*"

No doubt our Berkshire friend thinks that his case "takes the biscuit," but although there are not many people who run for so long a period without any trouble whatever, the actual fault in this case is one that is fairly commonly experienced. Can you guess what it was?

THE TECHNICAL QUERIES DEPARTMENT

Are you in trouble with your set?

Have you any knotty little Radio problems requiring solution?

The WIRELESS CONSTRUCTOR Technical Queries Department is now 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 Technical 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.

The first hint that he gives in his report was in the words, "two years," for if a set has been in action for two years without anything whatever being altered or done to it you can be pretty sure that the valves, or at least one of them, is losing its pristine "punch." The modern valve, robust and reliable as it is, nevertheless *does* wear out, or, as it is called, "lose its emission."

Its filament, specially designed to provide a copious supply of electrons, begins to age, and although

the wire itself is there intact, the electron supply fails, generally more or less suddenly. And when this happens there is usually only one cure, namely, a new valve.

If, as in this case, the reaction is affected at the same time, the probability is that it is the *detector* which has lost emission. This can easily be tested by replacing it with another valve of the same type.

When this is done the set should be restored to its old vigour. Failing another valve for a replacement test, the dealer or any friend with a good milliammeter will test its emission for you.

An Easy Method of Testing Components

Quite a crop of enquiries has arisen recently with regard to the method of testing coils, coil holders, H.F. chokes, etc., with telephones and a dry cell.

As they have been given before, only the briefest details of the stunt will be necessary, and these are given below.

One tag of the 'phone should be connected to one terminal of the dry cell, and two flex leads should be connected, one to the remaining 'phone tag and the other to the remaining terminal of the dry cell.

These two flex leads, if now touched lightly together, will produce a strong double click in the 'phones; one click when they make contact with each other and another when they are separated again, and this loud double click is evidence that continuity is satisfactory.

A fault on the coil holder, for instance, such as a break between the terminal and the plug or socket to which it is connected, may now easily be detected, since if one flex lead is connected to the terminal and the other to the side of the holder to which the terminal should make connection, absence of the double click is positive evidence that the connection is broken.

Coils and Holders

On the other hand, if one of the flex leads is connected to the socket of the coil holder and the other to the plug, if a double click is heard there is a short-circuit here.

It is, of course, essential to see that all leads are removed from the components under test, and also that no coils are in position in the coil sockets when these are tested.

It will be seen from the foregoing that this method may be extended to tests for almost any component or simple circuit.



The "VI-KING" THREE

DESIGNED AND DESCRIBED
BY VICTOR KING

This is the most remarkable broadcast receiver ever designed. Although wonderfully inexpensive and easy to build, it enables you to listen to either of the twin-wave programmes while others listen to the remaining one; alternatively you can hear 5 X X while others enjoy 5 G B, or you can tour the Continent on either long or medium broadcast waves, while the family take the local programme. Finally, you can listen on short waves when either long- or medium-wave broadcasting is being received by other members of the household. And only the one aerial and one set of batteries are required!

WE have heard a great deal about sets that will "cut out" the local station, or obliterate both twin Regional transmissions, and enable foreigners to be received; but we have, so far, never considered the question of receiving both twin programmes on one aerial but reproduced through different loud speakers or headphones.

"Cutting out the local" is all very well in its way, but surely it is much better to be able to listen to him, and to an alternative programme AT THE SAME TIME, but without interference one with the other.

A Remarkable Receiver

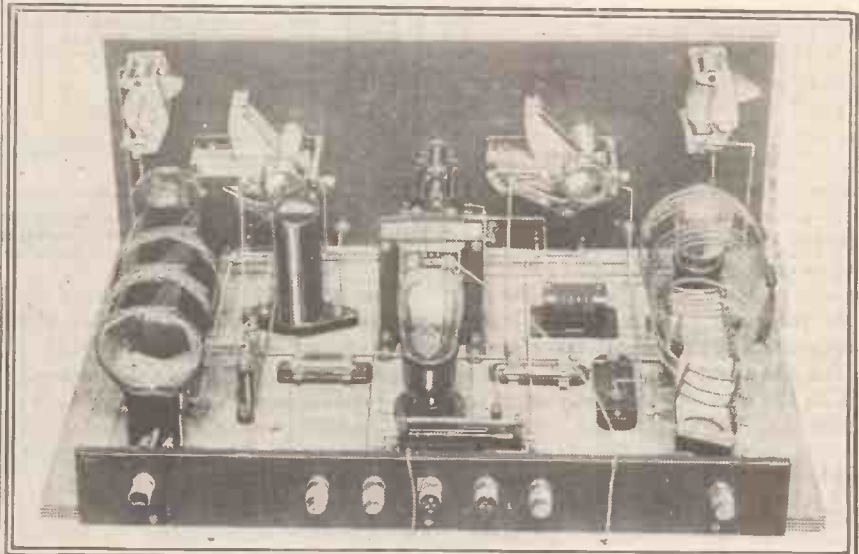
Let me explain what I mean. Suppose we have the usual family group listening on the loud speaker to the Regional transmitter (356 metres) at Brookmans Park, and one of you gets a bit fed-up with it and wants something different.

What usually happens? He either sits and bears it, or else goes out. With this set he can just put on a pair of 'phones, turn a dial, and he can get any other programme without in any way disturbing those who are enjoying the 356-metre stuff.

Or you yourself, say, want to hear Radio-Paris while someone else is more interested in 5 G B, 5 X X, or any other programme for that matter.

station. It's all so very simple on the "Viking" Three.

But the wonders of this remarkable receiver do not end here. You can



This is the complete receiver, with its valves and coils in position, not just one unit of the outfit. The set is quite easy, and remarkably inexpensive, both to build and to operate.

The same state of affairs exists. You simply tune in Radio-Paris and leave the others listening to their desired

go down on the short waves, if you wish, and listen to New York or Melbourne, while someone else

WHAT YOU WILL REQUIRE

- 1 Panel 18 in. x 7 in. x 3/16th in. (Trolitax, or Radlon, Becol, Ebonart, etc.).
- Cabinet for above, with baseboard 10 in. deep (Pickett, or Cameo, Artcraft, Peto-Scott, etc.).
- 1 .0005- and 1 .0003-mfd. variable condenser, slow motion, or ordinary with slow-motion dials (Jackson, or Lissen, Igranic, Lotus, Utility, Dubilier, etc.).
- 1 .0001 reaction condenser, slow-motion type (Polar).
- 1 .0001 ordinary reaction condenser (Polar, or Lotus, Magnum, Lissen, Ready Radio, Utility, etc.).
- 1 Double-pole change-over switch (Wearite, or Bulgin, Dubilier, etc.).

- 2 On-off switches (Lissen, or Lotus, Benjamin, Igranic, etc.).
- 2 Sprung-type and 1 ordinary valve holders (Igranic, or Benjamin, Lotus, W.B., Formo, etc.).
- 6 Single-coil mounts (Lotus, or Igranic, Ready Radio, Magnum, etc.).
- 1 Standard H.F. choke (Lissen, or R.I., Lewcos, Varley, Igranic, Ready Radio, Magnum, etc.).
- 1 Universal H.F. choke (Bulgin, or Magnum or any other reliable make intended for long or short-wave work).
- 2 .0003-mfd. fixed condensers (Dubilier and T.C.C. in set). (Lissen, Atlas, Mullard, Clarke, Goltone, etc.).

- 2 2-megohm grid leaks and holders (Lissen and Dubilier in set). (Wearite, Ediswan, Igranic, etc.).
- 1 400-ohm potentiometer, baseboard type (Ready Radio, or Igranic, Lissen, Sovereign, etc.).
- 1 L.F. transformer (Telsen, or Ferranti, R.I., Igranic, Brown, Varley, Lotus, Lewcos, etc.).
- 8 Terminals, engraved "Phones -" (2), "Phones +" (2), "L.S. -" (2), "L.S. +" (2), "Aerial," "Earth," "L.T. +," "L.T. -," "H.T. -," "H.T. + 1," and "H.T. + 2." (Belling & Lee, Eelex, Burton, etc.).
- Piece of ebonite, 16 in. x 2 in., for terminal strip.
- Wire, flex, screws, etc.

The "Vi-King" Three—continued

"remains in England" or "tours" the Continent!

In short, you can get almost ANY COMBINATION OF TWO STATIONS on any combination of wave-lengths, completely FREE FROM INTERFERENCE with each other, providing you with alternative programmes in the fullest sense of the term.

Perfect "Family" Set

As the receiver is divided into two detector sections, I shall refer to them as the "broadcast" and "short-wave" sides. This is because the latter side should be used for the short waves when such are to be received, owing to the fact that a smaller tuning condenser is incorporated in that section of the set.

It must not be forgotten, however, that either side of the set can be used for medium and long-wave reception, it is only for short-wave reception that the "short-wave" side is more suitable than the "broadcast" side.

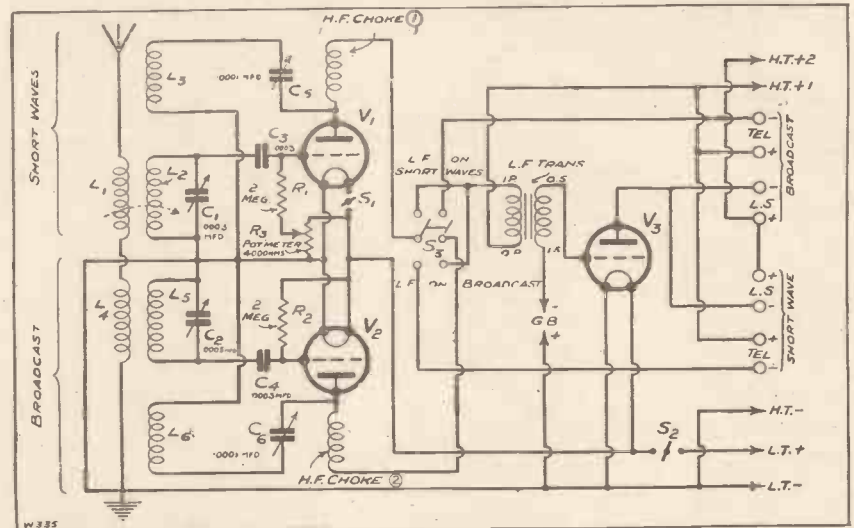
It is the "broadcast" side on which most of the searching should be done (when ordinary wave-lengths are being used) the stronger of the two alternative programmes (usually the local) being taken by the "short-wave" side.

Set the tuning of this side of the set to the station the family want to listen to, switch on the amplifier section so that they can have it on the loud speaker, and off you go on the

opportunity for loud-speaker reception on local transmissions or, really powerful 'phone work on the more distant stations.

be arranged to follow the other part of the set, and the "Vi-King" Three becomes an ordinary broadcast receiver, capable, if you are near enough to a

A MOST INTERESTING CIRCUIT



If you examine this diagram closely you will see how the two detectors operate, with independent tuning and reaction circuits, and how the L.F. valve can be switched over from one detector to the other.

The amplifier is changed over by means of the switch to either the "broadcast" or "short-wave" side of the set, leaving the opposite section of the receiver in each case for one-valve work with 'phones. An ideal combination that will appeal to a great number of constructors.

station, of excellent loudspeaker results.

So very unconventional is the circuit employed in this "Two-at-once Three," that it would perhaps be helpful for me just to run quickly through those points which are of particular interest.

A REAL "TWIN"-WAVE RECEIVER



The tuning controls are quite independent—they are wonderfully free from interaction. The hardest "searching" on the "short-wave" side will fail to influence the "broadcast" side

"broadcast" side, touring the ether in a fascinating quest for more acceptable fare.

The receiver is a joy to operate, and is exceedingly simple to build. The amplifier portion provides the

Naturally, it will not always be desired to have the short-wave part of the circuit in operation, so provision is made for cutting it out merely by operating the switch marked S₁. The amplifier can then

Two Complete Sections

In the first place it is best to look upon the "Vi-King" Three as a complete set with two distinct sections, each section having its appropriate output side, complete with a set of terminals.

These sections are so arranged that either one of them can be used in conjunction with the amplifier when loud-speaker results are required, or when you want to bring up the strength of a distant transmission.

The input circuits of the two parts are so arranged as to make possible the reception of the two stations simultaneously but independently. The first detector, shown at the top in the theoretical diagram, is arranged for use on the short waves, and when these wave-lengths are being used, coupling from the aerial is obtained by means of a two-or three-turn short-wave coil placed directly in series with the coupling coil of the broadcast circuit.

The output from the short-wave side

The "Vi-King" Three—continued

is joined to one of the centre contacts of the double-pole switch, at which point, for a moment or two, we will leave the "short-wave" side.

On the "broadcast" side (V_2) the detector circuit is very similar to that

connect the grid leak to the filament circuit, and, secondly, there is a difference in the capacity value of the tuning condenser employed.

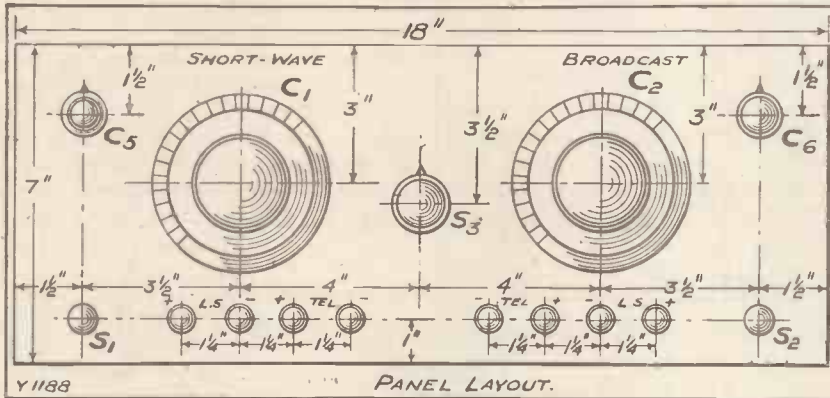
Otherwise the two arrangements are practically identical, and, as in the case

the amplifier can at will be connected after either V_1 or V_2 , and the connections are arranged so that when the transformer is joined to the output of one detector circuit, the other detector valve is joined automatically to a pair of output terminals.

How Switch Works

To make this point quite clear, if you refer to the theoretical circuit and visualize the switch closed in the upper position, you will see that the output of the "short-wave" detector circuit is taken to the primary winding of the intervalve transformer at the same time that the output from V_2 is connected, via the switch, to one side of a pair of 'phone terminals.

With the switch in the reverse position the transformer primary becomes part of the output circuit of the "broadcast" detector valve, while 'phone terminals are then provided in the output circuit from the "short-wave" side.

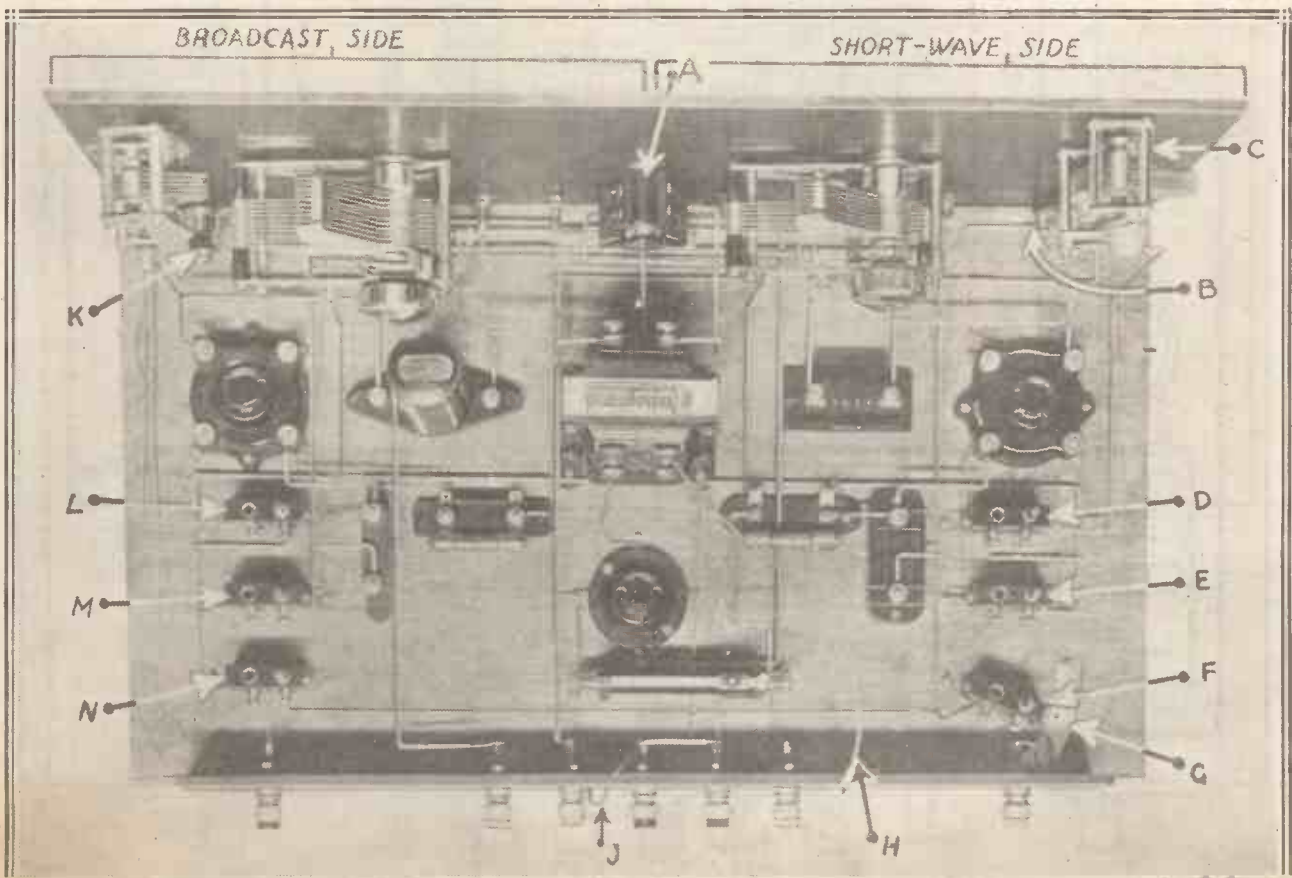


used for "short-wave" reception. There are, however, one or two essential differences.

In the first case, a potentiometer is not required on a broadcast waves to

of the "short-wave" detector valve, the output from V_2 is joined to the centre contact (the remaining one) on the double-pole change-over switch.

It is by means of this switch that



Check your assembly by this photo, both before and after wiring. (A) The L.F. change-over switch; (B) filament switch for "short-wave" detector; (C) "short-wave" reaction condenser; (D, E, and F) "short-wave" coil holders; (G) metal support for aerial coil holder (see text); (H) G.B. negative lead; (J) G.B. positive lead; (K) master filament switch; (L, M, and N) holders for "broadcast" coils.

The "Vi-King" Three—continued

One thing to which I have not yet referred, and which perhaps calls for elucidation, is the fact that two sets of output terminals are employed.

Why not, as in any ordinary set, use but one set of output terminals, thereby saving both terminals and panel space? A very sound idea on the face of it, but unfortunately rather confusing when it comes to practical considerations.

The use of only one set of output terminals would not bring into promi-

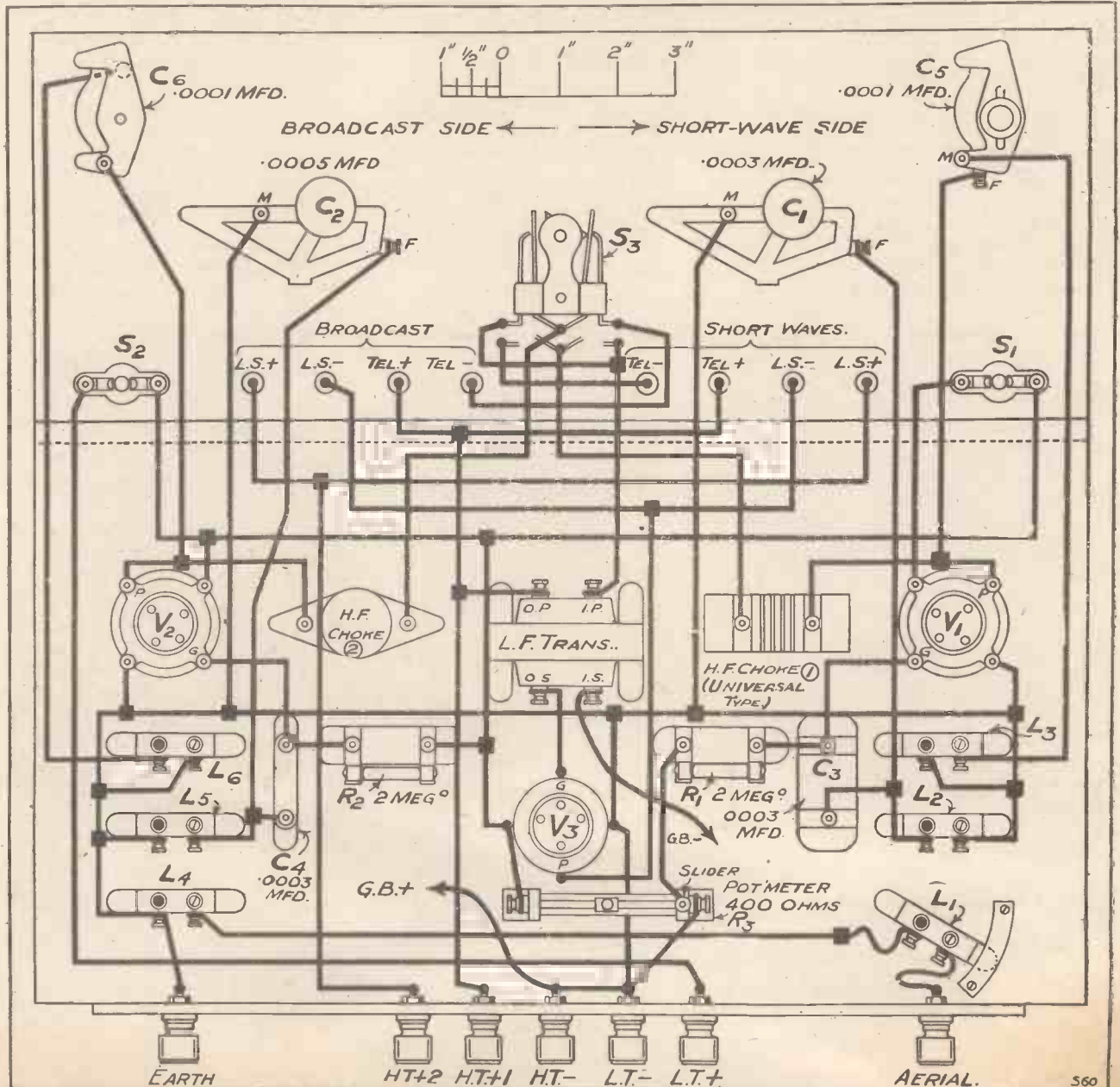
nence the "double" nature of the whole outfit, thereby robbing the set of one of its features. As now arranged the amplifier switch shows at a glance which section of the set is the loud-speaker section, and which is to be used with 'phones.

"Completely Fascinating"

There are no other novel features which call for particular attention—of course, the whole set is distinctly

novel, and it would be no exaggeration to say that of all the tests that I have conducted I have never found a design more completely fascinating than was the case with the "Vi-King" Three receiver. My only regret was that I could not listen intelligently to both sides at once!

I hardly think it necessary to say anything else by way of explanation. You have heard what the set is and what it will do, and it now remains only for you to prove its worth for yourself.



The layout is particularly orderly and symmetrical, and there should be no confusion between the "short-wave" and "broadcast" sections. Note the anchoring strip for the L_1 coil holder. This strip allows the holder to swing, but prevents it from being pulled up when removing the coil. It is a minor detail, but illustrates the attention to detail that stamps the receiver as an outstanding design.

The "Vi-King" Three—continued

Following the usual WIRELESS CONSTRUCTOR procedure, I have given elsewhere in the article a complete list of the components required for the construction of this set, and although

normally be required with ebonite in order to obtain clear-cut holes.

The finished appearance certainly merits this bit of extra care, which, after all, is only a case of seeing that the drill is not operated too rapidly or too jerkily.

It is essential in the interests of

a fairly thick baseboard and screws sent well home into it.

Panel Must be Secure

If your panel, with the components mounted on it, shows any signs of being insecure, you would be well advised to employ small panel brackets in order to obtain complete rigidity.

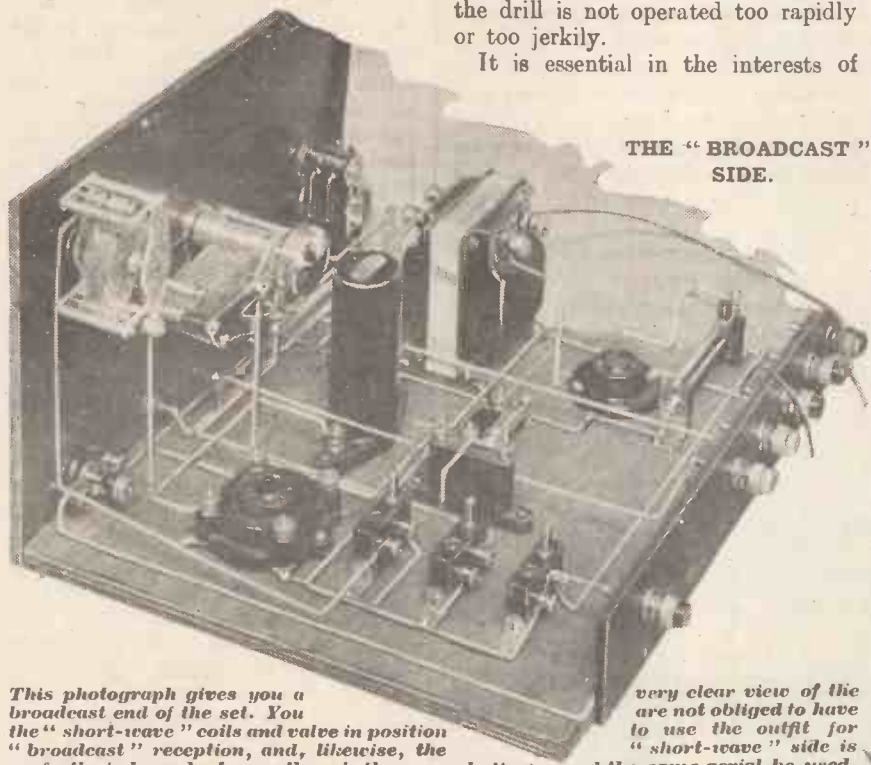
The component fixing, as far as the baseboard is concerned, is quite straightforward, with the exception of the arrangement of the aerial coil holder on the short-wave side (marked L_1).

As in the case of all short-wave receivers, it is desirable to be able to vary the degree of coupling between the aerial and the grid coil, and provision for such in the "Vi-King" is made merely by using only one screw for fixing purposes.

A Useful Refinement

The remaining fixing bracket of this particular coil holder is placed under a semi-circular piece of metal screwed down to the baseboard. Thus the extraction of a coil is not likely to be such a difficult proposition as would otherwise be the case.

Apart from this small refinement, the fixing of components is quite a



THE "BROADCAST" SIDE.

This photograph gives you a broadcast end of the set. You the "short-wave" coils and valve in position "broadcast" reception, and, likewise, the perfectly independent even though the same

very clear view of the are not obliged to have to use the outfit for "short-wave" side is batteries and the same aerial be used.

for guidance the name of the components used in the original set is in each case given first, this should not be taken as a specific recommendation for any particular part.

The standard of component manufacture is now of such a high level that any of those listed as alternatives, or, for that matter, any of the others advertised in these columns, will answer quite satisfactorily.

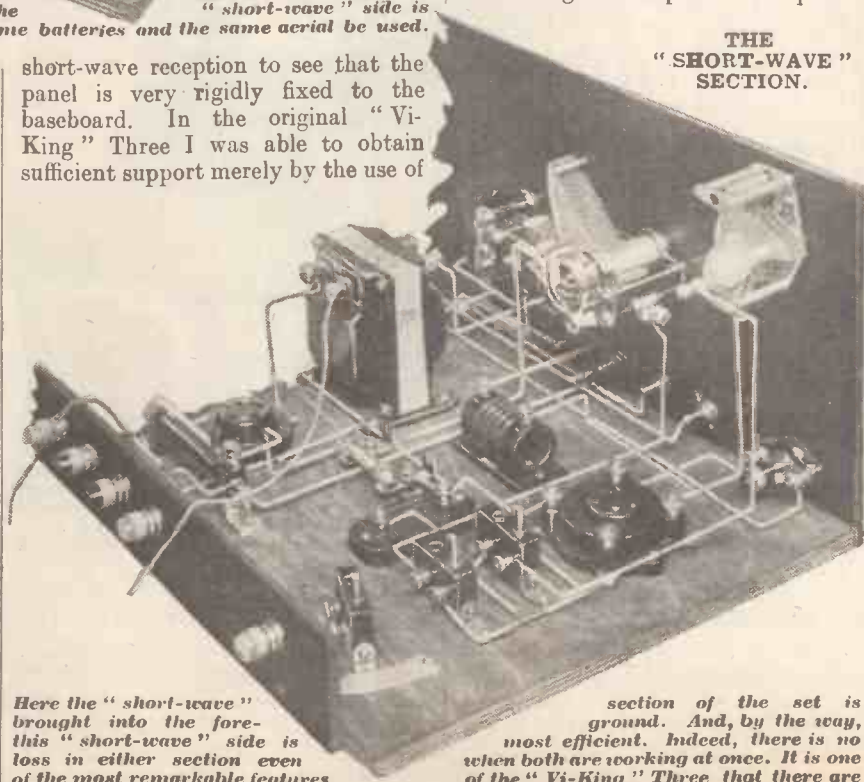
The set cannot be expected to live up to its reputation if cheap and shoddy substitutes are employed in place of the reputable articles, and wise buying may save no end of trouble in the long run.

Commencing Construction

When you have gathered the necessary components together, the constructional work can be started, in the usual manner, with the drilling of the panel.

If you choose for the panel the material used in the original receiver, then a little extra care will be necessary in the drilling operations than would

short-wave reception to see that the panel is very rigidly fixed to the baseboard. In the original "Vi-King" Three I was able to obtain sufficient support merely by the use of



THE "SHORT-WAVE" SECTION.

Here the "short-wave" brought into the fore—this "short-wave" side is loss in either section even of the most remarkable features no sacrifices in efficiency merely to achieve a spectacular adaptability and versatility.

section of the set is ground. And, by the way, most efficient. Indeed, there is no when both are working at once. It is one of the "Vi-King" Three that there are

The "Vi-King" Three—continued

straightforward job, and one which, if you carefully follow the back-of-panel diagram, should not take very long.

Naturally, in view of the circuit employed, the wiring of the "Vi-King" Three is a little more complicated than usual. For all that, it should not be very troublesome, and if you make a point of carrying out the switch wiring first, then it is unlikely that you will encounter any difficulties.

The Coils to Use

With the set completed, it may be helpful if I turn for a moment or two to the question of the accessories required in order to make the outfit complete. First, in regard to coils for the broadcast waves, you will require

three "short-wave" coil holders. If you experience difficulty in obtaining a coil of 5 turns, then a 4-turn winding will in all probability be quite satisfactory.

When using the set for the reception of two medium-wave stations use another 40 for reaction and a 60 for secondary coils in the short-wave side of the set, and a 6- to 15-turn coil for the aerial (L_4) position. One of your short-wave coils will do in this position when you are listening to the local.

Use the "short-wave side" of the set for the stronger of the two alternative stations when on the broadcast or long-wave band.

For long waves aerial coils of about 75 to 150 turns will be O.K.,

Valves and H.T.

For most satisfactory results valves of the H.F. type are recommended for use in the V_1 and V_2 sockets, while a small power valve should meet the case in the remaining position. In the original tests of the "Vi-King" Three it was also found possible to obtain excellent results with valves of the type specially intended for detection in the first two sockets.

The accumulator required will naturally depend upon the filament voltage of the valves chosen, and for H.T. nothing less than 100 volts is really desirable for H.T. +2, although in the case of the H.T. +1 lead this should be joined to a tapping on the battery at a point somewhere between about 40 and 60 volts.

Therefore, with coils, valves, batteries, in fact, everything in position join a pair of 'phones to the terminals thus marked on the right-hand side of the panel, and with the right-hand filament switch in the "on" position slowly rotate the main tuning condenser on this side of the panel until the local station is heard. (Switch the amplifier on to the "short-wave" side," i.e. switch to the left.)

Be careful to carry out this operation with the "broadcast" reaction condenser (C_6) at zero (plates all out). Then once you have found, and know where to avoid, the setting of the local, you can slowly increase the capacity of the above-mentioned reaction condenser until the set commences to oscillate.

Providing signals and oscillation seem quite normal on the "broadcast" side you can transfer the 'phone connections to the appropriate terminals on the left-hand side.

Testing the "S.W." Side

Having placed the amplifier switch in the "broadcast" position, and the potentiometer slider right over at the positive end of the winding, slowly increase the capacity of the short-wave reaction condenser, and note whether the set on the short-wave side will oscillate.

If it does, then rotate the tuning condenser and note whether oscillation can be obtained (possibly by readjustment of the reaction condenser) over the whole of the tuning range.

(Continued on page 422.)



The designer of the "Vi-King" Three, Mr. Victor King, whose set designs will appear exclusively in the "Wireless Constructor." When this photo was taken he was working out the final details of the "Vi-King" Three. A few days later the set was given its preliminary tests in the "Wireless Constructor" Research Laboratory, when it occasioned great interest, and even astonishment, among members of the technical staff.

a No. 35 for the aerial socket L_1 , a No. 60 in the middle socket, and a No. 35, 40 or 50 for reaction (placed in the socket marked L_3).

On the short waves, the most fruitful band of wave-lengths, if one may thus refer to it, is covered by a grid coil of 5 turns, and it should be placed in the middle socket of the

with grid coils of 250 turns. Reaction coils of 75 or 100 turns should be O.K.

Reaction on short waves will, in most cases, call for the use of a 4-turn coil, and it should be placed in the holder marked L_3 . The only other coil required—that for aerial coupling on short waves—should be a 2-turn coil, and it is fitted in the remaining holder.

The New London Station

by

NOEL ASHBRIDGE B.Sc., (Eng.), A.M.I.E.E.
CHIEF ENGINEER OF THE B.B.C.

MOST readers of the WIRELESS CONSTRUCTOR are already familiar with the general outlines of the Regional Scheme of high-power stations, and such questions as why the B.B.C. decided to begin it by building the experimental station 5 G B at Daventry have already been discussed in these columns. We can therefore pass straight on to a consideration of the performance of the new London station at Brookmans Park, and the experience gained during the first few months of working.

A Unique Station

This is of special interest because Brookmans Park is the first transmitting station built with the express object of radiating contrasted programmes on two wave-lengths, both of which are in the "medium" wave-length band allotted to broadcasting.

It is, in fact, unique in the world in this respect.

On October 21st one of the two new transmitters took over the service from the old transmitter in Oxford Street. The power delivered to the aerial system by the new transmitter is approximately 30 kw., which corresponds to a power input of some 130 kw., excluding the power required to drive water-circulating pumps, etc. At Oxford Street the power delivered to the aerial was 2 kw.

Unusually Low Masts

The masts at Brookmans Park are only 200 ft. high, in consideration of the danger to aircraft afforded by higher masts. Had it been possible to consider technical requirements only, masts having a height of about

500 ft. would have been built, which would have had the effect of increasing the energy radiated for the same input of power to the transmitter. Nevertheless, the efficiency of the aerial

Noel Ashbridge, the Chief Engineer of the B.B.C., is contributing an exclusive series of articles to the "Wireless Constructor," outlining the work that has been done and is being carried out in the moulding of the new Regional Scheme. In this first article he describes the Brookmans Park transmitters, and discusses many points of interest to all listeners.

system of the new station is considerably greater than that of the old,



Mr. Noel Ashbridge, B.Sc. (Eng.), A.M.I.E.E.

the ratio of power actually radiated being approximately 20 to 1.

In spite of this ratio it is inevitable that the field strength in the neighbourhood of the old station should be less under the new conditions. It is possible to plot on a map a line along which the strength from both the old and new stations is equal.

How London is Affected

If this is done we get a diagram which is roughly heart-shaped, having its centre in Oxford Street and the pointed end facing south. The area of this diagram is equivalent to a circle having a radius of about four miles, but this does not mean that everyone inside the line gets a noticeably weaker signal.

There are three reasons for this. In the first place we are dealing with high field strengths—Brookmans Park gives about 30 milli-volts per metre in the centre of London—and under these conditions a difference of, say, 30 per cent in field strength is not obvious when judged by ear. This, of course, reduces the number of people adversely affected.

The second point is the fact that the polar diagram, showing the amount of energy radiated from a station, never even approaches a circle in shape when taken at a distance of some miles from the station.

Energy Absorption

This is always the case, apart from the "shadows" cast by the masts, and is due to the fact that the energy is absorbed more rapidly in some directions than others, varying with the nature of the ground, presence of

The New London Station—continued

high buildings, etc. Due partly to the low masts, which were obligatory, the mast shadow effect is practically negligible at Brookmans Park, particularly on the 356-metre transmitter.

Powerful Modulation

However, the absorption over the thickly-populated part of the metropolis is greater than in other districts, and varies for every change of direction of a few degrees. Finally, there must be taken into consideration the amount of modulation possible in the case of each station. The new transmitters can be modulated actually up to 100 per cent without distortion, or running the risk of a flash-over, although they are not operated at this degree of modulation, even on

“choke control at low power.” This means that modulation is carried out at a power level of about $\frac{1}{4}$ kw., the modulated high-frequency oscillations being amplified to the full power of the output in the two subsequent stages.

All other B.B.C. transmitters, with the exception of 5 G B, employ modulation at high power, and with this circuit the peak voltages rise to a higher value. It should be pointed out, however, that it is not necessarily impossible to design a stable and safe transmitter with this latter method, but it is considered that it is easier to design for a greater factor of safety with the new circuit.

The actual effect from the listener's point of view is that for a given field

Moreover, it is an entirely adequate strength, except in cases where no sort of reasonably efficient aerial can be erected. Of course, if the power of the transmitter were raised to an extravagant extent, say five or six times its present value, this area would be reduced so as to be almost negligible, but the wipe-out would be very serious over a large area, and already some people apparently think that the power used is too high. Again, due to the effects of fading, the range of the station at night would not be increased, assuming that the range is defined as the maximum distance at which a station can be received at night without noticeable variations of strength.

Improved Quality

It is perhaps hardly necessary to point out that the number of people receiving a stronger signal is much greater than the number of people receiving a weaker one, but apart from this advantage it is most satisfactory to find that the improved quality has been the subject of hundreds of appreciative letters from listeners. This, of course, is also demonstrated by our definite measurements of the frequency and amplitude response of the transmitters with their associated amplifiers.

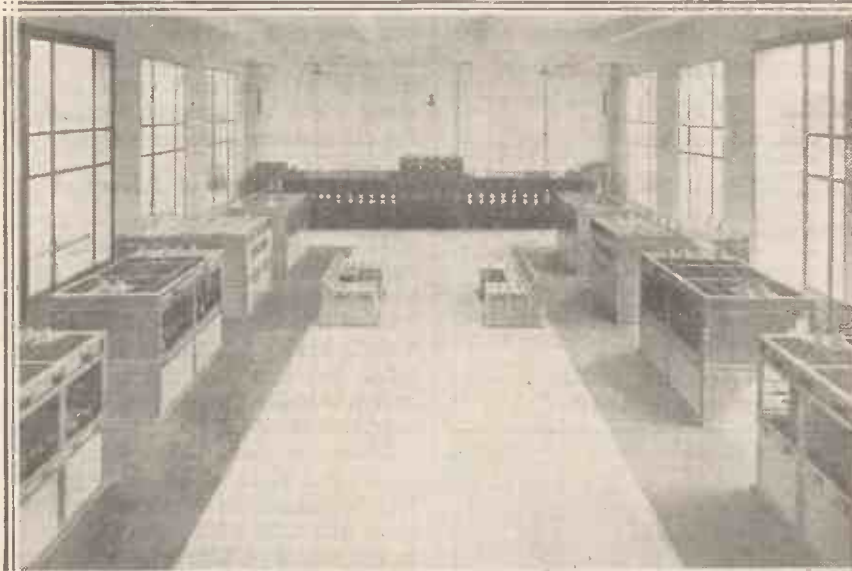
The second transmitter, working on a wave-length of 261.3 metres, 1,148 kilocycles per second, started tests on December 9th. This transmitter is identical with the one working on 356 metres, and both can be tuned to any wave-length between 250 and 550 metres. The aerials, however, are different, this being essential if the maximum efficiency is to be obtained from each. We had anticipated that some trouble would be experienced from induction, particularly between the low-frequency amplifying gear supplying each transmitter, causing a slight background of one programme on the other. For this reason every unit of each transmitter is as completely screened as possible, after allowing for the necessary ventilation.

Transmitters Carefully Screened

Further, separate amplifier rooms—or control rooms as they are usually called—are provided for each transmitter, and each room itself is screened by a carefully earthed screen of copper

(Continued on page 421.)

THE “TWINS” AT HOME



This is the transmitter hall at Brookmans Park. The two new high-power outfits are identical in construction, and you can see “Reg” on the left and “Nat” on the right. The two control engineers sit at the two desks in the centre.

peaks, because in most receivers there would be distortion due to non-linearity of the detector under such conditions.

The old transmitter would not withstand this degree of modulation without some distortion, and, what is even worse, there was more risk of a flash-over on sudden peaks, with the result that it was necessary to maintain a lower average level of modulation than is possible now.

This improved performance of the new transmitters is largely due to the different circuit used, because they operate on the principle known as

strength the amount of noise heard in a loud speaker is greater in the case of the Brookmans Park transmitter.

The “Weaker” Districts

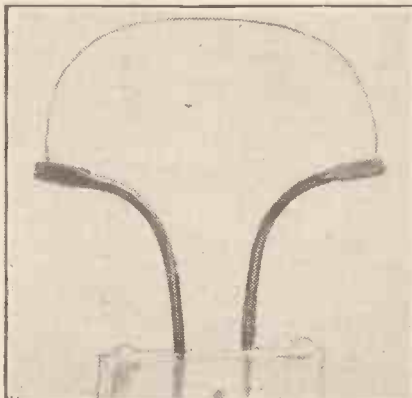
Summing up these effects, there are districts where the strength from the new transmitter is weaker than from the old, but it is difficult to define, to a mile or so, the limits of the area affected. On the other hand, the field strength in this area is between 20 and 40 millivolts per metre, which is a far greater strength than is received by the vast majority of people in this country, or in any other.

FILAMENT FAILURES



IF one could only look into a valve through a magnifying glass of almost unlimited power one might be able to understand fully the wonderful construction of the filament. One might see the molecules and the atoms, with their electrons spinning round, all busy, as it were, on an ordered and perfectly controlled series of movements.

Then if one were to switch on the L.T. one would see a tremendous commotion amongst the atoms, and



This is a photograph of the filament of an old valve, showing how the fixing is arranged to prevent sagging.

electrons would come surging along from the L.T. battery, creating such a disturbance as they came that many would be jostled off the filament into the space around them, where they would surge about like a great football crowd emerging from a ground after a match.

The "Crowd" Rushes Off

Next, if one were to switch on the H.T. one would see the electrons suddenly rush off in a steady stream, much as a football crowd does when

Wonderful though the valve is, it cannot last for ever, for all the time it is operating it is slowly but surely wearing out. If you are using old valves, and have any doubts about their condition, it is advisable to give them a test after the manner described in this article.

By KEITH D. ROGERS.

it has emerged from the ground and is running after a tram or bus. Myriads of electrons would be flying across space on their way to the plate. Here they would be collected and drawn off towards the H.T. battery.

Such, then, is a brief description, probably not wholly accurate (because we do not know exactly what happens), of the action of a filament in a valve; the electron stream, of course, being the well-known *emission*, upon which we rely for the operation of the valve.

What the Grid Does

The grid of the valve, as you probably know, controls these myriads of electrons; it decides how many shall reach the plate, or how dense the stream shall be; for, due to its powerful influence, it dictates exactly how many shall leave the filament.

Although the attraction of the plate when the H.T. is on is very high, the grid can override that attraction, and under certain circumstances nullify the effect of the potential on the plate.

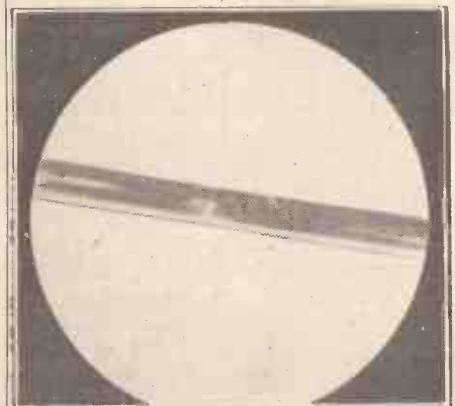
You can imagine the grid acting as a gate controlling the great crowds which are rushing off from the filament in an endeavour to get to the plate, and one can imagine the voltages applied to the grid as the controllers of the gate.

A positive voltage on the grid tends to open the gate wider, whilst a negative voltage closes it and retards the flow of electrons.

Varying the Plate Current

Thus when a negative signal impulse arrives the electrons reaching the plate are fewer in number, and when a positive impulse arrives there the number increases, and so the plate current (which is, after all, merely the emission going on round outside the valve) decreases and increases in accordance with the impulses on the grid.

One can thus see that grid bias has a very definite effect upon this "crowd" which is leaving the filament. The more negative the grid is made, the less electrons will leave the filament and fly to the plate, or, in other words, the less will become the emission.



A new filament looks like this through a magnifying glass. When wearing out it becomes pitted and rougher in surface.

If the grid is at zero volts, that is, if it is connected to the negative side of the filament, then a certain number

Filament Failures—continued

of electrons will flow across to the plate in a given interval of time. If the grid is made positive, then far more electrons will flow across in that same time—the stream is denser.

Now, the filaments of valves are designed to supply a certain number of electrons per second (a certain emission), with the grid at a certain potential and the plate at another fixed potential. In the case of a low-frequency valve the emission is fixed at a proper value by means of grid bias, so arranged that the valve operates to the best advantage.

"Opening the Gate"

If we remove that bias by taking the bias plug out of the battery we open the "gate" restricting the electrons and far more can pass on their way to the plate than was calculated for in the design of the valve. In other words, the emission is far too high. This is definitely harmful to the filament of the valve, and in time it wears the filament out.

There are many ways of making filaments, and there are many

TAKING THE VALVE'S PULSE



The apparatus used for taking valve curves. Filament volts and current, grid volts, anode volts and current all have to be measured before the characteristics of any valve can be known.

theories as to the exact happenings which take place when electrons are given off. In the case of the oxide-coated filament the effect is usually suggested to be an electrolytic one; the oxide coating (usually barium oxide) of the filament being decomposed into oxygen and the pure metal.

One can see that as the age of the valve increases more and more of this oxide coating is going to be decomposed until at last there is nothing left, and as it approaches that stage so the supply of electrons falls off, and the filament finally fails. Once the

emission seriously decreases the valve is useless.

The one obvious and outside indication of lost emission is a decreased plate current. Let us consider a valve of the L.F. type, which has a normal plate current of, say, seven milliamps when biased at a certain grid voltage, with a certain filament voltage applied to the filament and a certain H.T. voltage applied to the plate.

The First Sign

Suppose you use that valve for some considerable time, until, at last, you are rather suspicious that it is not so good as it was—it does not give so much "punch," signals seem rather distorted, and you cannot use quite so much grid bias as you used. The H.T. is O.K., filament voltage and current seems to be the same, yet the grid bias has to be dropped in value.

This is what has happened. The valve has lost its emission. This can usually be tested by placing a milliammeter in the plate circuit of the valve, and restoring the operating conditions to those used when the valve was new; that is, giving it the same H.T. voltage, the same bias, and the same L.T. voltage. You will now find perhaps that the

buy a new valve to look up the maker's chart and see the operating characteristics, what H.T. it should have, what grid bias should be used and what filament voltage is required, then, before placing the valve in your set, place it in a valve holder, and give it an emission test.

Connect up the L.T. battery to give the correct voltage, connect the grid-bias battery between the negative L.T. terminal and the grid of the valve to give it the correct grid bias, and apply the correct H.T. voltage by connecting H.T. negative to the negative of your L.T. battery, and H.T. + to one side of a milliammeter, and the other side of the milliammeter to the plate of the valve.

When adjusted to the right values of H.T. and grid bias (and, of course, L.T.), you will find that the milliammeter will give a certain reading, which will not be very far from that denoted on the characteristic curve.

Make a Note of It

Make a note either on the valve base itself, or in a little book, of the results of the test and the voltages used. Place the valve in your set and use it in the normal way. After many months, if you have reason to suspect the valve because your signals do not seem to be quite as good as they used to be, take the valve out and apply the same test to it, using the same voltages all through, and note the milliammeter reading.

If this has dropped considerably, say more than about 15 per cent of the original figure, you can get ready to buy another valve. There may be some life left in the valve, but it will not be giving of its best.

The Output Stage

Especially in the case of a super-power valve is this lost emission noticeable, for the emission of these valves is often of the order of 20 milliamps. Pentode valves, if badly treated, also quickly lose emission.

Use your valves carefully, make sure they are not over-run, and you should get a reasonably good life from them. You cannot expect a valve to last for ever, any more than you can expect a motor-car engine to run for ever, but you should get many hundreds of hours from your valves if they are of modern design, and purchased from reliable firms, and if they are used under the proper working conditions.

valve only gives you $4\frac{1}{2}$ milliamps.

You may continue to use it for a little longer with decreased bias (opening the gate of the grid and letting more electrons through), but this will only hasten the end.

I am frequently asked by readers how they can test their valves. The test mentioned above is the best one to use.

In the case of valves which have been in use for some time it is more than likely that the emission will be dropping, and that new valves will be required.

It is not a bad plan when you

The "S.S." UNIT

Selectivity and sensitivity are provided by this little unit. It can be added to any set, and enables you not only successfully to deal with the new regional broadcasting conditions, but to bring in distant stations that you have never heard before.

Designed and described by
A. S. CLARK.



IF I could live just where I chose, it would be far away from the local broadcasting stations, on top of a hill, and there would be no neighbours with aerials. In such a locality a simple set without any H.F. stages

COMPONENTS USED IN THE "S.S." UNIT.

- 1 Panel 7 in. × 7 in. (Goltone, or Becol, Ebonart, Radion, Trelleborg, Trollite, etc.).
 - 1 Cabinet for above, with baseboard 9 in. deep (Camco, Pickett, Lock, Gilbert, Peto-Scott, etc.).
 - 1 .0005 variable condenser (Burton, or Lissen, Ready Radio, Lotus, J.B., Polar, Ormond, Dubilier, Igranic, Formo, Colvern, Gecophone, Cydon, etc.).
 - 1 Slow-motion dial, if condenser not of slow-motion type (Indigraph, or Lissen, J.B., Lotus, Brownie, Formo, Ormond, etc.).
 - 1 "On and off" switch (Benjamin, Lissen, Burton, Keystone, Wearite, Bulgin, Lotus, Igranic, Jewel, etc.).
 - 1 Standard screen 9 in. × 6 in. (Ready Radio, or Paroussi, Magnum, Keystone, Wearite, etc.).
 - 1 Anti-shock valve holder (Formo, or Lissen, Bowyer-Lowe, Burton, Wearite, Magnum, Benjamin, W.B., Igranic, Lotus, etc.).
 - 2 1-mfd. fixed condensers (Lissen, or Mullard, Hydra, T.C.C., Ferranti, Dubilier, etc.).
 - 1 .001 and one .02 fixed condensers (Dubilier and T.C.C. in set, Igranic, Lissen, Clarke, Goltone, Graham-Farish, etc.).
 - 1 H.F. choke (Ready Radio, or Varley, Dubilier, Lewcos, Igranic, Lissen, R.I., Climax, Magnum, Bowyer-Lowe, Bulgin, Wearite, Colvern, etc.).
 - 1 Terminal strip 7 in. × 2 in.
 - 6 Indicating terminals (see wiring diagram for markings). (Igranic, or Eelex, Belling & Lee, Clix, etc.).
 - 1 Former 3 in. diameter by 3 in., and one 2 in. diameter by 1 in. (Pirtoid, or Paxolin, etc.).
- Small quantity of 24 D.C.C. wire and 26 D.S.C. wire.
Wire, screws, wander-plugs, etc.

would bring in many distant stations with ease.

Unfortunately, however, the question of where to live is generally settled for us by considerations beyond our control, and many of us are situated near to a powerful local station.

Increase in Selectivity

The result is that when we come to try and tune in distant stations on a det. and one or two L.F. we find it necessary to get the local station out of our way first.

In settling on a scheme whereby this may be done it has to be remembered that, since we are after distant stations, sensitivity must not be sacrificed. In fact, in most cases an

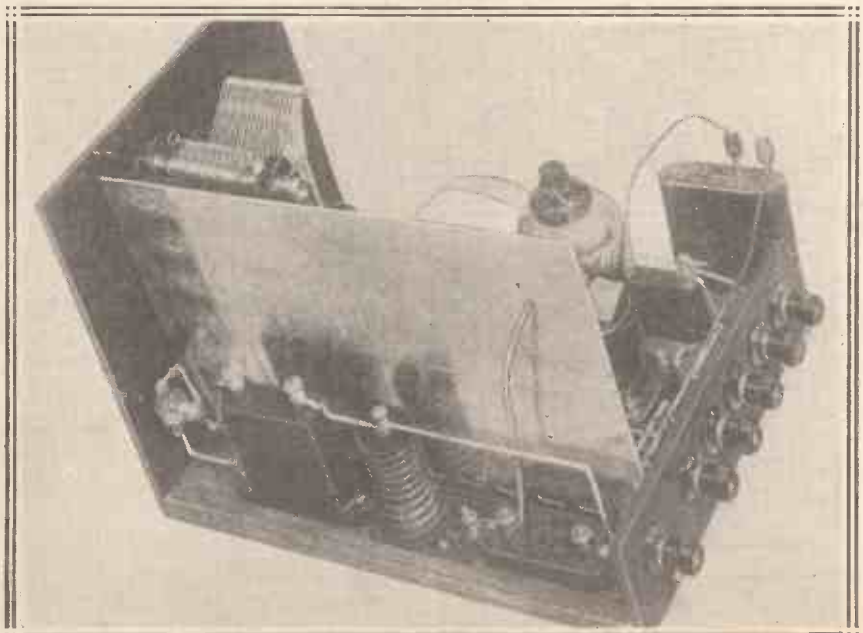
increase in sensitivity is very desirable.

Selectivity units, wave-traps and rejectors will all help to remove (or will remove completely) the unwanted programmes, and are ideal for a set which has one or more H.F. valves, or when it is merely desired to separate the two programmes of a regional station.

Dual Purpose

Since, however, we can do with more sensitivity for our simple sets, the obvious thing to do is to design an H.F. amplifier which not only helps to bring in distant stations, but also

SELECTIVE, SENSITIVE AND STABLE

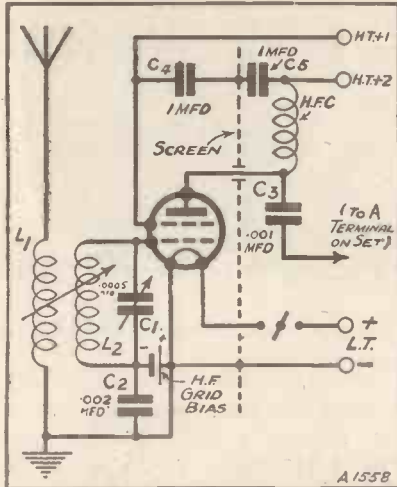


The screen, clearly seen in the above photograph enables the unit to be placed close to the receiver to which it is attached, without fear of instability due to feed-back. It will not make your set "go up in the air;" your set will be just as stable as before, but far more selective and sensitive.

The "S.S." Unit—continued

helps to keep out the local programme or programmes.

The "S.S." Unit fulfils the dual requirements and very effectively increases selectivity and sensitivity.



Here we see the theoretical circuit of the "S.S." Unit. Note that extra bias is applied to the grid of the valve—an important point when you are working with a screened-grid valve.

When designing this unit only one extra tuning control could be allowed, otherwise the unit would defeat its own purpose in that tuning in distant stations would become more difficult.

The schemes first tried were put

sult that we were not much better off than if an ordinary wave-trap were employed.

The solution to the problem was at last found in an almost absurdly simple circuit, which has the great advantage that selectivity is continuously variable by means of a small knob conveniently placed on the panel.

Secret of Success

With selectivity at its maximum, the H.F. amplification is so remarkably good that even the most sceptical "old hands" wax enthusiastic on hearing the "S.S." Unit at work turning a distant distorted whisper into an enjoyable programme.

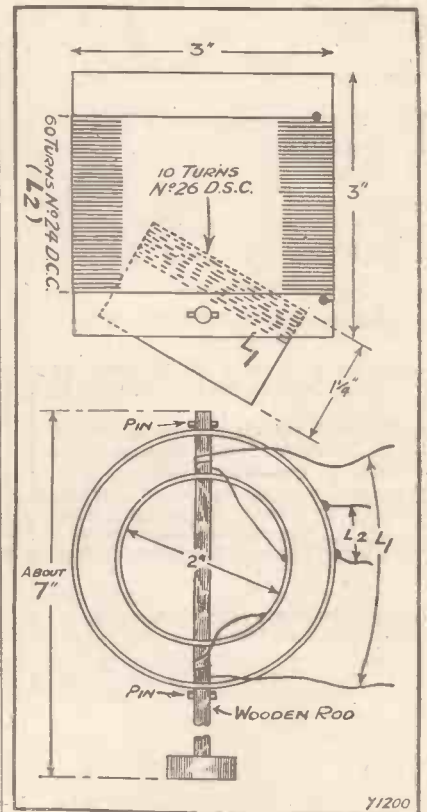
The circuit employed is built on modern and conventional lines, which makes it all the more desirable, but the secret of its success lies in the method of arranging the variable coupling between the aerial and tuned coils.

The aerial coil is wound on a rotor which is fitted in one end of the tuned coil, the number of turns of wire on it and the gauge being carefully chosen after much experiment to specially suit the types of aeriels generally in use by home constructors.

In this connection it would be as well to mention that the constructor can go one stage farther and make this coil specially suitable to his own

coupled to the first valve of the set to which the unit is added. The metal shield is not so much to separate the components on one side of it in the unit from those on the other, as to isolate the H.F. coil and condenser from the tuning arrangements of the set itself.

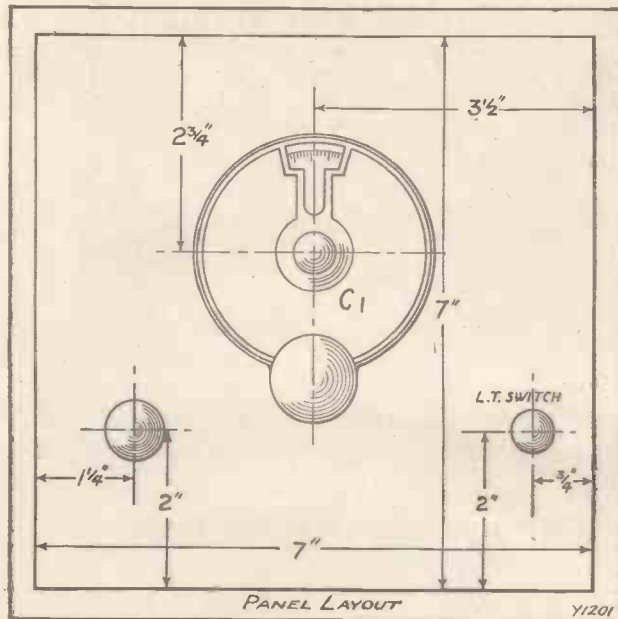
The unit is arranged at the left-hand end of the receiver, so that the screen is in much the same position as the screens employed in many complete four-valve sets.



On the left we have the panel drilling diagram. The centre dial is that of the H.F. tuning condenser, the left-hand knob is the aerial coupler control, and the right-hand one the on-off switch for the "S.S." Unit.

The aerial coupler is shown diagrammatically in the right-hand diagram, which shows exactly how the aerial and grid coils are wound.

It also shows the positions of the two pins used to keep the rotor spindle in place. These pins may be pieces of copper wire.



aside as unsuitable, because the selectivity gained was largely at the expense of the amplification that the extra valve should give, with the re-

aerial by trying more or less turns of wire on it.

For obvious reasons a screen-grid valve is employed, and it is choke-

In order to carry this idea of a complete four-valve set one stage farther, the output from the H.F. unit is by means of a flex lead which is taken as direct to the aerial terminal of the set as possible through a small hole in the the cabinet of the unit.

H.F. Choke Considerations

By this means, this vital wire is kept as short as it can be. The use of another terminal would only increase capacity effects and make an extra connection necessary when joining up the unit to your receiver.

The only component which requires mention, apart from the inductances (which are home-made), is the H.F. choke. This choke must be one

The "S.S." Unit—continued

specially designed for use in the plate of an H.F. valve, and I advise you to keep strictly to one of the makes mentioned in the list of components.

Do not think that because you have a choke which gives reaction quite satisfactorily in a Reinartz circuit that it will do. In a Reinartz circuit an H.F. choke has to choke only a portion of the H.F. currents, while the ideal choke for the plate circuit of an S.G. valve would choke completely every tiny little pulse of H.F.

Winding the Coils

The tuned coil is wound with No. 24 gauge D.C.C. wire, and consists of 60 turns on a former 3 in. long and 3 in. in diameter. This winding should be started $\frac{1}{2}$ in. from one end, both ends being fastened in the usual manner by means of two small holes about $\frac{1}{4}$ in. apart.

The former for the aerial winding is 2 in. in diameter and about 1 in. wide. Ten turns of No. 26 D.S.C. wire are wound on it, starting about $\frac{1}{4}$ in. from one end.

The spindle consists of a piece of smooth round stick about $\frac{3}{16}$ in. thick. A stick out of a packet of Glazite wire makes a very useful spindle. The holes in the larger former are mid-way between one end of the former and the beginning of the wire. The two holes in the rotor are central, that is, $\frac{1}{2}$ in. from either end.

Be careful to drill all holes a tight fit for the stick. Seccotine will secure the rotor in place, while the other two holes have to be slightly enlarged so that the spindle will rotate conveniently in them.

Any small ebonite knob with a thread in it will do for the end of your spindle. It is attached by the simple method of tapering the stick and forcing the knob on so that it more or less cuts a thread on the spindle.

Connections to Rotor

The two ends of the aerial winding are joined to lengths of flexible wire, which are wound two or three times round the wooden spindle so that the latter may be rotated without the flex wire being strained. You can follow this scheme from the photographs, which also show how neat the arrangement is since it avoids wires straggling about.

The panel is drilled in accordance with the dimensions on the panel layout diagram, from which it will be gathered that a slow-motion dial is used. While tuning is not so critical that this could not be dispensed with, it is a refinement that is really worth having.

Follow the disposition of the components as shown in the wiring diagram carefully. The coil is secured to the baseboard by means of a screw at each end of a thin piece of wood, which passes through it and so clamps it to the baseboard.

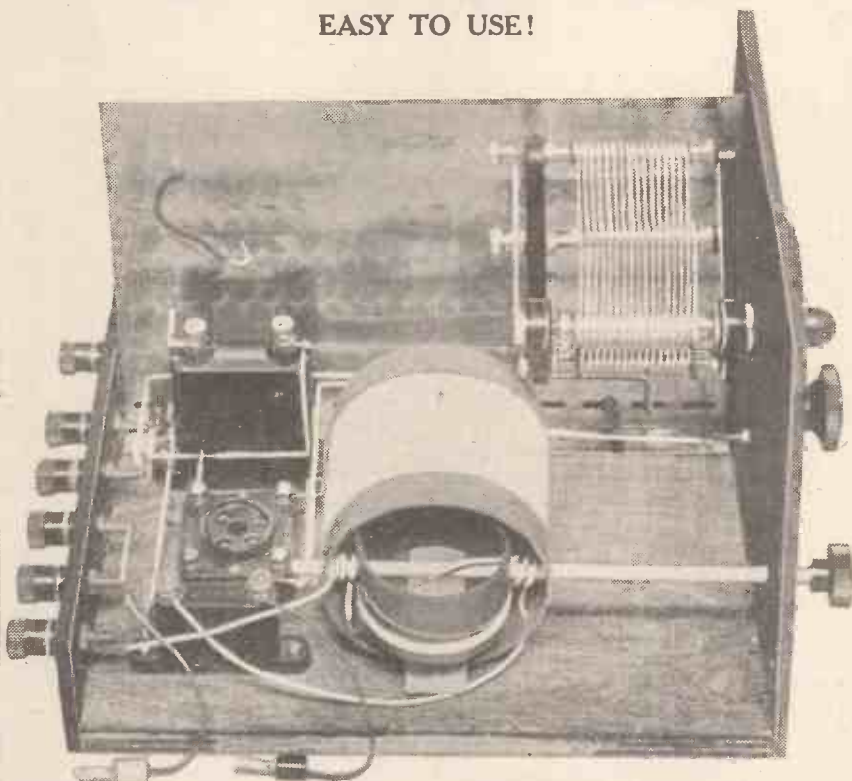
from the coupling condenser to the aerial terminal of your set, and join up the four battery terminals of the unit.

Voltages to Use

The voltage on H.T. + 1 should be 70 to 80, and on H.T. + 2, 120 to 150. The H.F. grid bias should be $1\frac{1}{2}$ or 3 volts. A two-, four-, or six-volt screen-grid valve can be used. Do not forget to join up the flex lead to the terminal on top of this valve.

The tuning will be just as before the unit was added, except that the

**CHEAP TO BUILD! SIMPLE TO MAKE!
EASY TO USE!**



Variations of selectivity can be obtained by rotating the aerial coil, which, as seen in this photograph, consists of a small winding on a rotor inside one end of the former upon which is wound the grid coil.

No H.T. — terminal is provided, since it is assumed that the same batteries will be used for the unit as are employed for the receiver.

The wiring requires no comment except that the wires which pass through the screen must be well insulated.

When connecting up, remove the aerial and earth from your set, and join them to the aerial and earth terminals on the unit. No connection will be required to the earth terminal of the receiver. Take the flex lead

extra tuning condenser on the unit must now be kept in step with the tuning of the set. You will soon learn the approximate dial readings of one condenser against the other (they will not be the same), and a slight rushing noise will indicate that the two circuits are in tune.

Coupling will be at its maximum when the axes of the two coils are coincident and the aerial winding is inside the tuned coil. Minimum coupling and therefore maximum selectivity will be obtained with the

THE "S.S." UNIT

—continued from previous page.

rotor at about right angles to this position.

As already indicated, you should experiment with the number of turns on the aerial coil so as to suit the

position of maximum coupling, and tune in your local station or stations. Such transmissions should be found quite easily without reaction, and will give you a starting point for the dial readings.

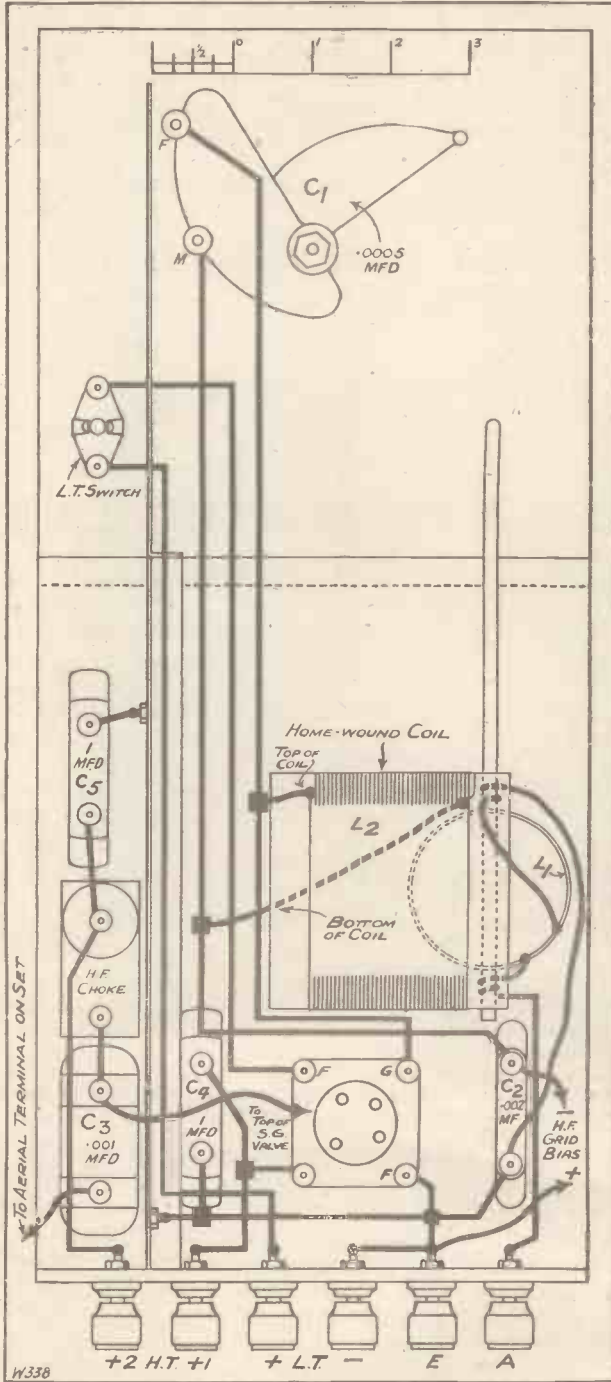
Next tune in a few of the more powerful distant stations and note the dial settings. After this you will find no difficulty in finding other stations.

WATCHING YOUR BATTERIES

THE usual reason for a milli-ammeter in the plate circuit of the last valve is to indicate whether distortion is taking place, and also what the current consumption of the power valve is.

Actually, if used intelligently it will also indicate how the H.T. and L.T. batteries are "getting on." If immediately on switching on the current begins to fall and drops two or three milliamps. and then remains steady, this may be taken as an indication that the H.T. battery voltage has dropped.

The diagram on the left tells you all you want to know about the layout and the wiring. By means of the scale provided you should be able to make your "S.S." Unit exactly like the original illustrated in the photograph below.



READY TO SCOUR THE ETHER

The photograph shows the completed unit, with screen-grid valve in position. Don't forget that the anode of the S.G. valve is connected to the terminal on the top of the bulb and not to the "plate" pin in the base. The latter is the connection to the screen grid.

If dry H.T. batteries are used, this quick drop will become larger and larger as the batteries wear out.

A continual drop which takes place gradually will indicate that the L.T. needs charging, and if the meter drops far the accumulators should immediately be disconnected and charged.

A drop in the current can, apart from the above, be due to lost emission on the part of the power valve.

aerial winding to your particular aerial-earth system.

For a start set the rotor in the

The selectivity should be increased just sufficiently to cut out any interfering transmissions.



Running Commentary from Vienna—Summer Timing of Programmes—The Wedgwood Bi-Centenary—The British Legion—Trooping the Colours—Wolfe and Montcalm—B.B.C. English—Hubay in May—Some Savoy Hill Personalities—Sir Thomas Beecham and Broadcasting—B.B.C. and the Civil Service—Trouble in Scotland.

By OUR SPECIAL COMMISSIONERS

Running Commentary from Vienna

THE B.B.C. will take a series of running commentaries of events in the European Swimming Championships at Vienna, from August 26th to 31st. A water-polo match is to be included. The fact that such an "O.B." is considered now to be in the stride of broadcasting shows that this side of the work has made great progress in the past two years.

Summer Timing of Programmes

With the approach of longer days the B.B.C. is preparing to institute again the group programmes which were so successful last summer. These give an opportunity for the regions to work off some of the meritorious local features that accumulate during the winter months. The seasonal timing extension will begin this year on April 28th, after which group programmes will run on until nine o'clock.

The Wedgwood Bi-Centenary

In addition to a number of special entertainment items and talks concerning the Wedgwood Bi-Centenary Celebrations, there will be on Sunday, May 18th, a relay by all Northern stations of a religious service at the Stoke-on-Trent Parish Church, with the Archbishop of Canterbury giving the address. This service will be taken by 5 G B as well.

The British Legion

The annual British Legion meeting, to be held this year at Cardiff, with the Prince of Wales present, will be the subject of several special broad-

casts, including a relay of a "star" concert.

Trooping the Colours

The ceremony of Trooping the Colours on the King's Birthday this year will be broadcast from all B.B.C. stations. This is one of the programme items for which there is admittedly no alternative.

Wolfe and Montcalm

The monument to General Wolfe in Greenwich Park will be unveiled by the Marquis de Montcalm on June 5th. The ceremony, which will begin at three o'clock and last an hour, will be broadcast on the London regional frequency, 356 metres. It was the ancestor of Montcalm who was Wolfe's famous antagonist in the Battle of the Plains of Abraham, which wrested

47-VALVE AMPLIFIER



This amplifier, which is used in Baker Street, London, supplies 200 loud speakers. The receiver used in conjunction with it is a three-valver.

Canada from the French during the Seven Years' War.

B.B.C. English

There is such growing dissatisfaction with the recommendations of the B.B.C. Advisory Committee on Spoken English that the Governors of the B.B.C. are shortly to reconsider the policy of tolerating such a committee. It is felt that the better plan would be to employ duly educated and qualified announcers, as at present, but to trust to their individual judgment about pronunciation.

Educated variations would be more palatable to listeners than standardised perfection. And another point is being noted: the attempt to apply standard English in the Provincial stations is being particularly resented where previously the local dialect has found its place at the microphone.

Hubay in May

Hubay will play for listeners in May, the accompanist being Katherine Goodson, and the recital including Brahms' third Sonata, of which Hubay gave the first performance.

Some Savoy Hill Personalities

The rise of Mr. Haley Simpson is being remarked on by the headquarters' staff. Mr. Simpson has made a special study of balance and control of music. Indeed, so thorough has been his work on this subject that it is believed that Sir John Reith will not now find it necessary to ask Mr. Filson Young to proceed with his inquiry into the matter.

Mr. Howard Marshall, recently appointed to be deputy-director of talks, is making rapid progress, and

Savoy Hill News—continued

is already marked out by the Board for preferment in the near future.

Now that Mr. Compton Mackenzie's time will not be drained by the duties of editing a weekly, he is turning more attention to the actual organisation of the programme work at Savoy Hill, and I should not be surprised to find him soon established as a special confidential advisor to Sir John Reith, along with Mr. J. C. Stobart, in relatively the same position as that occupied by Mr. Filson Young's *vis-à-vis*, Mr. Roger Eckersley.

Mr. Roger Eckersley is following Sir John Reith into the country. The latter has established a big seat near Beaconsfield, and the former is taking a place near Ashdown Forest. This entails the demobilisation of No. 21, Thurloe Square, the beautiful town house where Mr. Roger Eckersley and his brother Peter used to entertain on behalf of the B.B.C. It is understood that Mr. Cecil Graves and Mr.

and Sir Thomas Beecham is not far off. When the explosion occurs, probably about the middle of May, there will be a situation of intense dramatic interest to the public.

Sir Thomas's very decided views on the business and artistic defects of the B.B.C. are well known to his friends. The B.B.C., on the other hand, or at least some of the chief officials there, feel that there are two sides to the matter.

B.B.C. and the Civil Service

So it has turned out that the story about the plan to bring the B.B.C. into the Civil Service and to use it as a convenient dumping ground for those who are being displaced in the different offices of the Fighting Departments was true.

But the premature publicity created such a storm of adverse criticism that the Government was bound to deny the intention.

Liberal candidate, and Oxford scholar, who directs in Scotland for Sir John Reith, is alleged not to be accorded the resources or the freedom to develop the instinctively Scottish programmes which listeners North of the Tweed like to have two or three times a week.

The B.B.C. explains that any deficiencies there may be now will be remedied with the establishment of the twin-wave regional service in Scotland. But Scots objectors are not unaware that this millennium is about two years off, and they want something meanwhile.

So the movement grows for a special representative advisory Board for the B.B.C. in Scotland. This certainly would strengthen the position of Mr. Thomson in his struggle with the programme officials in London.

 * CHOOSING GRID- *
 * LEAK VALUES *

RADIO ON THE "FLYING SCOTSMAN"



It is proposed to supply entertainment for passengers on the famous express by means of radio-gramophones. Here we see one of the sets in use on a special test train that was recently run for experimental purposes.

Val Goldsmith will take over this entertaining now.

The Earl of Clarendon, Mrs. Philip Snowden, and Sir Gordon Nairne are much more frequent visitors to Savoy Hill than they used to be. These three members of the Board are particularly active in programme matters.

Sir Thomas Beecham and Broadcasting

It is an open secret that the long-expected break between the B.B.C.

A friend in Whitehall tells me that it was amusing to witness the wrath of the chief plotters when their little scheme evaporated under the searching rays of publicity.

Trouble in Scotland

There is another outbreak of trouble for the B.B.C. in Scotland. This is the result of a feeling that centralisation has been overdone as far as Scotland is concerned. Mr. Cleghorn Thomson, the brilliant young ex-

It is the almost invariable practice to use a condenser of .0003 mfd. capacity and a grid leak of 2 megohms resistance.

This being the case, it may be asked if a .0003-mfd. condenser and a 2-megohm leak represent the best possible combination to use?

The .0003 condenser may be considered as the best value for most purposes.

The value of the grid leak, however, is a much more variable quantity.

In the first place, it can exercise control of the sensitivity of the receiver, and a high value of leak will sometimes give much greater strength of signals than one of low value.

On the other hand, a low value of grid leak is better from the point of view of quality. With too high a value of leak distortion may be caused.

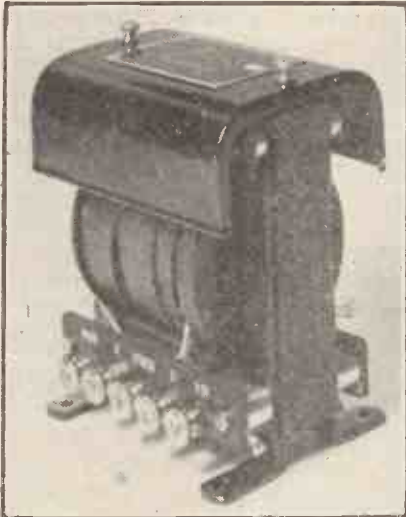
It is often quite an advantage to experiment with different values of grid leaks. For instance, if a set is used mainly for providing good quality reception of the "local" and is operated quite near to the transmitter (say, 5 to 10 miles), it is a good plan to use a leak of quite low value, perhaps even as low as ¼ megohm. This may result in a reduced output from the loud speaker, but that will be hardly noticeable if the signals are already strong. T. B. S.

"AS WE FIND THEM" NEW APPARATUS TESTED

All apparatus reviewed in this section each month has been tested with the utmost care in The "Wireless Constructor" Laboratory.



Magnavox X-Core Speaker
THE Magnavox loud speaker has been on the English market for a good time, and earlier models have previously been reviewed in these columns. We were thus interested to try the new pattern, known as the X-Core owing to the improved methods of construction.



This Varley transformer gives L.T. and H.T. from A.C. mains for any combination of directly- or indirectly-heated A.C. valves.

The model tested was one designed for operation with normal receivers, the necessary step-down transformer being provided in the speaker assembly, while the field current is supplied from alternating current mains, through a transformer and dry rectifier incorporated in the speaker. The particular construction of this speaker ensures absolute alignment of the pole-piece and moving coil, and the choice of a special material known as "Lexide" for the cone also represents an improvement.

Two models are made, one with a 10½-in. cone, and the other with a 7¾-in. cone, the former being that tested in the laboratory. The quality of reproduction when this speaker was fed from a first-class amplifier was remarkably good, the proportion

of the higher tones (lower tones are generally well looked after in a moving-coil speaker) being of a satisfactory nature.

It is usual when testing moving-coil speakers to concentrate upon good reproduction of the bass, but it must not be overlooked that it is very easy to lose reproduction of the higher frequencies in this type of speaker, so much so in fact that many listeners are under the impression that all moving-coil speakers are "boomy," which is another way of saying that they notice the presence of the low tones at the expense of the high.

The price of the 10½-in. cone model designed to run from 200- to 240-volt 50 cycles A.C. mains is £11, and in addition, of course, a suitable baffle or cabinet is necessary. Those readers who do not care to go to this figure can obtain the 7¾-in. model complete with mains drive for the field current at a figure of £8 5s. The reproduction on this model also is good, but, of course, does not come up to that of the larger cone. The British agents for the Magnavox speakers are The Rothermel Corporation, Ltd.

"National" Portable

A large number of portable sets have been placed on the market during the last few years, and many of them, while attractive in their exterior appearance, will scarcely stand examination when "opened up." The "National" portable, which sells for the remarkably low price of fifteen guineas, not only performs well, but is very well made internally, whilst the loud-speaking device incorporated is certainly above the average for portable receivers.

The "National" portable was submitted for test in November. We had it in use almost daily for some time in order to give it an adequate test. The sensitivity and selectivity

on the lower band are both excellent and fully up to the requirements for Brookmans Park. On the upper band sensitivity is good, but the tuning is rather flatter, critical reaction being necessarily needed to separate Radio-Paris from 5 X X when these two stations are in the same line, but the directional effects of the frame are sufficient, of course, to separate them when they are not in line.

Good Sensitivity and Quality

The sensitivity is, however, very good and adequate loud-speaker strength is obtainable from Eiffel Tower, Radio-Paris, Hilversum, and the other long-wave stations. A large size of dry battery is provided, while the accumulator lasts for a very good period without recharging.

Good quality is assured by use of a super-power valve in the output, with 15 volts grid bias. The high-tension consumption of the set proved to be 9 milliamperes at 120 volts. An examination of the valves used would suggest that the high-tension demand would normally be more than this, and probably the valves used



This "Volcon" condenser is reviewed on the following page.

"As We Find Them"—continued

were picked to have rather a lower consumption than usual.

In any case, this consumption is quite modest for such a receiver, particularly when the quality is as good as we found it to be, and should ensure quite a reasonable life for the batteries.

Reaction control on the lower band is quite good throughout the whole range, but on the upper band is not so smooth as we should like. It is, however, quite satisfactory for normal needs, and it is only when one endeavours to work the set on the very edge of reaction that any irregularity ensues. Altogether we consider that this set represents excellent value, while the make-up of the receiver makes it very convenient in operation, the controls being at the top and very easy to handle.

The exterior appearance of the set is attractive and a waterproof cover is provided with the set. Altogether this receiver is a very attractive proposition and represents remarkably good value.

Polar Condensers

Messrs. Wingrove and Rogers, Ltd., the manufacturers of the Polar condensers and other accessories, have submitted for test and report two of



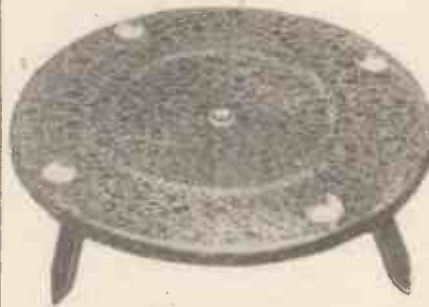
This differential condenser has an effective capacity (each half) of .00015 mfd.

their "Midget" type variable condensers suitable for reaction control. The first is the "Volcon," which has a maximum capacity of .0001 mfd.

It is an exceedingly well-made little component with a stoutly-constructed brass framework. Contact to the moving vanes is made via a pigtail connection, and the vanes themselves run smoothly on ball bearings. We notice that the makers supply an

ebonite insulating bush so that the condenser can be used in sets with metal panels, the insulating bush being necessary in those circuits in which the moving vanes are not earthed.

For instance, in the ordinary Reinartz reaction scheme neither the



This ingenious turntable for supporting a portable set has collapsible legs, for use when required out of doors.

fixed nor moving vanes are at earth potential. The vanes are of stout brass sheet and are accurately spaced.

The second condenser is of the differential type, each side having a maximum capacity of .00015 mfd. This is a very compact little component, a special insulating material being used to separate the fixed and moving vanes. The movement is exceedingly smooth and, as in the "Volcon," connection is made to the moving vanes by a pigtail flexible lead. Tested for insulation at 500 volts, both the "Volcon" and the differential condenser gave an infinity reading. These condensers are good jobs both mechanically and electrically, and can be recommended.

The Magnum "Dissolver"

It is becoming quite usual to provide the more elaborate radio designs with some means of using a pick-up so that the receiver can be changed over from radio to gramophone with the minimum of trouble.

To meet the demand for such a component, Messrs. Burne-Jones & Co., Ltd., of Magnum House, Borough High Street, S.E.1, have produced a centre-tapped potentiometer to which they have given the name "Dissolver."

The device consists of a neatly-enclosed non-inductive resistance element, to which contact is made by means of a moving arm bearing upon a springy brass segment. This scheme prevents wear of the resistance

strip and in consequence there is no change in the resistance value after a period of use.

The component is well finished and has a velvet-like movement. The measured resistance of the particular specimen tested was one megohm, but it should be borne in mind that the actual value is not critical so long as it is not lower than that given. It is a component which performs the duties for which it is intended quite satisfactorily.

The Benjamin Turntable

In order to obtain the best results with a portable set incorporating a built-in frame aerial it is necessary to rotate the receiver.

This procedure is essential not only from the point of view of volume, but also to enable the selective properties of the frame to be employed to their full advantage. Messrs. Benjamin Electric Co., Ltd., have recently brought out a ball-bearing turntable to meet the demands of portable set users.

The turntable itself is mounted on rubber supports and has an attractive brown mottled finish. It has a nice free movement and is capable of supporting the heaviest of sets. It is suitable for use outdoors as well as indoors. For outdoor use three folding legs are provided, and these when opened out provide a firm and effective support for the set. The legs have a height of about four inches, and thus the set itself rests upon the turntable above the level of the ground; a point of some importance inasmuch that capacity between the set and earth is somewhat reduced.



This component is reviewed in the preceding column.



The "SKYSCRAPER" TWO



Used by itself this set is a very sensitive and selective two-valve. Alternatively it will convert an amplifier or your electric-gramophone into a powerful long-range receiver.

By the "WIRELESS CONSTRUCTOR" RESEARCH LABORATORY.

THIS special two-valve receiver is intended for use with the "Super-Quality" Amplifier described last August. No! Don't turn over because you did not make this amplifier, for the "Sky-Scraper" Two is also suitable for use in other ways as well!

It will transform an ordinary L.F. radio amplifier, or even a special electric-gramophone amplifier, into a really powerful wireless receiver. Also, used by itself it forms a fine long-distance set for telephone work.

No coil-changing is necessary, the movement of a single switch changing over both the aerial coil and H.F. transformer for long or ordinary broadcast waves. In the simple and efficient manner in which this change-over is made lies the chief attraction of the set.

Simple Switching

The fact that there is only one switch for wave-changing demonstrates the simplicity of the operation. You will appreciate the efficiency by noting that a complete change-over of aerial coil and H.F. transformer is made. By this means the set retains the advantages of an ordinary receiver in which the coil units are actually interchanged by hand when going from one band to the other.

You will see that a special ganged switch is employed. This switch is in two parts (one section being on either side of the screen), joined together by a common spindle passing through the screen.

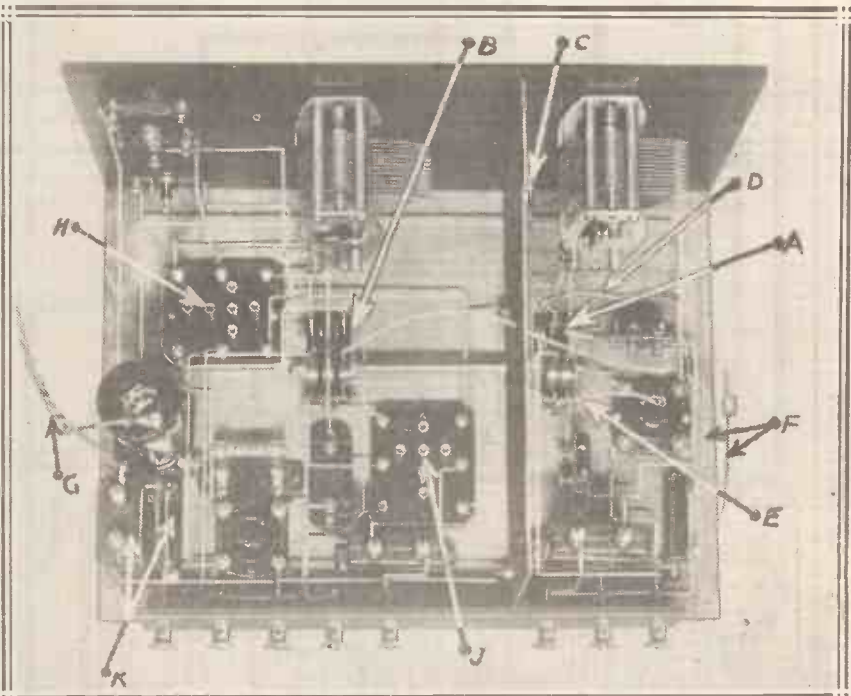
Both sections are controlled by a plunger mounted on the panel on the aerial side of the screen. The plunger has a fairly large movement and is connected to the switch by a short lever, so that when it is pulled in and out it rotates the spindle sufficiently for the latter to work the switch contacts.

Two of the chief advantages of this switch are that wiring is simplified, because all the contacts are not close to the panel, and that by having it in two sections the contacts are brought fairly close to the points to which they have to be connected.

The set consists of two valves, one

The H.F. valve is of the screen-grid type, which, due to its great amplification, makes the set very sensitive. The aerial is connected to this valve by means of a tapped coil, either of the ordinary "X" or centre-tap type, according to the degree of selectivity required.

OUTSTANDING POINTS IN THE DESIGN



The arrows on this photograph indicate features and vital points of the design. A and B are the two parts of a special ganged switch. C is a metal screen situated between the grid and plate circuits of the S.G. valve. The flex leads D and E give different degrees of selectivity and are connected to terminals on the "X" coils. Grid bias is supplied to the S.G. valve by the leads F. G is twin-flex carrying the output and running to an amplifier input. H and J respectively are the long- and lower-wave H.F. transformer holders. The two components indicated by K form a decoupling device which prevents L.F. feed-back.

for H.F. amplification and one for detector. The output is taken via a length of twin-flex wire to the input of the amplifier. If it is to be used with telephones, these two wires are joined to a couple of extra terminals that can be mounted conveniently on the panel.

The "X" coils, having a smaller number of turns of wire in the aerial circuit when they are used, are more selective than centre-tapped coils. The latter are most suitable when the set is to be used a fair way from the nearest broadcasting station.

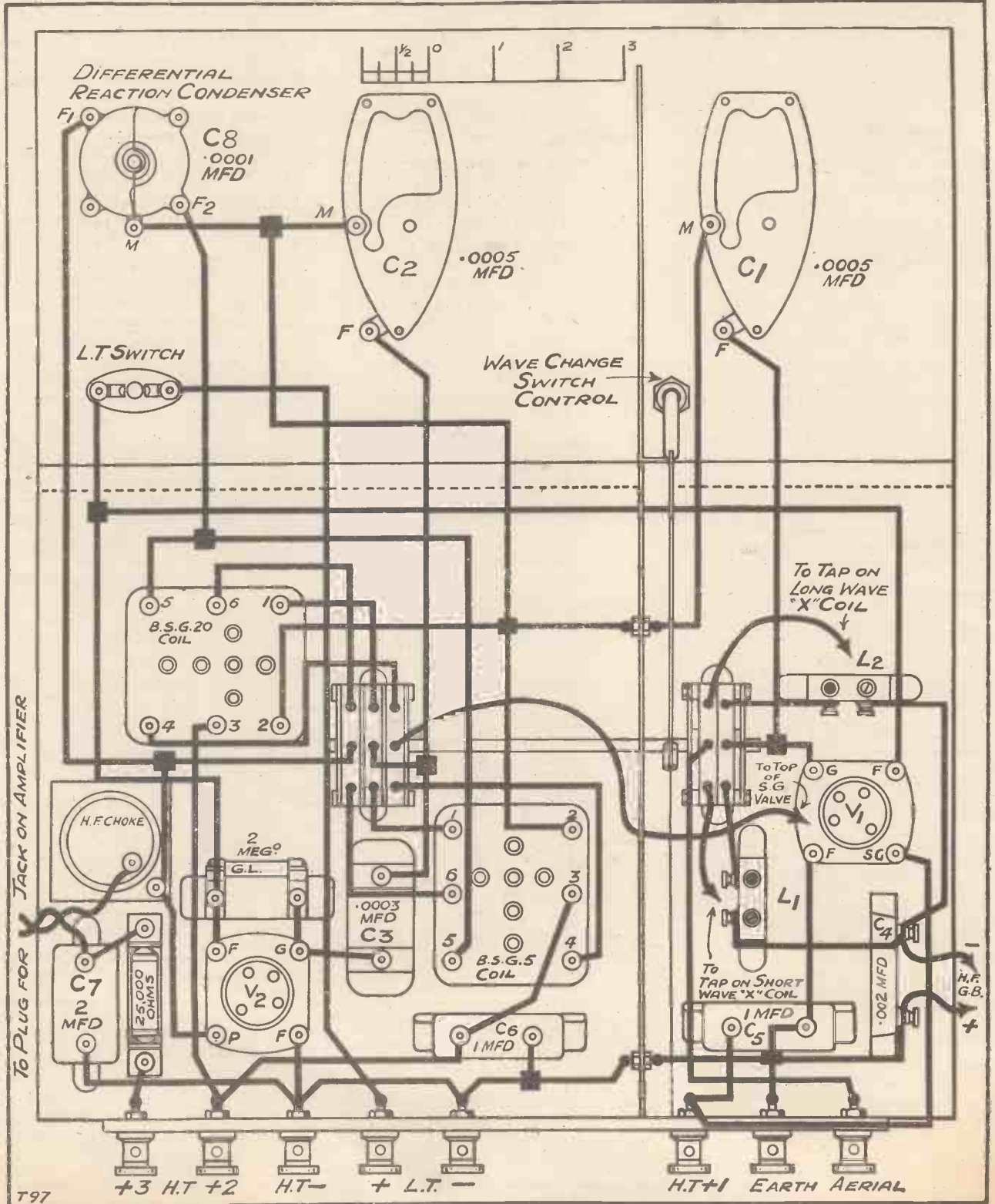
With a set that is to be capable of

The "Skyscraper" Two—continued

distant reception as well as serving as a local station receiver, the question of selectivity has to be considered

carefully. With the "Skyscraper" Two the selectivity is of a very high order.

This is achieved by using special screen-grid H.F. transformers, and a wave-trap will be necessary only if



When wiring from this diagram you will realise how cleverly the components have been arranged to keep all the leads quite short, particularly those running to the sections of the switch.

The "Skyscraper" Two—continued

the set is used within four or five miles of a powerful local station.

An anti-motor-boating scheme is employed in the H.T. lead to the detector valve, so that the set will not give L.F. instability troubles with certain types of amplifiers. (For

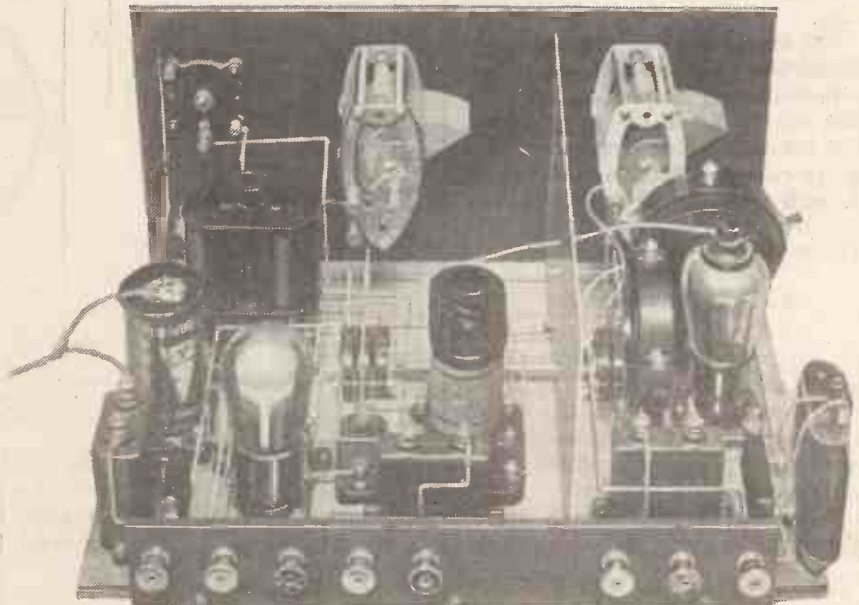
instance, this device is desirable when the set is used with the "1929 Super-Quality Amplifier" described in the WIRELESS CONSTRUCTOR for August, last year, and which has two L.F. transformer stages, one being of the push-pull type.)

Tuning becomes quite easy with these dials, in spite of the selective nature of the set. The aerial coils are of the two-pin plug-in type, whilst the H.F. transformers are 6-pin binocular ones.

In view of this the two tuning

YOU WILL REQUIRE

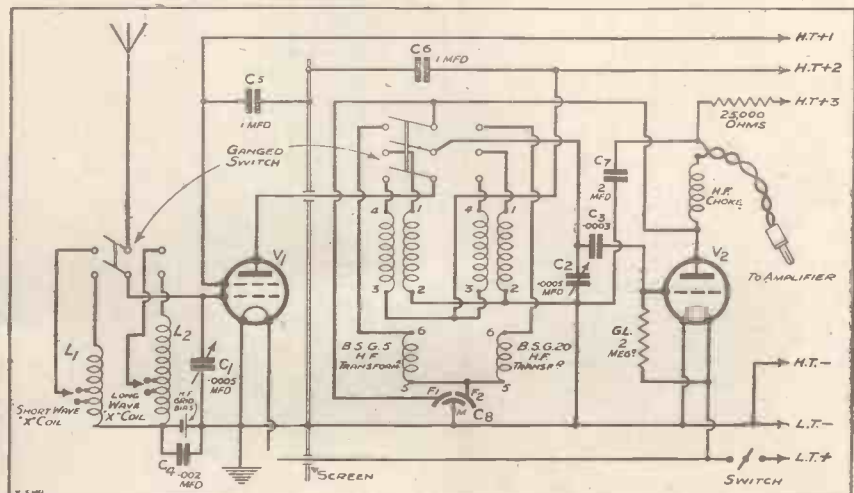
- 1 Panel 14 in. x 7 in. (Radion, or Ebonart, Becol, Goltone, Trolite, Trelleborg, etc.).
 - 1 Cabinet for above, with baseboard 10 in. deep (Pickett, or Lock, Camco, Peto-Scott, Gilbert, etc.).
 - 2 .0005-mfd. variable condensers, slow-motion type or with vernier dials (Lissen, or Ormond, Geophone, Burton, Igranic, Lotus, J.B., Ready Radio, Dubilier, Cyldon, Formo, Colvern, etc.).
 - 1 Differential reaction condenser, .0001, .00013, or .00015 (Ready Radio, or Lotus, Lissen, Dubilier, Pye, Burton, Wearite, Ormond, Magnum, etc.).
 - 1 "On and off" switch (Lotus, or Wearite, Burton, Bulgin, Keystone, Igranic, Lissen, Benjamin, Pioneer, Jewel, etc.).
 - 1 Standard screen 10 in. x 6 in. (Parex, or Ready Radio, Magnum, Keystone, Wearite, etc.).
 - 2 Anti-shock valve holders (Benjamin, or Lotus, Igranic, W.B., Lissen, Formo, Marconiphone, Bowyer-Lowe, Wearite, Burton, Precision, etc.).
 - 1 Baseboard-mounting double-pole change-over switch and 1 three-pole baseboard-mounting change-over switch (Utility, Wearite, etc.).
 - 1 4-in. coupling spindle for above and push-pull panel control (Utility, Wearite, etc.).
 - 2 Single-coil holders (Lotus, or Lissen, Ready Radio, Igranic, Wearite, Magnum, etc.).
 - 2 1-mfd. fixed condensers (T.C.C., or Lissen, Ferranti, Dubilier, Hydra, Mullard, etc.).
 - 1 .002 fixed condenser (Lissen, or T.C.C., Atlas, Dubilier, Mullard, Igranic, Graham-Farish, etc.).
 - 2 6-pin coil holders (Lewcos, or Colvern, Magnum, Keystone, Bowyer-Lowe, etc.).
 - 1 H.F. choke (Varley, or Dubilier, R.I., Lissen, Lotus, Lewcos, Climax, Ready Radio, Bulgin, etc.).
 - 1 .0003 fixed condenser (Dubilier, or Igranic, Graham-Farish, Lissen, T.C.C., Atlas, Mullard, etc.).
 - 1 2-megohm grid leak and holder (Dubilier, Ediswan, Igranic, Lissen, Carborundum, Loewe, Mullard, etc.).
 - 1 25,000-ohm fixed resistance and holder (Ready Radio, or Bulgin, Paroussi, Wearite, etc.).
 - 1 2-mfd. fixed condenser (Dubilier, Ferranti, Hydra, T.C.C., Lissen, Mullard, etc.).
 - 1 Terminal strip 12 in. x 2 in.
 - 8 Indicating terminals, see wiring diagram for markings (Ealex, Belling & Lee, Clix, Igranic, etc.).
- Wire, wander-plugs, screws, etc.



Here is a back-of-panel view of the completed "Skyscraper," with coils, valves and G.B. battery all in place. When you consider the circuit employed, which is shown below, you will appreciate the remarkable degree of compactness attained.

Reaction is controlled with one of the differential reaction condensers now so widely employed, because of the advantages they give of smooth control and small effect on tuning. Two slow-motion dials control the tuning condensers.

dials will not be "in step" as regards degrees. You will not find this a drawback, as once the readings for a few stations at various parts of the dials have been found, it will be easy to keep the two circuits in tune over their whole range.



Efficiency is guaranteed on both wave-bands by a complete change-over of coils when going from one band to the other. This makes it possible to use standard components throughout, and it is quite likely that you will have many of the parts mentioned in the list of requirements on this page.

The "Skyscraper" Two—continued

The constructional work is quite straightforward and requires little comment. The various sections of the work are carried out as follows. Drill the panel in accordance with the panel layout dimensions, then mount the components on it and fix it to the baseboard together with the terminal strip.

The components on the baseboard should now be mounted in accordance with the wiring diagram layout. The first one to fix is the gang switch, and before it is finally screwed down the position for the hole in the screen through which the spindle passes is marked. You can drill this hole with a large-size drill, such as a $\frac{3}{8}$ -in. one.

The Wiring is Easy

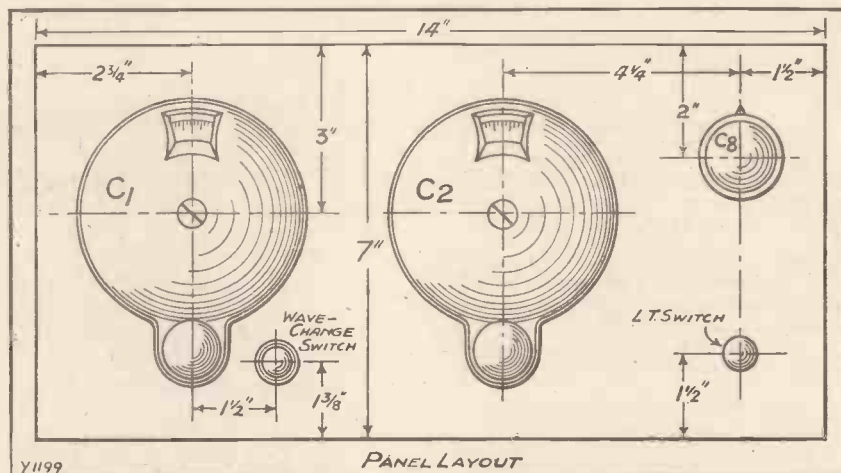
You will, of course, have to move the three-pole part of the switch to screw the screen into place. Incidentally, it will not matter if the switch spindle just touches the screen, as the spindle is entirely insulated from all the switch contacts.

When all the components are in place you have only the wiring to do.

Two wires pass through the screen, and these must, of course, be insulated, even if bare wire is used for the remainder of the connecting leads.

ing connections to the aerial taps on the plug-in coils.

Some of you will have incorporated the "1929 Super-Quality Amplifier"



Drilling the panel, like the rest of the constructional work, is quite easy. All the dimensions that you will require for marking out the panel are given in this diagram.

The wire for the terminal on the top of the screen-grid valve should be flexible, as also should the H.F. grid-bias leads, and the two leads for mak-

ing connections to the aerial taps on the plug-in coils. Some of you will have incorporated the "1929 Super-Quality Amplifier" in the WIRELESS CONSTRUCTOR "All-Electric Gramophone," so we will consider the "Skyscraper" Two in connection with this first. The twin-flex output leads from the set are connected to a plug for insertion into the jack already mounted on the gramophone.

As you know, when this plug is inserted it disconnects the pick-up and puts the set's output across the primary of the L.F. transformer. The three H.T.+ terminals of the set have to be connected each to one of the plugs that are joined to the potentiometer taps on the mains unit.

The L.T. Supply

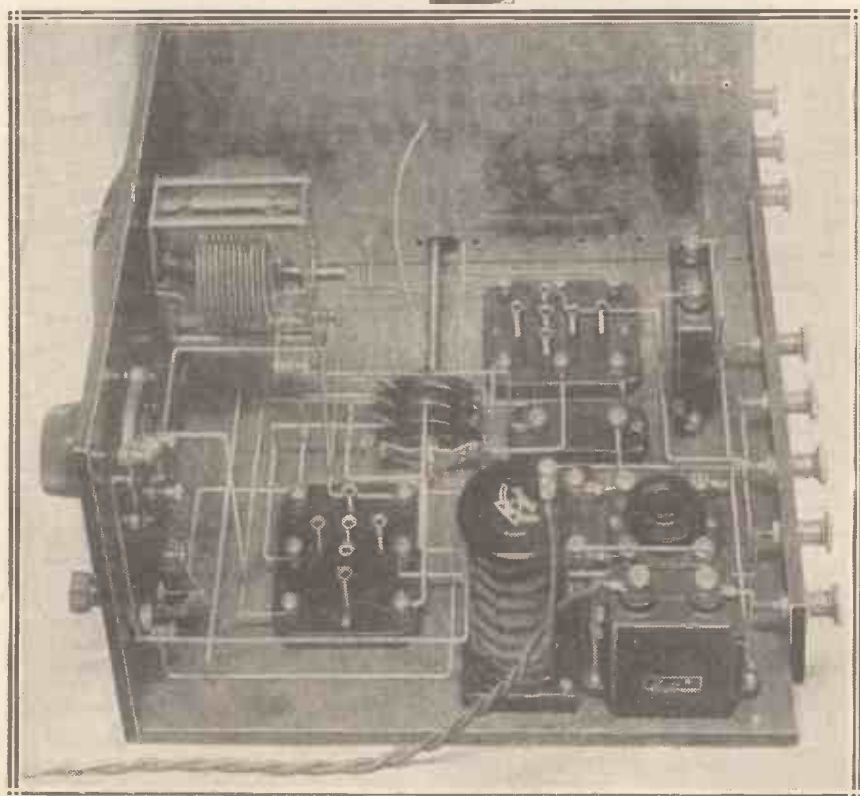
The filaments of the two valves in the "Skyscraper" must be run from an accumulator supply, as the application of raw A.C. to their filaments would result in a continuous hum, since they are types of valves different from those used in the amplifier.

If you have an accumulator for the amplifier filaments you simply run two wires to it from the L.T. terminals of the set, and it is not necessary to make any connection to the H.T.— terminal of the receiver.

On the other hand, if you are running the filaments of the amplifier valves from the mains transformer, it will be necessary to have a small accumulator for the filaments of the receiver valves. In this case it will be necessary to run a wire from the

(Continued on page 419.)

IT WILL SUIT YOUR AMPLIFIER



The output from the receiver is carried by a length of twin-flex wire joined up in the detector valve's plate circuit. It is therefore possible to employ any type of ordinary L.F. amplifier with the set if desired.

MY VIEWS ON RECEIVER DESIGN



By Capt. P.P. Eckersley

M.I.E.E.

THE chief problem to-day is to design a set with sufficient selectivity for all reasonable purposes. There are three kinds of problems in selectivity before the radio receiver designer. (1) The very easy one of separating two practically equal strength signals at 100 to 200 kilocycles per second frequency difference in fundamental carrier-wave frequency; (2) separating two practically equal strength signals of 9 kilocycles per second difference in fundamental carrier-wave frequency; (3) separating two signals of ratio as much as 1,000/1 in field strength and separated in fundamental carrier-wave frequency by 9 kilocycles.

A Terrible Task

Ideally, according to modern ideas, the set that does this has got to have single-handed control, cost not more than £20 complete, and give perfect quality; well, well, well!

Naturally, it cannot all be done. It is attempted in many sets to-day by giving the user three interdependent controls: *volume* as pure magnification of the receiver (usually done by varying the aerial coupling), which is bound up with *reaction*, which also changes magnification at the same time as a changing selectivity, both of which are further influenced by *tuning*. The quality of reproduction depends upon all three factors at once, and we hand over this apparatus to a supposedly non-skilled personnel to operate.

If we had only to consider the problem of listening in service condi-

What is the Ideal Set? This is a difficult question to answer, but in this interesting and informative article our Chief Radio Consultant puts forward his ideas on the subject.

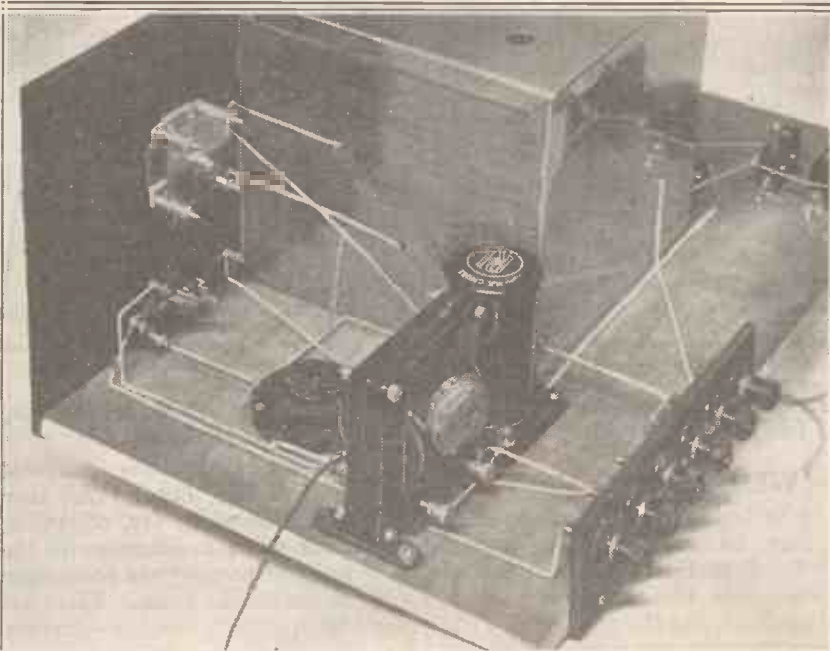
tions where field strength is very strong, we should not be so hard put to it to find a solution to the difficulties inherent to adjustment of controls. Give me the job of design-

ing a set for a Central London listener who truly and faithfully, with his hand on his heart, says he wants no more than the two Brookmans Park transmissions, and I will clasp him to my bosom and almost give him the set.

For the "Local" Only

The strength of the weaker Brookmans Park station in London is nearly always greater than 10 millivolts per metre, and the average (on

A SENSITIVE AND SELECTIVE SET



The L.F. end of a simple broadcast receiver, which is capable of providing excellent quality and is easy to handle. Many readers will recognise the photo as that of the "Maximum" Three, published in our issue for November, 1929.

My Views on Receiver Design—continued

the weaker) in Central London 30 to 40 millivolts per metre, I should say.

A decently designed closed circuit would give a selectivity quite sufficient for the needs of the present case. I would therefore use a simple detector and note mag. for these conditions, and would guarantee one-handed control (simply tuning), and the set would be sufficient for all the needs of the case.

When the Trouble Starts

But ask that set to function still as a one-handed control, say, on the south coast with the "Tower" transmitting, while the user wants Daventry! It just cannot be done, and we have to go to high-frequency stages, and ganging and tuning and

to do it, but is the resulting quality worth while? It is, I think, possible to do it with good quality, but the receiver to do it is not yet made.

I think the next few years will see a very considerable revolution in broadcasting technique, particularly as regards reception; transmission, too, will have to be modified in some sort in order that receiver design may be made simpler.

The problem is wholly one of getting a very simply-operated set, and without interdependent adjustments. There is no set that I know in the world which has a very wide performance which gives really good quality and is truly a one-handed control. I do not think that two- or three-handed control really matters so

and has to be each used separately at different times for a proper control of the car.

The "Ideal" Receiver

☐ If I could take a receiving set with its dial calibrated in kilocycles, set tuning to the wanted station, then bring up the volume until I had the required detector feed, then work an interference eliminator to rob the transmission of fringing from other stations without materially changing tuning or volume, then work a low-frequency volume control so as not to deafen myself and yet still allow my aunt to hear, I should say the set would be perfectly simple to understand and work by almost anyone.

A set, however, which you have to tune in from your own calibration (and then miss the numbers on the scale or try on "long" when you want "medium"), which at last gets you the station you want too weak, which you then bring up by reaction, which spoils the quality and alters the tuning, which all has to be done over again, which suffers interference at last so that you have to go back and alter volume through an aerial coupling which makes the set immediately oscillate (off tune), is not exactly an ideal present to your aged relation from whom you have expectations, and who wants to listen "to all these wireless's, my boy."

The problem is independent of the receiver-out, it's a real problem for service listening to-day.

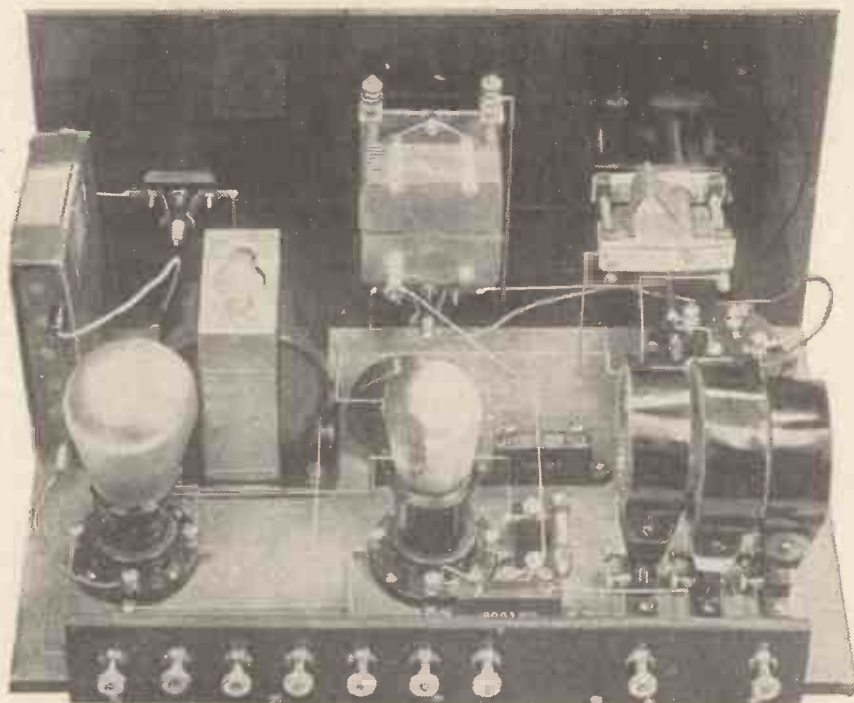
Big Changes Required

I spent Christmas in Norfolk at one end of a large outside aerial with a set which is a very fair example of modern design.

My service stations were the Daventrys, Brookmans Park longer wave (at a pinch), and the Dutch, Scandinavian, and French long-wave stations. I claim to know something about the operation of a wireless receiver, although I am not very good at finicky stuff, but I defy anyone to get reasonable quality from 5 GB or freedom from interference from Langenberg; even Daventry 5 XX had to be carefully adjusted with my three interdependent adjustments, and that was by far the best station.

It is all rather interesting. There have got to be some big changes yet in the whole art.

A CHEAP TWO-VALVE ALL-WAVE RECEIVER



For the home-constructor there is a lot to be said for the plug-in coil two-valve all-wave receiver, for this is cheap to build, and simple to operate.

reaction and volume control and all the rest of it.

What About Quality?

As to trying to get a one-handed receiver to separate two equal-powdered medium-wave stations at night, when the one you want is fading down and the one you don't is fading up, well, you may as well give up the idea on the basis of present technique. It is, of course, possible

long as each handle does something definite and independent.

We know that quite unskilled people drive cars, but I think they would be worried if, say, advancing the spark made a difference to the gear ratio, or pressing the accelerator too far put on the brake. There are three main controls on a car—steering, throttle, and gear ratio selection. Anyone in a few hours masters the fact that each is largely independent

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.

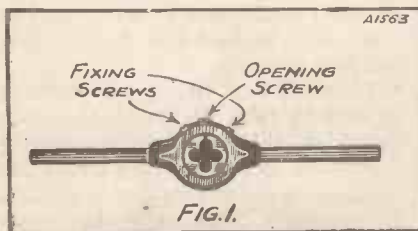


Cheap and Useful

MOST readers will find that 4 B.A. and 6 B.A. dies make an exceedingly useful addition to their constructional outfit. We shall see in a moment how this can be used to advantage in numerous ways, but first of all just a word or two about them.

Since in wireless construction dies will not be used for precision work, and their services will be called upon only now and then, there is no need to purchase tools of the best quality. I have, as a matter of fact, quite a number of dies of various sizes bought at Woolworths' at sixpence a-piece, which have proved perfectly satisfactory for the kind of jobs that I am going to suggest.

One naturally cannot expect for this small sum to obtain dies up to the standard of those sold by first-rate tool shops—still, they are quite good for odd jobs. Readers who go in for more elaborate workshop equipment will no doubt provide themselves



An example of a cheap die holder that gives very satisfactory results.

with dies of high quality, and whilst they are about it, might do well to purchase not plain but collet dies. The collet die has a guide which enables the thread to be started quite easily and makes it almost impossible not to go straight.

The cheap dies mentioned are sold only in the round type illustrated in

Fig. 1, which also shows a useful form of holder. Holders, by the way, are also purchasable at Woolworths'.

If you look at the drawing you will see that the die has a central threaded hole, round which are a number of plain holes. Cuts are made from the threaded hole into the plain holes. These break the threads in the die itself, and provide the necessary cutting edges. The purpose of the



This type of holder is more expensive but much better in operation.

round holes is to allow the die to clear itself whilst in use on metal or ebonite jobs.

In the holder are three set-screws. Two of these fit into recesses in the die itself and their purpose is simply to retain it in position. The middle screw has a pointed business end which fits into a triangular cut in the die. By turning this screw inwards the die can be opened out considerably—it is necessary, of course, at the same time to slacken off the holding screws.

The second form of die and holder are seen in Fig. 2. Here the dies are rectangular in shape, and each is made in two separate parts. Such a die can be opened very widely indeed by slackening off the adjusting screw.

Starting the Thread

One of the most difficult things in putting a male thread on to ebonite or metal is to get a good start.

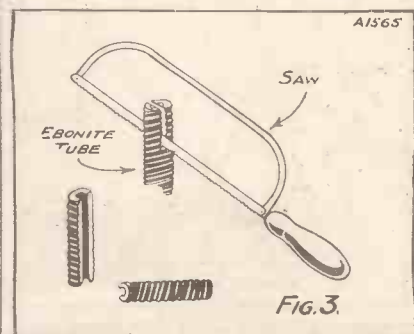
You will notice, if you examine a die, that there is a "let-in" on one face. This face should always be turned towards the work.

If you are using a round die open it out as much as possible when you make a first cut, turn it down as far as you want to go, then slacken off the opening screw and come back again. Continue making the die smaller and smaller until the screw is a perfect fit for the female thread.

If you have a rectangular split die the work is even easier, for you can open out the die until it will slip on to the part to be threaded. The adjusting screw is then turned up pretty tight, and the subsequent procedure is easy.

Wireless Work

In wireless constructional work a couple of dies, Nos. 4 B.A. and 6 B.A., will enable quite a number of



This diagram shows how the spacers are made.

useful little jobs to be done. You know, for instance, what a difficult job it often is to start a nut on a screw or a piece of studding whose end you have cut off. Here is a method which makes it perfectly easy.

Before you start cutting, run on the appropriate die. Then remove the

A Practical Man's Corner—continued

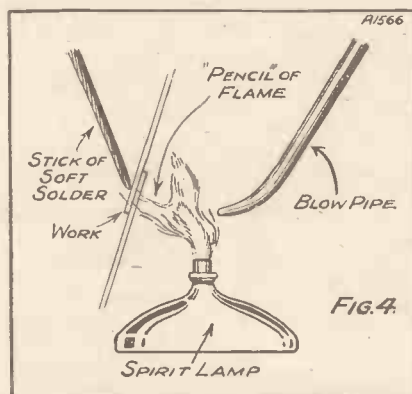
unwanted portion of the screw or studding and file the end flat. Now screw off the die. In coming off it will straighten out any damage there is and make it perfectly easy to start a nut. You will probably have in your toolbox quite a number of B.A. screws which you have discarded because their diameter is rather large, which means that they are a very tight fit for nuts. Just screw them into the die and out again, and you will find that they are perfectly satisfactory.

Perhaps you have some terminals whose milled nuts fit so tightly that your finger and thumb become sore if you have to fiddle about with them much. You can put matters right by running a die over the male portion of the terminal. It is a great nuisance if one strips the thread on the male part of a terminal on some component, for it may be a difficult, if not an impossible, matter to change the terminal itself for another.

Here is a tip worth noting. If the terminal is 4 B.A., file it until the threads have almost disappeared. Taper off the tip a little. The 6 B.A. die can now be run on quite easily.

Another Job Simplified

And here is another job that dies simplify immensely. In many modern aerial or high-frequency intervalve transformers the primary is wound



Soldering two pieces of wire by means of a blowpipe.

over the secondary, being separated from it by insulating distance-pieces.

It is also rather important to space the primary turns—and spacing is not much use unless it will “stay put” when the component is subjected to ordinary handling. Fig. 3 shows how admirable spacers may be made. Take a length of ebonite tube

with an external diameter of a quarter of an inch.

Quite Easy to Do

Cut off a number of pieces, each $\frac{3}{4}$ in. longer than is required to make two spacers. Fill up the hole for $\frac{3}{4}$ in. at one end with a plug of whittled wood. Fix this plugged portion in the jaws of the vice. The plug is necessary, because if it were not there the tube would almost certainly split. Now open out a $\frac{1}{4}$ -in. die as wide as you can and put a thread on to the outside of the tube.

This job is surprisingly easy. If a little turpentine is used as lubricant the die can be turned on quite fast and a good, clean thread results. The Whitworth standard thread is twenty to the inch, so that it is a simple business to measure off just how long each spacer need be. When the tube has been threaded, split it in two with the hacksaw, as shown in Fig. 3, and cut off the spacers into the required length.

These spacers lie nicely on either cylindrical or ribbed coil formers, and since the turns of the primary lie in the threads the finished transformers are exceedingly robust. When making transformers, by the way, one difficulty presents itself. This is to make the spacers stay in position whilst the first two or three turns are put on. This is easily overcome if each is given a touch of either Chatterton's compound or Seccotine.

Easy Soldering

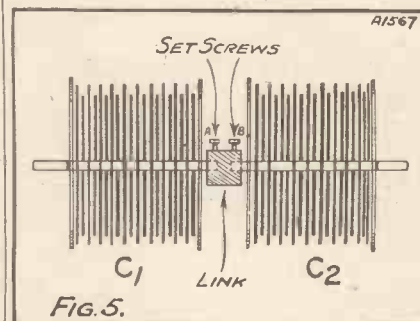
Though soldering has gone out of fashion in wireless construction work, there are still many cases in which the ability to make simple soldered joints is of the greatest service. Broken leads, for example, are easily repaired, whilst resistances, coils, and even transformers whose windings have given way can often be given a new lease of life if their owner has a little skill in soldering.

Some people find the soldering iron itself a rather difficult tool to use, and it certainly has its drawbacks. It must, for example, be kept perfectly clean, and it is most important to heat it to just the right temperature. I make a great deal of use of a very handy little tool, the simple blowpipe. This consists of a metal tube from 10 to 18 inches in length.

The upper end is a quarter to three-eighth inch in diameter and at

its lower end is a nipple with a tiny hole. The large orifice is placed in the mouth of the operator and the small is held close to the flame of a bunsen burner or spirit lamp. When one blows rather strongly into the pipe an intensely hot “pencil” of flame can be directed upon the work in hand.

Fig. 4 shows how the blowpipe is



Fitting up ganged condensers.

used. The work here takes the form of repairing a broken lead. The two ends, having been cleaned up and dressed with a little flux, are placed side by side and a stick of soft solder is held just touching them. The flame is then directed on to the wires by means of the blowpipe. The solder flows and runs delightfully, making a very sound and reliable joint.

Ganging Condensers

It is exceedingly easy to gang certain makes of condenser now on the market, since the spindle has a quarter of an inch shank that protrudes at the inner end. All that is necessary is to cut the outer end of the spindle off short, to mount the two or three condensers to be ganged in line and to make a link or links that will join them up.

Provided that the spindle of both C_1 and C_2 (Fig. 5) are at the same potential—this will mean usually that both sets of moving plates are earthed—a metal coupling is all that is required. This may be made from a piece of $\frac{3}{4}$ -in. brass rod about 1 in. in length, through which is drilled a $\frac{1}{4}$ -in. hole, which must, of course, be perfectly central and dead straight. If the vanes are at different potentials the link should be of ebonite.

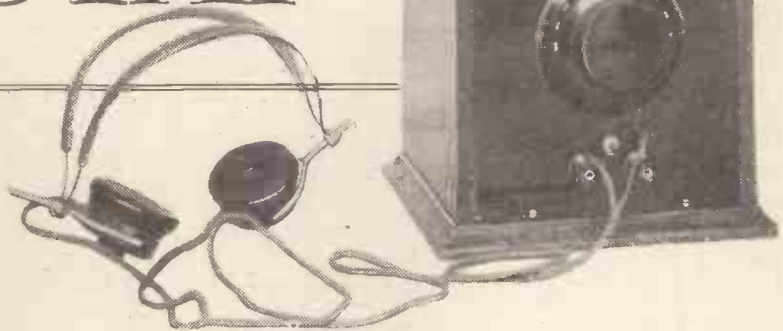
Set-screws (A and B), as shown in the drawing, fix the coupling piece to the inner end of the spindle of C_1 and the outer end of that of C_2 .

The "CRYSTAP"

Do you want a really GOOD crystal set? This is an easily-made but effective receiver, the working of which will be a revelation to those who judge the crystal set's powers from old-fashioned models.

As its name implies, the crystal circuit of the "Crystap" can be tapped on to the tuning coil (in the same way that aerial tapings are taken), to improve strength and selectivity. And it DOES, as you can prove for yourself by making this low-cost high-efficiency receiver.

By G. T. KELSEY.



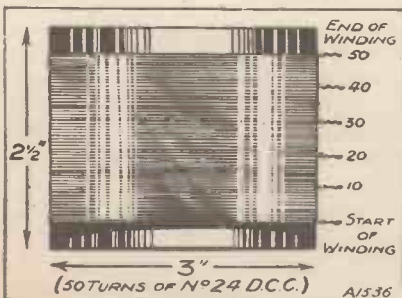
THE "Crystap" receiver, so called by reason of the crystal tapping schemes introduced, is so simple as to bring it within the reach and ability of the veriest novice, and the construction can be undertaken with confidence and the knowledge that the finished article will be bound to "deliver the goods."

In point of fact, it cannot help but work—and work well at that—and if you use reliable parts and follow carefully the constructional procedure you should have many a happy evening to which to look forward.

Inexpensive to Build

The expenditure involved in the construction of the "Crystap" is not likely to be great, and for your convenience a list of the parts required is given on this page.

For the sake of convenience, I chose for use in the original set a crystal detector of the semi-permanent kind. Should you experience any difficulty in obtaining one of this particular type, or if for reasons of your own you prefer a different detector, then there is no reason why you should not use one of the cat-whisker type in place of that originally employed.



Here are the details of the coil, which you can wind for yourself and thus be sure it is exactly as specified for this set. The arrangement of the tapings on which the clips go will be seen clearly in the illustrations on the following pages.

The constructional work should be started with the winding of the special coil. First take the former (which can be of one of the branded materials intended for this purpose, or of cardboard tubing), and pierce two small

which tapings are to be made, placing matchsticks underneath to hold the turns away from the main winding.

It is then a simple matter to remove a small portion of the cotton covering and to solder on a piece of fairly stiff wire to which ultimately the tapping clips can be attached.

Another method is to make tapings as the coil is being wound, merely by twisting the wire so as to form a loop for connecting purposes. These loops can afterwards be scraped free of the insulating covering, and the clips can be taken direct to the bared portion.

The Panel Layout

The completed coil can then be put aside for a moment or two while the panel and baseboard are prepared. A diagram is provided from which your panel can be marked out for drilling, and the only thing that may have to be altered is the hole for the crystal detector should you choose a detector different from the one employed in the original set.

Panel brackets are quite unnecessary,

YOUR SHOPPING LIST.

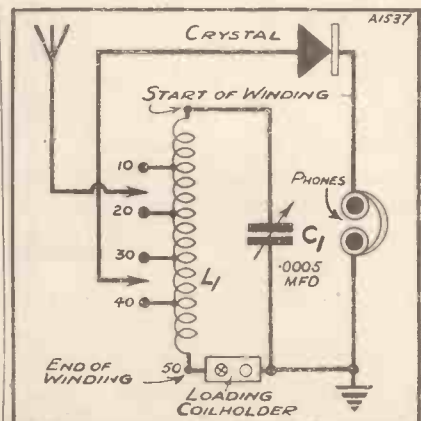
- 1 Panel 7 in. × 7 in. × $\frac{1}{8}$ or $\frac{1}{4}$ in. (Becol). (Radion, Trolite, Ebonart, etc.).
- 1 Cabinet for above, with baseboard 8 in. deep (Cameco, Pickett, Arcraft, etc.).
- 1 .0005 variable condenser with plain dial (Lotus, or Igranic, Utility, Dubilier, J.B., etc.).
- 1 Panel-mounting crystal detector, semi-permanent or cat-whisker type (R.I.). (Jewel R.D.40, Brownie, Harlie, etc.).
- 1 Single-coil holder for baseboard mounting (Wearite, or Lotus, Magnum, Ready Radio, Keystone, Igranic, etc.).
- 4 Engraved terminals with the following markings: "Aerial," "Earth," "Phones" (2) (Igranic, Eelex, etc.).
- Coil former 3 in. diameter and 2½ in. long (Pirtoid). (Paxolin, etc.).
- ½ lb. No. 24 D.C.C. wire.
- If required—one No. 150 or 200 plug-in coil.
- Screws, wire, flex, clips, etc.

holes at each end, roughly about half an inch apart and at a distance of about half an inch from the ends.

Secure one end of the wire through two of these holes and proceed to wind on 50 turns. It should be remembered that tapings are required on this winding at 10, 20, 30 and 40 turns, and upon the method in which you decide to make these tapings will depend the procedure to be followed in the construction of the coil.

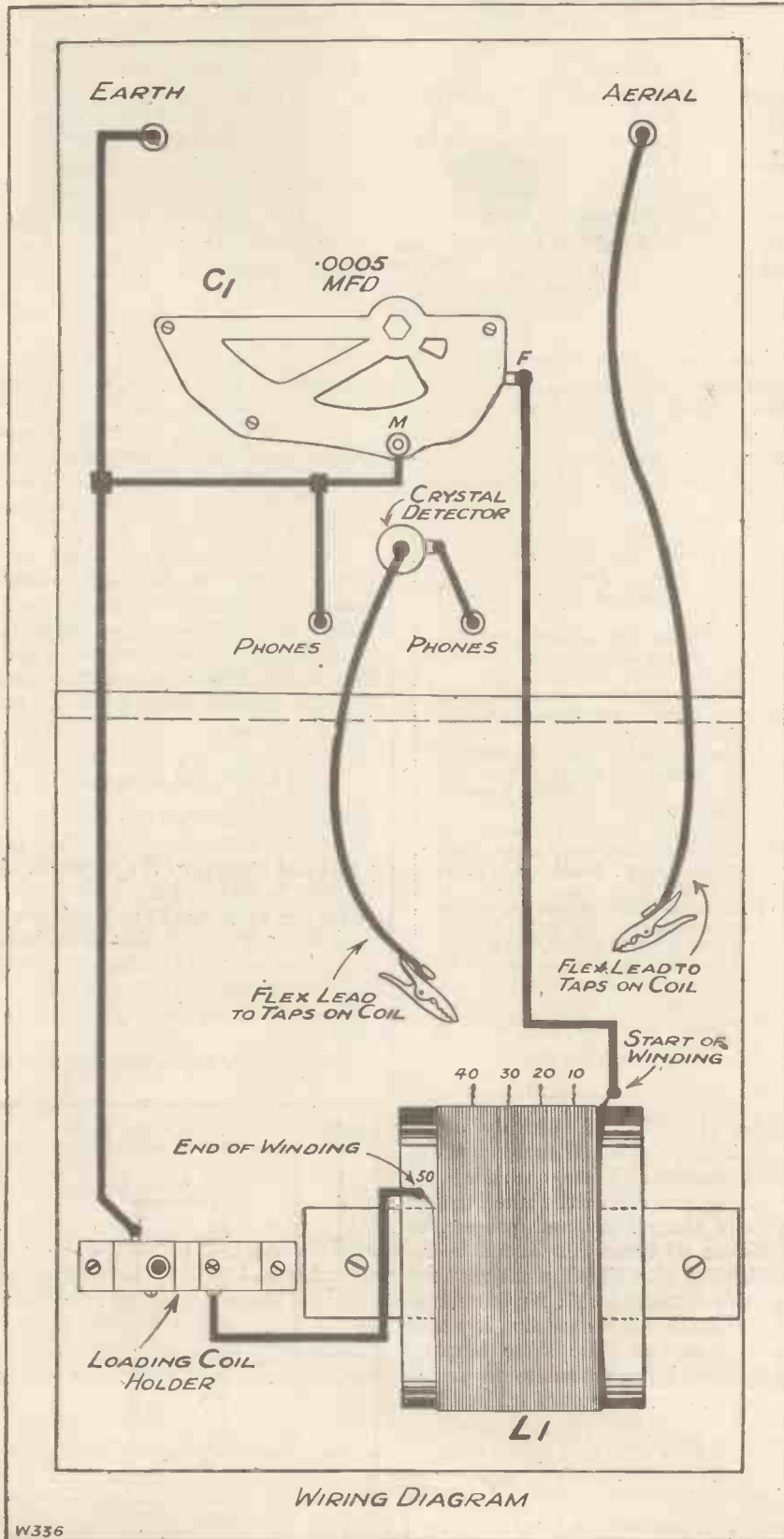
Making the Taps

If you are able to solder, the best scheme is to wind on the full number of turns and then to prise up with a penknife or screwdriver the turns at



This is the circuit—and it is one that will take a lot of beating for strength and selectivity.

The "Crystap"—continued



because there are only two components to be supported, and adequate rigidity is given by the screws along the base of the panel. A good plan is to use a baseboard with a minimum thickness of $\frac{3}{8}$ in. on account of the fact that quite stout screws can then be employed without fear of splitting the wood.

Fixing the Coil

The baseboard carries but two components, and when you have fixed the condenser, the detector and the terminals to the panel you can proceed by securing in position the long-wave coil holder which is to take the loading coil.

The problem of effectively securing to the baseboard the former on which the short-wave coil is wound can be overcome in several different ways, although the most simple scheme is that used in the original set.

A piece of wood, roughly about $\frac{1}{2}$ in. wide and 4 in. long, is passed through the former and a small screw at each end suffices to hold the wood and the coil in position. For the sake of convenience it is desirable to arrange for the tappings on the coil to face the panel, a point to be borne in mind when you are carrying out the coil-fixing operation.

There are two ways in which you can carry out the wiring, and from the point of view of efficiency it does not matter very much which method you adopt in the present set.

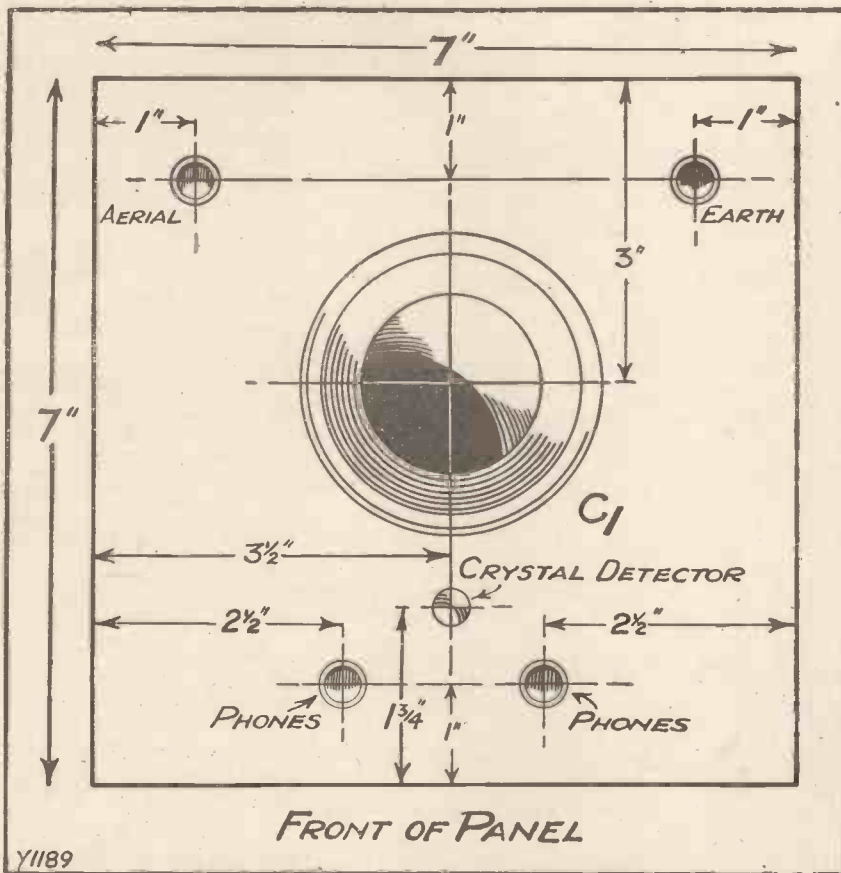
Methods of Wiring

Personally, I prefer to solder the connections because by this method it is possible to make a neater and securer job, but the other method—that of fixing all wires under terminals, thereby doing away with the necessity of using a soldering-iron—will be quite satisfactory.

If it is the latter method you choose, then remember that a reasonable length of wire for connecting purposes should be left over at each end when winding the short-wave coil.

When the set is completed, and you have fixed the tapping clips on the ends of the flex leads from the aerial terminal and the crystal detector, you can proceed to give your "Crystap" its first tests. A little experiment will be necessary in order to determine the ideal position for the

The "Crystap"—continued



The layout makes for easy drilling and convenience in operating.

clips for your particular set of conditions, but as a starting-point the clip from the crystal detector can be attached to the tapping nearest the end of the coil which goes to the fixed plates of the variable condenser.

If you have carefully followed the original layout and wiring this will be near the end of the coil nearer the edge of the baseboard. The other clip—the one from the aerial terminal—should at first be joined to the same tapping on the coil as the other clip. Should reception be loudest at the minimum point on the condenser dial, a lower tap for the aerial should be employed. A shorting strip should also be placed in the loading-coil holder when listening on the lower broadcast band.

The Aerial Clip

Though not designed to be an ultra-selective set, you will find that the "Crystap" makes it possible to tune the local station more sharply merely by placing the clip from the aerial terminal at a position farther towards the loading coil end of the short-wave coil.

Bear in mind that each time you make adjustments to this clip it will be necessary to re-tune the set in order to bring the local station up to full strength.

On the Long Waves

Final adjustment for best results should be made both to the crystal detector and also to the position of the clip which is joined to this component.

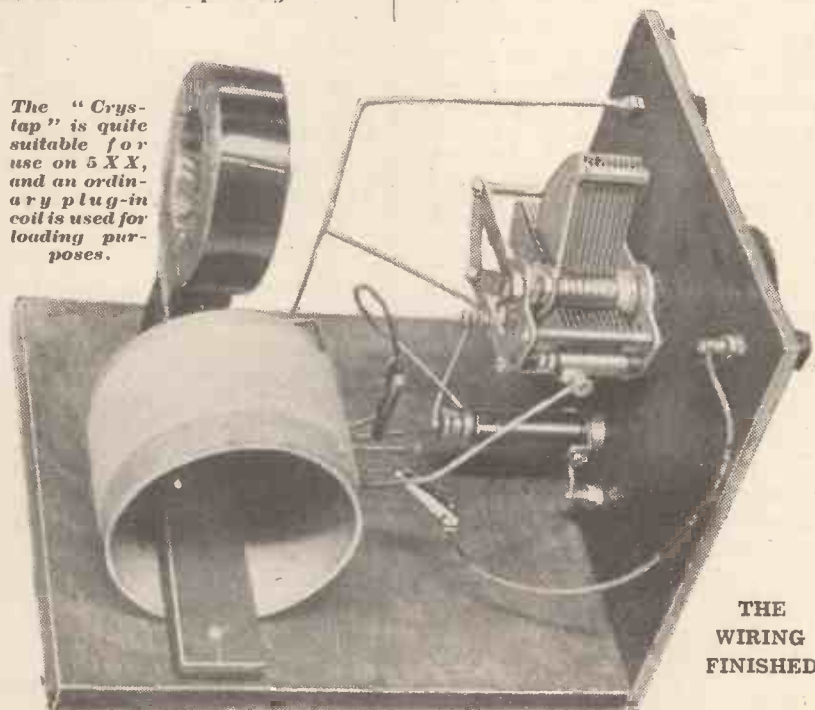
To receive 5 X X, the long-wave station at Daventry (which you should easily be able to do if you are within a radius of about 60 to 80 miles from the station), a No. 150 or No. 200 plug-in coil should be inserted in the loading coil holder in place of the shorting strip, which otherwise must always be used.

With Two Local Stations

Those readers residing in the outlying districts of the Brookmans Park area will find the "Crystap" most effective on the two stations, enabling complete separation of the two transmissions to be obtained.

Those who are very close to the Regional station may find shortening the length of their aerial will be beneficial, but in most cases this will not be necessary.

The "Crystap" is quite suitable for use on 5 X X, and an ordinary plug-in coil is used for loading purposes.



For this illustration the baseboard was tilted from the back to show the details as clearly as possible. The crocodile-clips and their flex leads show how the aerial and crystal connections to the coil are made. Note also the simple but effective method of holding the home-made coil in position on the baseboard.

THE EMPIRE BROADCASTER

WHO SHOULD PAY ?

It has been announced by the Post Office that because there were many more wireless licences last March than were anticipated, the B.B.C. will receive an extra £38,000.

As a result of this, propaganda on behalf of a scheme for building an Empire broadcasting station has received added impetus. In fact, just lately the papers have had a good deal to say, chiefly in the form of letters from correspondents, about the need for a better Empire broadcasting service.

Now, as readers know, the B.B.C. hires from the Marconi Company the Chelmsford short-wave broadcasting station 5 S W, and nightly relays, for the benefit of British listeners abroad, parts of the B.B.C.'s programmes. But it appears that there is a good deal of dissatisfaction with the present service from 5 S W, and British listeners abroad are of the opinion that the B.B.C. should spend more money on 5 S W, and thus provide a better service for overseas listeners.

Government Should Do It

It has also been suggested that the B.B.C. itself should build its own short-wave broadcasting station, presumably with the money subscribed by British listeners in this country. We are definitely against any such plan as that, for we do not think it fair that the licence money subscribed by British listeners in this country should be devoted to providing a short-wave broadcasting station.

At first glance, of course, this may appear to be a rather selfish view. In fact, several listeners from abroad have written in accusing us of a lack of patriotism, etc. But although we sympathise very much indeed with the desire of British listeners abroad to receive programmes from the Old Country, we are sure that, on reflection, they will realise that the B.B.C. is not legally entitled, not morally entitled, to spend the money subscribed for a home broadcasting service on providing a free short-wave service for the benefit of listeners abroad.

However, there is much to be said for an Empire broadcasting station spon-

sored by the Government. And we join very heartily with our friends overseas and quite agree that such a station should be erected by the Government.

Cementing the Empire

We ourselves look forward to the day—and we hope it will be in the near future—when the Government decides that one of the best means for cementing the Empire with the Old Country will be the erection of a powerful short-wave broadcasting station. But it is not right that that station should be built out of the funds

A SWIFT SERVICE!



H. Cochet, the world's tennis champion, listens with a friend to Miss Joan Ridley's 5-valve portable.

supplied by listeners for a home service of British broadcasting.

A reader writes from Egypt to say that he wishes to register a protest against our narrow-minded attitude on the question of Empire broadcasting. He says that he has listened to 5 S W's transmissions for more than two years without a break, and he has not the slightest hesitation in saying that 5 S W delivers the goods, leaving P C J and other short-wave stations completely in the shade.

His set was formerly one of our Research Department's products, The "Short-Wave" Two, but he added a stage of screened-grid H.F. amplification, and also a second L.F. stage transformer-coupled, and gets results

which would delight the heart of even the most fastidious listener.

Frequently he places the loud speaker on the balcony, and adjourns to the other side of the road to listen to 5 S W's programmes. P C J, 7 L O (Nairobi), the German short-wave station on 31 metres, come in at varying strengths, but for reliability, absence of fading, quality, etc., he prefers 5 S W every time.

Private Enterprise?

Our correspondent goes on to say that if, as we assert, a great number of home listeners object to their money being spent on providing free entertainment for British listeners overseas, why don't we use our publicity opportunities and get the Postmaster-General to allow a company to be formed by wireless manufacturers to run a short-wave station as was the case with the old B.B.C. None of the overseas listeners, in the opinion of our correspondent in Egypt, would in the least object to being told that they must always use So-and-so's valves, or So-and-so's sets.

"If P C J had not justified its existence, I do not think that Messrs. Philips would have continued it for so long, or, if the present B.B.C. is as poor as is stated, why not make an appeal to overseas listeners to make a voluntary subscription of, say, 5s. a year?"

Our correspondent says he has not the slightest doubt that the response would clearly demonstrate that Britishers abroad would willingly pay for such a service.

Now, as a matter of fact, we have suggested such a course as this, and it obviously requires some overseas club organisation to get in touch with Britishers abroad and see what really could be done in a financial way to provide such a station. After all, an Empire station costs a lot of money, and it would require a pretty good subscription list to put into effect the scheme suggested by our Egyptian correspondent.

Germ of Practicability

Still, there is a germ of practicability in the idea, and it probably will come to something when British listeners overseas really make up their minds that they are willing to club together to provide such a service, or when they are willing to club together and arrange in Canada, Australia, South Africa and other Colonies and Dominions to provide, in return for 5 S W's transmissions, an

(Continued on page 423.)

AN ERUPTION OF VOLUME



The volume this valve yields is amazing. You'll be impressed by its volcano of sound.

It is the valve we have chosen for a new 2-valve receiver introduced only 3 weeks ago, and which has taken the trade by storm. The volume this receiver delivers is startling. Largely it is due to this amazing Lissen valve. This valve will do for your set what it has done for Lissen's newest commercial receiver. It is the only valve giving pentode output and pentode quality from batteries without shortening the life of batteries.

Every set employing a single stage of L.F. can be vastly improved by introducing the Lissen Power Pentode Valve instead of an ordinary power valve. Many sets with two L.F. stages can also use it—ask your dealer. But next time instead of buying a Power valve buy a Lissen Power Pentode. Listen to its eruption of volume!

LISSEN POWER PENTODE P.T.225
(Consumption only 7 milliamps) **17/6**

17/6

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Lissen H.T. Eliminators deliver smooth, steady current from your house electric supply, and cheaply. The Lissen Eliminators can be put into your set as easily as any battery. From the four types made there will be one to suit you. Send a deposit of 5/- and we will arrange for delivery of the eliminator to suit you, and for it to be properly installed in your set. Send 5/- only. Leave the rest to us. You pay the balance in one sum after installation or by extended instalments.

D.C. Model "A." 100-110 or 200-250v. Cash Price 27/6, or 5/- down and 5 monthly payments of 5/6.

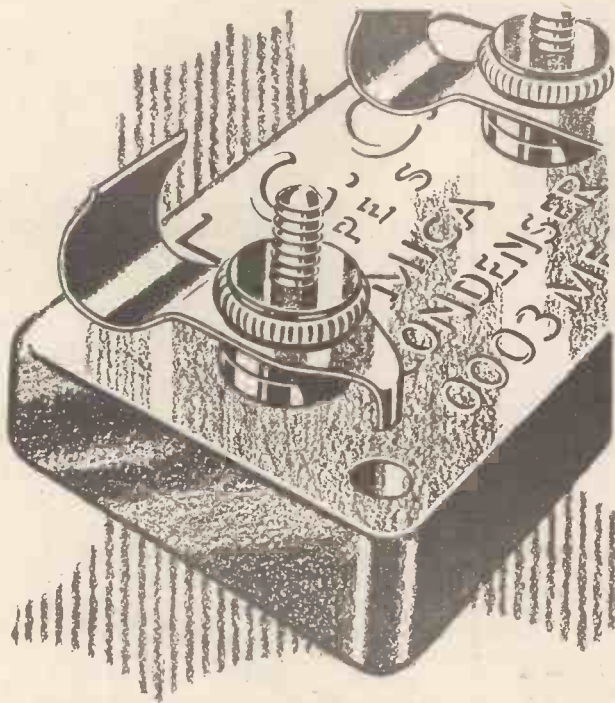
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There's no excuse now for using cheap and doubtful condensers. A genuine T.C.C. costs no more. When a set designer specifies a .0003 mfd. fixed condenser he assumes you will get a .0003 mfd. exactly, not about .0003 mfd. Be certain yourself of getting a condenser of guaranteed capacity — get a T.C.C. Ask for T.C.C. always and be sure. Here are the new prices.

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CONDENSERS**
Flat Type

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*Tested to 500v. D.C.
to work at 250v. peak.*



Adv. Telegraph Condenser Co. Ltd.
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CA 3512



And Now— MAGNAVOX X-Core Dynamic Speaker with the New Beverley Cabinet

Music lovers will welcome the introduction of the new Beverley Cabinets for Magnavox Special Model X-Core Dynamic Speaker Unit. It affords an opportunity to purchase the world's finest moving-coil speaker together with a cabinet of exquisite design. The Beverley Cabinet is available in either Walnut, Oak or Mahogany. The front grill is covered from the inside by a fine silk gauze. The delicate and rich buffed finish of the cabinet work will harmonise with any decorative scheme. The new Beverley Cabinet has been scientifically designed in order to ensure perfect response and reproduction in conjunction with the Magnavox 7-in. Cone X-Core Dynamic Speaker Units, either A.C. or D.C. type.

Model.	Volts.	Complete with Cabinet.
106	110-180 D.C.	£8 15 0
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400	110, 50 cycle A.C.	£11 0 0
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Magnavox Special Model X-Core Units can be purchased separately, deduct 55/- from above prices.

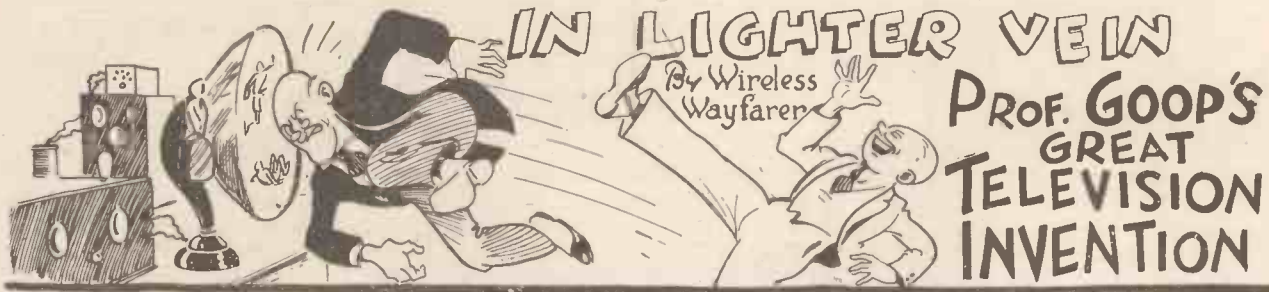


Write for the new 1930 8-page X-Core Folder. Sent free on request.

The Rothermel Corporation Ltd.,

24, Maddox Street, London, W.1

Phone: MAYFAIR 0578/9.



I WAS just engaged in making up my weekly accounts when the professor called in to see me the other evening. I trust, by the way, that you, dear reader, keep accounts, for, believe me, it is the only way of knowing how one really stands.

If you have not some record of the way in which every penny is spent, how can you possibly know whether you are laying out your money to the best advantage and all that kind of thing? Follow my example and you will find that money troubles are banished.

Retaining a Balance

I was just completing my little table for the week which read as follows:

<i>Receipts.</i>		£	s.	d.
Balance from last week ..		0	0	0
Borrowed from Goshbur-				
ton Crump		0	0	2
(Tried to touch him				
for a fiver, but he said				
that this was all he'd				
got.)				
Received from my uncle		0	2	9
(With whom I left				
my evening suit.)				
Found in the overcoat				
that Professor Goop				
lent me		0	0	1½
By sale of pup to Tootle		0	1	3
Sundry odd receipts ..		14	2	2½
		£14	6	6

<i>Expenditure.</i>		£	s.	d.
Box of matches		0	0	1
Stamps and sundries ..		14	6	4
Balance forward		0	0	1
		£14	6	6

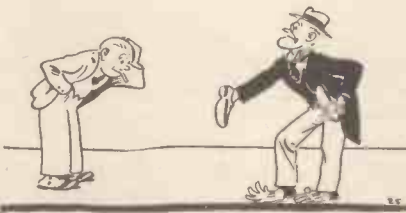
Enter Prof. Goop

You will see in a moment how easy it is for me to put my finger instantly on anything like waste or leakage.

I was searching my pockets for the penny with a view to carrying it forward, when the professor entered.

He was clearly bursting with ideas. His eyes were positively flashing, while the fact that his feet were thrust into a pair of gloves and his hands into a pair of shoes showed quite clearly that his mind was dealing with something pretty absorbing.

Peeling off his quaint handwear and thrusting one of the shoes into either pocket he sank into my biggest armchair, only to rise again with alacrity. I happened to have been showing Goshburton Crump earlier in the evening one of my most prized war



"His mind was dealing with something pretty absorbing."

trophies, one of those German helmets with a spike at the top.

It was disgusting of him to go and leave it in the chair, for really the professor might have damaged it pretty badly. Professor Goop was rather seriously punctured and elected to remain for the time being on his face on the hearthrug, rather than sit in even the softest chair.

Future of Television

"Has it ever occurred to you as curious," he asked, "that whereas the B.B.C. has been broadcasting television for many months now, the number of what we may call seers-in still falls somewhat short, I am credibly informed, of the million mark?"

"Why, not in the least," I said. "You can't see-in without a seeing-in thingmejig, and there are going to be heaps of those available in the near future."

"But what," said the professor, "does the near future mean exactly?"

The best way, I told him, of obtaining a satisfactory answer to the question was to order a cherry or plum tart for the following day's

luncheon. By consulting the oracle of the stones in the well-known manner he would no doubt find his problem immediately solved. The professor was silent for a bit whilst he thought this over.

"Wayfarer," he cried at last, "it is up to you and to me!"

I opened my eyes with a little start.

"What is?" I inquired.

"To make it possible for the public to see these wonderful transmissions of television, not in the near future, but to-morrow."

That Abstract "To-morrow"

"How lucky it is for lots of us," I murmured, "that to-morrow never comes; jam yesterday and jam to-morrow, you know, but never jam to-day."

"We will get on with the business at once," said Professor Goop, "and let me tell you here and now that I have an idea which will entirely revolutionise the reception of television."

"Of course, your ideas and mine always do revolutionise whatever they are concerned with. Have we not revolutionised loud speakers, and valves, and long-distance reception, and broadcast transmissions, and practically everything else?"



"He sank into my biggest armchair, only to rise again with alacrity."

"We have," admitted the professor, "though it is sad to notice how slow the authorities are to avail themselves of our wonderful inventions. My television scheme, however, is one that is bound to be received with acclamation."

"Tell me more," I breathed. "Do you know what a scanning disc is?"

"Why, naturally. One of those yellow things that you put over your

In Lighter Vein—continued

headlamps when it is foggy—no, wait a moment—it's a thing they use for marking the positions of shots on a rifle range."

"Idiot!" screamed the professor, leaping up from his recumbent position, sitting down on a hard chair and leaping up again. "Idiot! The scanning disc is a revolving thing with a lot of holes pierced in it."

"Like Sir K. N. Pepper that day when he tripped up on the hillside and rolled into the gorse bush?"

Synchronisation

"No, no, a scanning disc is flat."

"Well, Sir K. N. was pretty flat by the time they got him out."

"Listen!" growled the professor. "A scanning disc is used in the television receiver for producing that delightful wavy-line effect that is so comfortable for the eyes. It rotates rapidly in front of a neon lamp, whose orange light is most restful to gaze upon. The scanning disc, however, has been hitherto the one great—I may almost say the insurmountable—difficulty of the television inventor."

"Why?"

"Because there is one at the transmitting end and one in each receiving set, and if they don't both rotate at exactly the same speed you get the images all woozy."

"Then why not make them whizz just as fast as each other?"

"How the dickens are you going to do that?"

I thought for a while.

"The thing is perfectly simple,"



"When he tripped up on the hillside and rolled into the gorse bush."

I said at last. "All that you require is a third wave-length for your television broadcasting. Two are already needed, one for speech and one for vision; and the former occupies—or, at any rate, would like to—about half the broadcast band, so that there can't be much objection to sticking in a third.

"I mean to say that if you are going to do a bit of heterodyning you

might just as well do it thoroughly. All that you require on this third wave-length is an impulse automatically sent at the completion of every round of the transmitter scanning disc. By means of a relay this is used to control the disc in the receiving instrument. You will want three receiving sets, of course, but since we have already been promised complete television outfits for a tenner or so, that won't make any difference to anybody."

"A noble idea," said the professor, "and one that we may well turn our attention to in the—er—near future. Meantime, I think that we had better develop my own novel system."

No Neon Lamp

"And what is that?"

"Do away altogether with the scanning disc and the neon lamp. There is no need for a second receiving set; no need for anything special in the way of television apparatus. All that you require can be housed comfortably in a small box, a very small box—far smaller, in fact, than the average dog kennel. You simply stretch a piece of white linen or canvas over the spout or cabinet of your loud speaker and you can see as well as hear a singer."

"But I don't want to see singers."

"Why not?"

"Because they make such beastly faces. One of the great joys of present-day wireless is that you can hear the nice noises that they make without having to witness their facial contortions when they are getting the C in alt., or, in the case of bassos, something that sounds like a volcano starting operations."

"But in my invention you needn't bother about the musicians if you don't like them. You can see the Boat Race or the Derby or anything that is being relayed by means of the microphone."

"That's the stuff to give 'em," I smiled. "Have you got the apparatus working?"

"I have."

"Well, can we see the England and France Rucker match to-morrow?"

How It Works

"I shall be delighted. Let me tell you roughly how it works. What most people do not realise is that the

microphone, whether it is in the studio or in the open air, receives the impact of light waves as well as that of sound waves. Now, it has been proved conclusively by the Thingmebob theory that light waves hit things with a pretty good smack. Anyhow, it follows that light waves are really transmitted by the microphone, and it is equally obvious that they must



"Something that sounds like a volcano starting operations."

be receivable via the loud speaker. Come in to-morrow and see."

On the following day I betook myself to the "Microfarads" at the appointed hour. Over the spout of the loud speaker was draped an old pyjama jacket of his.

The professor switched on, and immediately the battlefield came into view. The ball was being fielded by a Frenchman, who ran like a hare towards our line.

"Go low!" I yelled, carried away with excitement.

Our right-wing three-quarter went for him and missed:

"Like this!" I screamed, getting the professor by the ankles and hurling him into the fireplace.

"No, no!" roared the professor, pushing me through the French windows. "Shove him into touch!"

Just as I returned into the room our full-back fielded the ball.

"Now for a really good kick!" I bellowed. "Find touch! Right up the line!"

The End of the Game

Subconsciously I gave just the kick that I had in mind, and in some queer way the professor went into touch with horrid, crashing sounds amidst the wireless apparatus.

The professor's invention is very wonderful, but I am afraid that it is too exciting to let loose upon the world. What would have happened if it had been a boxing match instead of a game of Rucker I shudder to think.

MAKING H.F. CHOKES

An ordinary H.F. choke is not particularly easy to make, but the short-wave variety is very easily constructed. Two of these chokes are described in this article.

By G. T. KELSEY.



To function efficiently on waves below about 40 metres an H.F. choke does not require to consist of very many turns of wire.

A solenoidal winding of only 100 or 150 turns is all that is required on these "high frequencies" to obtain a satisfactory choking effect, and it is therefore quite a practical proposition to make short-wave chokes at home.

For the Short Waves

They are not satisfactory on broadcast waves—for these waves the construction of a suitable choke is a much more involved business and is really outside the scope of the home-constructor. But on short waves the chokes illustrated on this page, which can be made for a very small cost, will be found completely effective.

In the first example shown the actual "former" consists of a wooden wire spool with one of the end-pieces sawn away. The remaining end-piece forms an excellent mount for fixing purposes, and it also affords a place on which to mount the two terminals.

Use a Dry Former

These terminals, which need only be of the very small variety, should be fixed before the actual winding is commenced, and to do away with the possibility of a short-circuit and reduce the chances of a high-resistance leak it is a sound scheme to counter-sink the terminal shanks on the underside of the mount.

The mention of high-resistance leaks tempts us to remind you that the wooden spool *must* be thoroughly dry before being used in the construction of a choke, and it is therefore worth while to leave it in a hot oven for an hour or two before it is used.

The winding in this first example, providing the diameter of the former is roughly about $\frac{3}{4}$ in., should consist of 150 turns of No. 34 or 36 D.S.C.

or enamelled wire (preferably the former) and the start and finish should be taken to the two terminals. If your particular former happens to be only $\frac{1}{2}$ in. in diameter, then it would be advisable to wind on an extra 25 or 30, or even 50, turns in order to make up for the discrepancy in the diameter.

The second choke is wound on a former consisting of a cardboard or similar tube, roughly 1 in. in diameter, which is supported in a vertical position on a small piece of ebonite. The exact method of fixing the tube to the ebonite is one which you can best decide for yourself. Nevertheless, from the point of view of simplicity, the scheme employed in the construction of the original choke has much to commend it and is probably the best.

Mounting the Coil

A small piece of wood is wedged into the end of the cardboard tube, and a screw and nut suffice to hold

this to the ebonite base. To make a thoroughly sound job the wood can be stuck down to the ebonite mount, if you happen to have a gluepot handy.

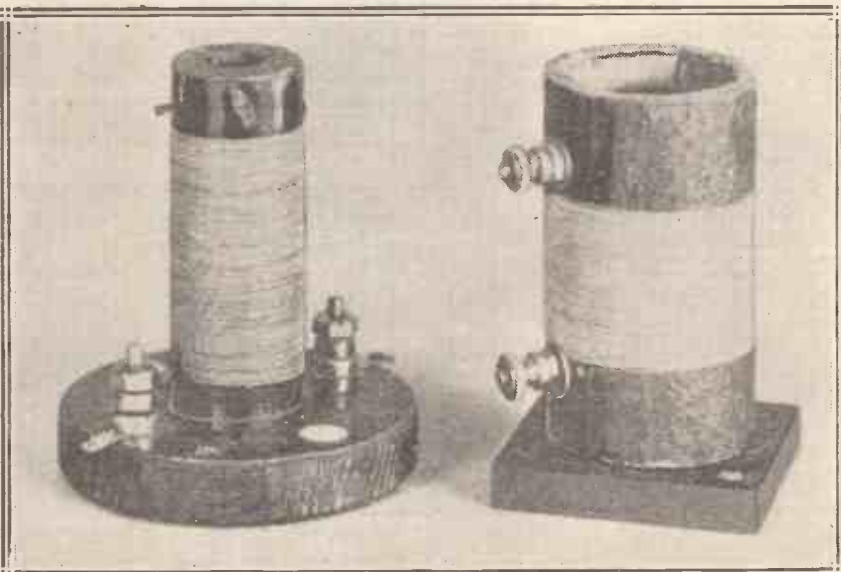
As you will see upon referring to the photograph, the terminals on the second choke are carried on the actual former, and here again the terminals should be of the small type, so as to be in keeping with the rest of the component.

The Number of Turns

In this case, with the larger former, the turn numbers will not require to be so great—a hundred will in most cases be sufficient, the gauge and type of wire being the same as in the first example described.

The two terminals provide an anchorage for the start and end of the winding, and only if the finished winding feels at all loose will it be necessary to use a "blob" of Chatterton's compound or sealing wax for extra security at each end.

TWO VERY SIMPLE SHORT-WAVE H.F. CHOKES



On the left is a short-wave choke wound on an ordinary wooden wire bobbin, while for the H.F. choke on the right a 1 in. cardboard former is employed.



WITH PICK-UP AND SPEAKER

Pick-up Amplifiers—Stabilising L.F. Stages—Interference from Turntable Motors—The Mechanical Noise Nuisance—Making Gramophone Cabinets Sound-Proof.

Conducted by A. JOHNSON-RANDALL.

I HOPE my readers will be lenient with me for saying a few words once more about the subject of pick-up amplifiers.

It is the old question of resistance-transformer, or all-transformer coupling. The WIRELESS CONSTRUCTOR Queries Dept. is continually receiving queries from "fans" who are not quite sure what type of amplifier to use.

Well, for ordinary domestic purposes I always plump for R.C.-transformer coupling. My reasons are many. In the first place there is the question of stability. When the pick-up is joined up in front of the *first* valve of a two-stage transformer amplifier it must be remembered that there are three amplifying valves in circuit and the magnification is enormous.

Consequently, there is every chance of L.F. howling taking place. With R.C. coupling, however, the overall magnification is considerably lower and, moreover, there is little chance of reaction effects occurring, as in the case of two transformers.

Avoiding Overloading

One stage of R.C. followed by a good transformer stage gives all the volume required for domestic purposes. With two transformers there is a possibility of the last valve being overloaded, and in addition some care must be taken in the choice of the valve preceding the last stage.

To avoid overloading it is desirable to employ one of the L.F. and not "H.F." type. Thus the grid can be adequately biased and the volume applied to the last valve controlled by a high-resistance potentiometer across the secondary winding of the second transformer.

If really big volume is required it is best to use push-pull valves in the output stage, with high anode voltages. Amplifiers of this type are, of course, only employed for moving-coil work and so forth.

Then there is another point not generally understood. It is not

necessary to possess a moving-coil speaker in order to enjoy the advantages of a pick-up. Any good cone movement of the balanced-armature or similar type will give excellent results. A moving-coil instrument is very nice, but certainly not essential.

Watch Your H.T.!

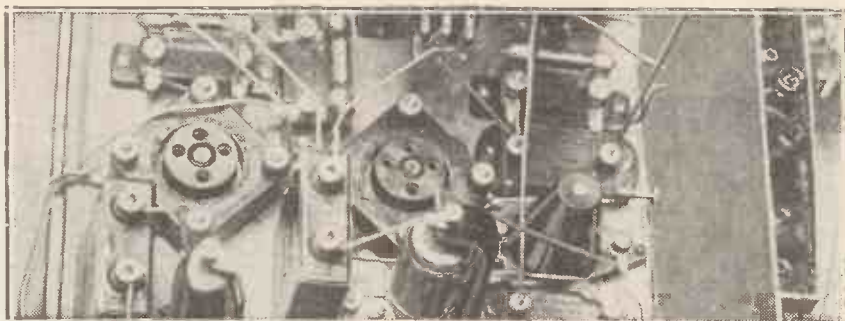
Here are some hints on stabilising unruly gramophone amplifiers. First, make sure that the H.T. supply is in perfect order. If an eliminator is being used see that it is actually capable of supplying the required anode current without excessive voltage drop.

Next, insert an anti-motor-boating unit in series with the first amplifying

Last month the problem of interference from the turntable electric motor was discussed and readers who suffer from this trouble were advised to try earthing the metal frame of the motor, or screening it with an iron box.

Cases have been met with where these expedients are not sufficient, notably when the motor is run on direct current. This is a rather more difficult case to deal with, and the first step is to make sure that the motor is really behaving properly and is not giving an undue amount of sparking, indicating faulty adjustment of brushes or defective parts.

If this does not appear to be the case, try this remedy. Obtain two high-voltage type Mansbridge condensers of 2 mfd. capacity each, and



This shows the low-frequency side of the baseboard of a large radio-gram receiver called the "Sologram." In this case resistance coupling was used throughout, a volume control being placed immediately after the detector valve.

valve. This can consist of a resistance having a value of 20,000–30,000 ohms, joined in series with the H.T. + lead and the H.T. side of the anode resistance or first transformer primary winding.

A 4-mfd. condenser is then joined between this point of connection and L.T.—

In addition it is advisable to try reversing the leads to the secondary of one of the transformers in a two-transformer-coupled amplifier.

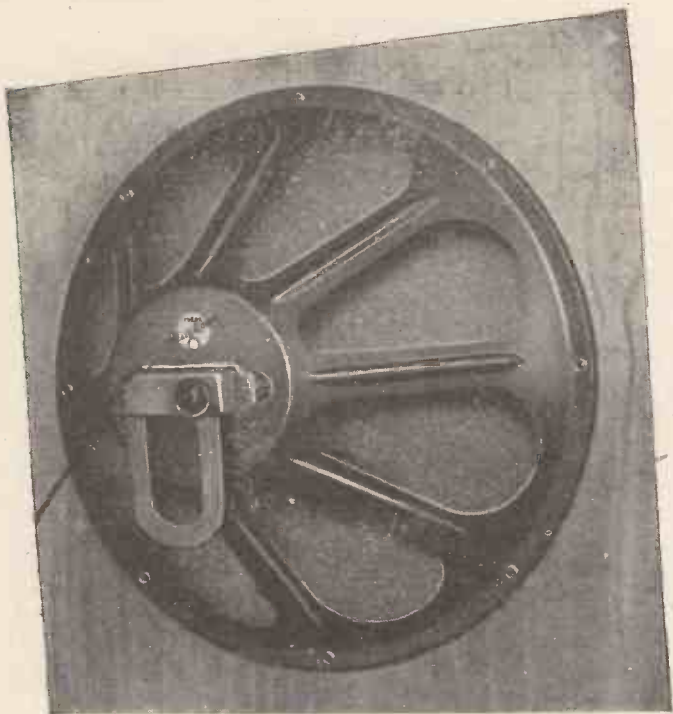
Other useful "dodges" are to earth the cores or metal shroudings of the transformers and also the pick-up arm.

connect them up in series across the two mains terminals of the motor. Then connect the centre point between the two condensers to earth, and you will probably find that the noise has gone.

Be Careful with Mains

This tip is given for what it may be worth, with the warning that anything done upon the mains circuit should be carried out with considerable care and circumspection.

Here is a tip about the timing of a gramophone unit which does not appear to be so widely known as it should. The usual method of timing



THE CHASSIS FOR THE BLUE SPOT UNIT

This is the Blue Spot "Major" Chassis, complete with 13" cone—built by Blue Spot to provide a chassis worthy of the Blue Spot 66K Unit.

Simply bolt the Unit to the Chassis and there you have a Blue Spot speaker ready to play. Price 15/.

The Blue Spot "Minor" Chassis with 9½" cone is 12/6.

AND THE 66K UNIT

The Blue Spot 66K Unit needs no introduction. The pioneer of balanced armature units still remains the most sought after unit to-day, because of its purity of reproduction no matter what volume is given it. Sold under guarantee at 25/- in special carton.



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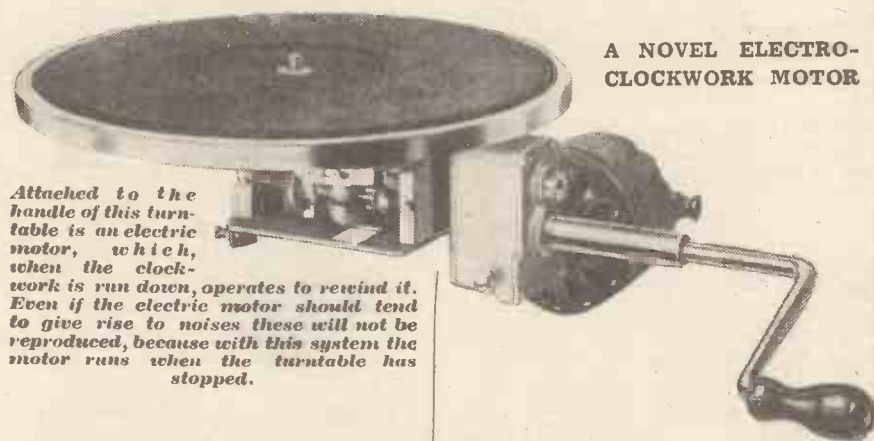
Distributors for Northern England, Scotland and North Wales: H. C. Rawson (Sheffield and London), Ltd. 100, London Road, Sheffield (Telephone: Sheffield 26006); 22, St. Mary's Parsonage, Manchester (Telephone: Manchester City 3329).



With Pick-Up and Speaker—continued

in a rough-and-ready fashion is to put a mark on the edge of the turntable and count revolutions with the aid of this indicator for a given period of time; say, one or two minutes. But this is not a very easy thing to carry out, since one has to glance at the watch periodically, and one is apt to lose sight of the indicating mark as one does so, and so make a mistake in counting.

An easier scheme is to pick out an old record which is worn-out or otherwise finished with, and rule upon it a radial line in the form of a scratch made with the aid of a sharp knife-point and a ruler. If you place this upon the gramophone and drop the pick-up on the record you will hear a sharp click every time the scratch comes round, and by listening to the loud speaker you can count the clicks and keep your eye upon the watch continuously, and so avoid mistakes in counting.



A NOVEL ELECTRO-CLOCKWORK MOTOR

Attached to the handle of this turntable is an electric motor, which, when the clockwork is run down, operates to rewind it. Even if the electric motor should tend to give rise to noises these will not be reproduced, because with this system the motor runs when the turntable has stopped.

Here is a point about "scratch" which may be consoling to those who are annoyed by a particularly "hissy" pick-up. It seems that a certain amount of needle scratch is more or less inevitable with the present methods of gramophone reproduction, simply because it is desirable that a new needle should quickly grind itself in to a good fit in the groove on the record, and so the manufacturers find it necessary to include a definite amount of abrasive material in the composition of the record itself.

This grinding process seems bound to produce a certain amount of scratch, and it will perhaps help us to put up with it cheerfully if we know what is going on; incidentally, the writer may perhaps be pardoned

for mentioning that he personally always looks with suspicion on any pick-up which is stated to give "no scratch whatever," because in his experience pick-ups which conform to this description are usually notably deficient in high-note response!

The Noise Nuisance

Pick-ups vary almost as much in the amount of direct mechanical noise they produce as in the quality of reproduction they give, a fact which will probably be modified considerably in the near future as manufacturers find out more about these devices. Indeed, for some time past it has been possible to produce a good pick-up which makes very little mechanical noise, but apparently the factors involved are not very widely known among the manufacturers, or else the question is not taken very seriously.

Be that as it may, the fact remains that quite a number of the pick-ups on

suggested that you should attempt to silence the pick-up itself, because to do so is no easy job, and requires a certain knowledge of methods of damping which few pick-up users can be expected to possess. The safer method is to try and prevent the noise of the pick-up getting out into the room, and an improvement can usually be effected on these lines.

The most stubborn case is that of a portable gramophone used for pick-up work, because the inability to shut



Don't forget that a volume control is supremely important in radio-gram receivers, owing to the wide differences in input which is experienced when different records are played.

the lid when the instrument is being used is too great a handicap. Where the lid can be shut, the first point calling for attention is the sound-tightness of the joint, and a little stopping of cracks here will often produce sufficient improvement to make the noise no longer noticeable.

Fitting the Felt

First, therefore, look at the lid and see whether it makes anything like a good joint with the body of the case. Probably it does not, so investigate the possibilities of a few narrow strips of felt and some Seccotine. You can get quite a good joint in this way.

If you find you can still hear the pick-up unpleasantly, it may be worth while to consider lining the whole of the inner surface of the lid, especially if the cabinet is made of rather thin material. Felt is again a good material, but a thicker grade is desirable this time. It can be held in place with Seccotine as before, with the aid of some drawing pins to keep it evenly stretched until the adhesive has set.

Muffling Methods

Under more normal domestic conditions, on the other hand, these pick-up noises can be rather troublesome, and a few hints on their reduction may not be amiss. It is not

BETTER THAN A 2-VOLT PENTODE



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CHEAPER

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The Mazda P.240 is more robust and more economical, too, the H.T. current being only about two-thirds of that consumed by a pentode, whilst its cost price is considerably lower.

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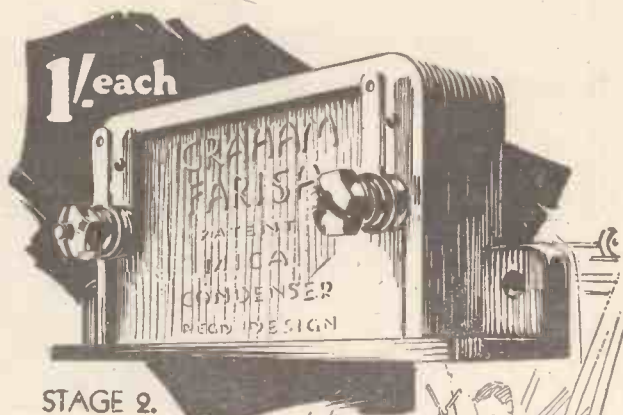
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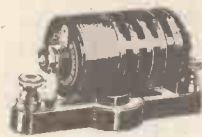
EDISWAN

THE CONSTRUCTION OF A CONDENSER



STAGE 2.

Toolmaking



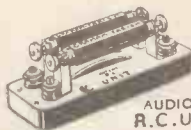
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"Electroficient" Eliminator Choke ... 22/6
"Multiwave" H.F. Choke 5/-
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"Electroficient" Mains Transformer ... 39/6

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in a dealer's shop.



If you run extension leads from your set to a loud speaker in another room you should be careful over the various points discussed in this interesting article.

By G. W. EVANS.

"I HAVE recently run long extension leads from a four-valve set to various rooms upstairs and downstairs so that a loud speaker can be plugged into any room. The plugs are in parallel and only one loud speaker is used, but I find that whenever these extension leads are used I have to push up the signal strength considerably, owing to a loss, apparently in these leads. The speaker is quite an ordinary one, and when used on the set gives ample volume."

H.T. Leakage

Such was the remark made to me the other day by a listener who has quite a good four-valve set, and who was in trouble owing to the extension leads cutting down his signal strength.

No doubt many of you have experienced the same trouble when you have run long leads to your set for a speaker elsewhere in the house. As a rule, any bother due to extension leads is present only in sets which

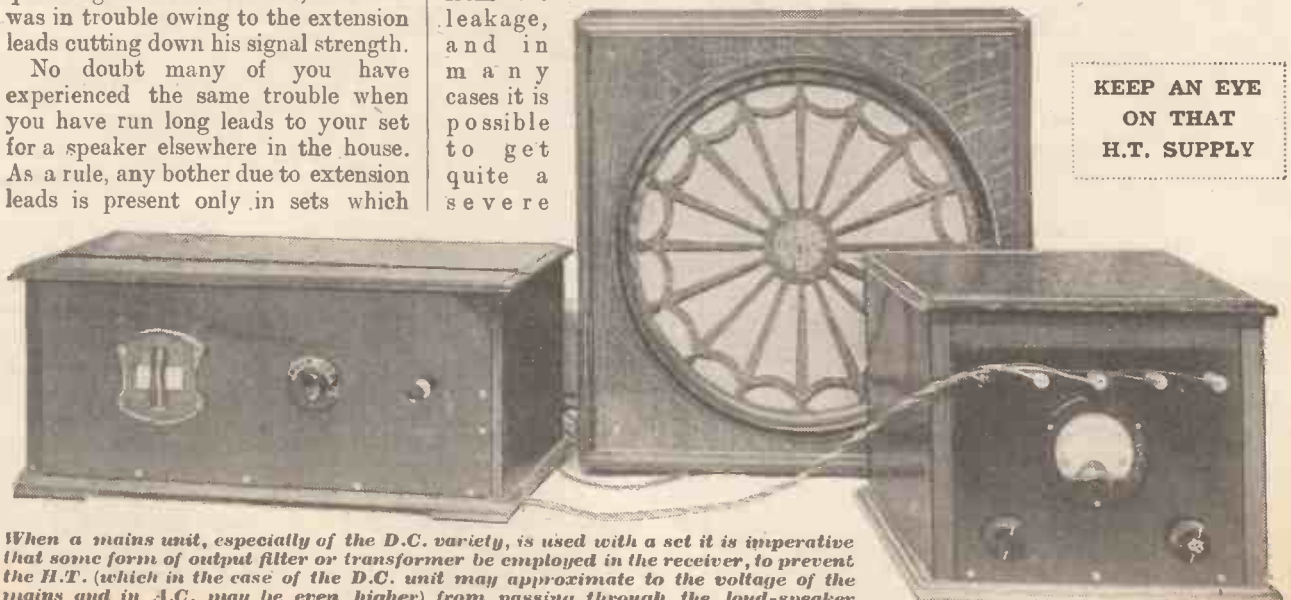
have the loud speaker direct in the plate circuit of the last valve. This, I found, was the case with the listener whose complaint is instanced above, and upon a filter circuit being included the results were very greatly improved.

If you take long loud-speaker leads all round the house from the set it is advisable to isolate those leads from the H.T. circuit. You have only to allow one of those leads to short-circuit to anything that may be more or less earthed, and a considerable amount of H.T. may be lost. There is definitely no advantage in having long loud-speaker leads with the H.T. coming through the lot. It is asking for trouble from H.T. leakage, and in many cases it is possible to get quite a severe

shock from the ends of such leads where plugs or terminals are arranged to take the loud speaker.

The Output Circuit

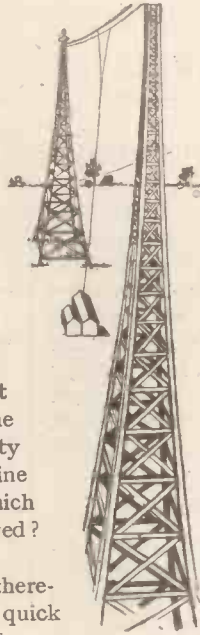
A filter output circuit completely obviates this trouble, and should always be used where long extension leads are to be employed, especially if mains H.T. is used for the set, when direct leads would be very dangerous. Many people prefer an output transformer and a further transformer in front of the loud speaker in order to isolate the speaker completely from the leads, and this system is quite useful when long leads are being employed for a moving-coil



KEEP AN EYE ON THAT H.T. SUPPLY

When a mains unit, especially of the D.C. variety, is used with a set it is imperative that some form of output filter or transformer be employed in the receiver, to prevent the H.T. (which in the case of the D.C. unit may approximate to the voltage of the mains and in A.C. may be even higher) from passing through the loud-speaker extension leads.

Do You Know-



that every portable radio set with a self-contained aerial is directional, which means that to obtain the loudest volume and the greatest selectivity the set must be in direct line with the station from which signals are to be received?

A Portable Receiver, therefore, must be capable of quick and easy manoeuvring in any direction, and the Benjamin ball-bearing Turntable will enable your set to do this without any alteration to its existing design.

Attractive crystalline finish, ball-bearing, and with hinged and folding legs. These folding legs enable the set to be used out of doors, raising the Receiver above the damp ground and thereby considerably reducing capacity to earth. The legs can be folded up for indoor use. Price 7/6 complete.



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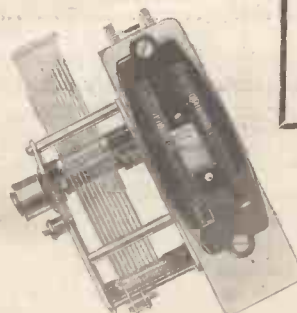
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Losing L.S. Power—continued

speaker. In such a case a 1 to 1 ratio transformer is quite suitable at the set end, the step-down transformer for the moving-coil speaker being on the speaker itself. In this way a loss in current is avoided which might otherwise take place if the step-down transformer were included at the set end and the speaker carried some distance away.

For the majority of extension leads it is usually best to use parallel wires somewhat separated, instead of twisted flex, so as to cut down the self-capacity of the wires, which might easily bypass some of the higher frequencies, causing the reproduction to lose a certain amount of its brilliance.

Series or Parallel?

Where two loud speakers are used it is never safe to arrange them to be either in series or in parallel without first testing them on temporary leads.

A certain amount of experiment is necessary to arrange several loud speakers at the ends of extension leads, and so find out the best

before putting in the permanent leads.

A great deal may be lost if the extension system is not quite suited to the speaker in use, but whatever system of connection is employed—either series or parallel, or a combination of both—it is practically essential from the point of view of H.T. safety and from that of ensuring good results to use a filter output circuit, or an output transformer, in the set.

The "Earth" Return

It is often suggested when an output filter circuit is employed that as one end of the loud speaker is earthed there is need to take only one lead round the house, and to tap any speaker between that and earth. This frequently works quite well, but it is not always successful.

You may earth your set perfectly, you may carry out a good extension lead and connect the loud speaker at one end to the lead and the other end to what you consider is an earthed point, with the result that because the so-called earth point is very badly

There are cases, of course, where earthed objects can be used for the return lead perfectly satisfactory, but it is by no means a safe method, and in wireless it is necessary to make sure of everything, so I would very strongly advise the use of double extension leads.

Avoid Flimsy Wire

Extension leads must be carried out carefully, and with really good wire, if they are to be perfectly successful. The 26 or 28 D.C.C. wire which I have seen used in many houses may last several months, but in the end they are usually either broken or the insulation badly frayed, with the result that a fault is set up which is rather difficult to trace, and which, when traced, is not always easy repair without complete rewiring of the extension leads.

In the case, of course, where the H.T. flows through the wire, which I am afraid is very frequently the case, then any shorting may easily run down the H.T. battery and leave the owner at a loss to explain why his batteries have lasted so badly. Well-insulated wire, an output filter circuit, and two-wire extension leads should always be employed if you want to make sure of things.

PACKING OUTPUT FILTER CHOKES



A good quality and low-resistance L.F. choke is essential if an output filter is to be used. In this photograph we see girls at Messrs. Varley's factory busily packing up output chokes, ready for the home constructor.

combination. Thus if you are considering wiring your house to take these leads, and are debating the question of whether you will place them in series or in parallel, it would be advisable to run test extension leads round first, roughly arranged as you intend having the final leads and then to test them in the various combinations of series and parallel, in order to find out the best results

earthed the signal strength is considerably cut down.

A gas pipe is very often recommended in such cases, but I have come across instances where the use of a gas pipe in an upstairs room as a return lead for the loud speaker has proved completely inadequate, and in the end I have usually found that a two-wire extension lead has been necessary.

* **STAINING BASEBOARDS** *
* By A. S. CLARK. *

WHITE baseboards never look so well as those with a nice flat-brown finish. If the baseboard is left white the set tends to have an amateurish look, and naturally all constructors like their receiver to look as much like a professional job as possible.

The baseboard should not be covered with varnish stain, since this has a highly glossy surface and takes a long time to dry. A suitable stain can be made with permanganate of potash and water. This chemical can be obtained for about 2d. an ounce, and one ounce will last a lifetime as far as baseboards are concerned.

Just a little should be mixed with water. It will have a bright reddish appearance in liquid form, but dries a very pleasing brown. An ordinary varnish brush can be used for applying the stain.

Coils specified for the "Skyscraper 2" and "Vi-King 3"

Lewcos Binocular Coils, used in the "Skyscraper 2," are specially designed with fieldless or astatic windings to prevent interaction and are sufficiently fieldless for use in multi-stage receivers without screening.

Lewcos "X" Coils (triple tapped), also used in this Receiver, are ultra selective.

- 60 X - - - - 4/6 each
- 250 X - - - - 6/6 each

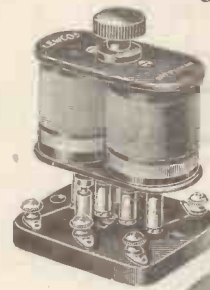


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Lewcos Centre-tapped Coils, as used in the "Vi-King 3," ensure at all times the maximum inductance with minimum self-capacity. These Lewcos Coils provide you with every quality that makes for selective tuning, together with greater volume and purity of tone.

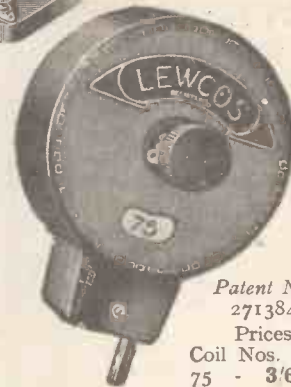
Lewcos H.F. Choke, also included in the "Vi-King 3," gives efficient performance on all wave-lengths from 2,000 down to 20 metres.

Price - - 7/9 each



Binocular Coils
Patent 277876.
(Specified for this Receiver.)

BSP5 - 10/6 each
BSP20 - 12/6 each



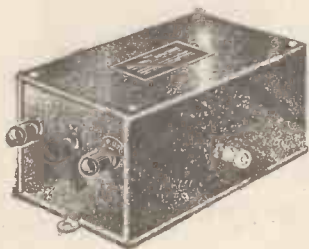
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Prices:

Coil Nos. 25 to
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Our News Bulletin

B.B.C.'s New Chief

THE appointment of Lord Clarendon to the Governor-Generalship of South Africa means, of course, that a new Chairman of the B.B.C. will have to be found. Lord Clarendon has been Chairman of the B.B.C. now for three years, and the fact that he is vacating the post arouses a good deal of speculation as to who Lord Clarendon's successor will be.

In the Running

Several names have been mentioned, including those of Lord Lee, Mrs. Philip Snowden, and Dr. Montague Rendall. The latter, by the way, has been a Governor of the B.B.C. since 1927. Probably by the time this issue is on sale this vexed question will have been settled, and we shall

know who Lord Clarendon's successor will be.

Lord Clarendon Interviewed

Interviewed by one of our representatives the other day, Lord Clarendon, probably for the first time since he was appointed Chairman of the B.B.C., spoke about his work at Savoy Hill.

"There have been some wonderful changes in the last few years," he said. "Compared with, say, 1923, the broadcasting services of to-day are remarkably good."

That Alternative Programme

Talking about programmes, Lord Clarendon said: "Well, we can't please everyone, but we can, I think, and do please the majority. The Regional Scheme will relieve the Corporation of some of the criticisms,

because listeners nowhere will have to rely on one programme; they will have an alternative."

First in the Field

Our readers have probably noticed that the newspapers and other magazines in this country have been full lately of details for constructing wave-traps, rejectors, and such-like, for dealing with the twin-wave problem from Brookmans Park. Our contemporaries, "Popular Wireless" and "Modern Wireless," as our readers hardly need telling, were the first to provide amateurs with a reliable solution to the problem, and it is interesting to note how our lead has been followed so closely.

Taming the Twins

There has been a "Daily Mail" wave-trap, and, of course, other wireless magazines have produced their various solutions to the problem. Even "World Radio," with a lot of microphone publicity, produced the B.B.C.'s idea of a satisfactory gadget for dealing with Brookmans Park.

The Great Test

In short, there are likely to be hundreds of various types of wave-

(Continued on page 414.)

MAGNUM SHORT-WAVE CONVERTOR



Attach this to your set and hear the whole wide world.

Price £4 : 10 : 0

Complete with coils and ready for use. Full particulars, including a list of short-wave stations, on application.

MAGNUM H.F. CHOKE

For "Vi-King 3,"



Standard type 7/6
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Build the "VI-KING THREE"

	£	s.	d.
1 Cabinet, with 10" Baseboard	1	4	0
1 Ebonite Panel, 18" x 7", ready drilled	4	0	6
1 Magnum .0001 Reaction Condenser	7	6	6
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1 J.B. .0003 S/M Condenser	10	0	0
1 Polar .0001 S/M Reaction Condenser	6	0	0
1 Wearite D.P.C.O. Switch	3	0	0
2 On-Off Switches	3	6	0
2 Spring and 1 Ordinary Valve Holders	4	0	0
6 Lotus Single Coil Mounts	4	0	0
2 Lissen 2-meg. Leaks and Holders	1	6	6
1 Lissen Baseboard Potentiometer	12	6	6
1 Telsen L.F. Transformer	2	0	0
8 Indicating Terminals, as specified	1	6	6
1 Terminal Strip, 16" x 24, ready drilled	10	0	0
1 Each Coils No. 25, 40 and 50	10	0	0
1 Set Short Wave Coils	1	13	6
3 Valves, as specified	1	6	6
Wire, Flex, Screws, etc.			
	£8	15	0

Any of above parts supplied separately as required. The "Vi-King" Set, as above, ready wired and tested, including Royalty ... £10 15 0 We specialise in "Skyscraper Two," "S.S. Unit," "Chassis Short-Waver," "Silver Champion," "A.C. Chassis Three," and all apparatus described in "Wireless Constructor." Full particulars and useful list of leading short-wave stations free on application. Catalogue and lists free on application.

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Specified for the "B.P. 5," "Connoisseur's Five," "Exhibition Five," etc.

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Supplied in two Resistance values:—

1/2 meg. for Transformer Coupling and Pick-up Control.

2 meg. for R.C. Coupling.

Price 7/6



AVAILABLE
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to fit inside any Portable



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SPECIFICATION. COMBINED MODEL.

For A.C. Mains, 100 volts, 200/220, or 230/250. 40/100 cycles.
Incorporates Westinghouse Metal Rectifier on H.T. and L.T. side.
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H.T. Tappings, 2 variables (one lators.
S.G.) and one Power. Price - - - £5-17-6



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60 ohms.
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New Type A.C. Valve Holders . . . 1/3 each
Horizontal, for S.G. Valves . . . 1/9 each
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Switch, G.25 . . . 2/3
Constant Inductance L.F. Chokes . . . 21/-
Universal Input Transformer,
200 v., 5 1/2 v., 4 v. 37/8
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IMPROVED TYPE H.F. CHOKE
Iron Cored, can be supplied Centre Tapped.
Inductance, 300,000 microhenries. Resistance,
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WEARITE COMPONENTS

162

OUR NEWS BULLETIN

—continued from page 412

traps available before very long. Many of them, of course, betray very ingenious ideas, but the great test is their practical application to the problem of the twin-wave transmissions, especially where interference is so bad for listeners living close to Brookmans Park.

Capt. Eckersley's Verdict

Our "Brookman's" Rejector (known also as the "Kendall" Rejector, and described in "Modern Wireless") is generally acclaimed to be the best device of its kind, and we might remind our readers of Captain Eckersley's review of this instrument. Captain Eckersley said it was the best thing of its kind he had ever come across.

And so, if you are still troubled with interference and have not built one of these rejectors, do so, and we feel sure you will not be disappointed.

A Minister for Radio?

Mr. Eric Dunstan, who used to be an announcer at the B.B.C., and is now radio and film critic for an

evening newspaper, has been writing about the type of man who ought to succeed Lord Clarendon as Chairman of the B.B.C. Mr. Dunstan seems to think he should be a Minister of the Crown, or else officially connected with the Post Office. We agree with the view that such a Chairman should be free from Government influence, and he should be strong enough to

the sort of spirit which emanated from the B.B.C. when it was first formed in 1922.

Red-tape and officialdom are all very well in their place, but Savoy Hill is not the place for them.

Radio Finance

The Post Office commercial accounts for the financial year ended March, 1929, show that the cash receipts for wireless receiving licences totalled £1,358,187. The percentage allowed to the Post Office for expenses of management, distribution of licences, etc., was £178,686, leaving a balance of £1,179,501. The B.B.C. were paid £887,616, thus leaving a balance for the Exchequer of £291,885.

This represents an increase of £47,000 during the year.

Broadcasting Fees for Parsons?

The "Daily News" was asking recently why parsons are not paid for their services when broadcasting for the B.B.C. An official at Savoy Hill, when asked why parsons didn't get a fee, replied: "Because we never have paid fees in such cases, and also because of the regulation laid down by the Religious Advisory Committee which recommended that

(Continued on page 416.)

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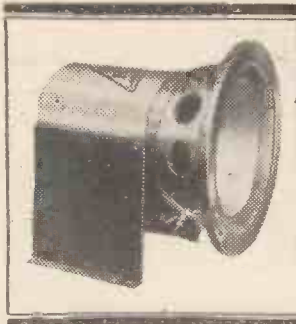
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handle the Post Office autocrats as they should be handled.

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The first quality in the successor to Lord Clarendon should be understanding of public psychology—a man who knows how to get a staff around him who can select good programmes and who can stimulate

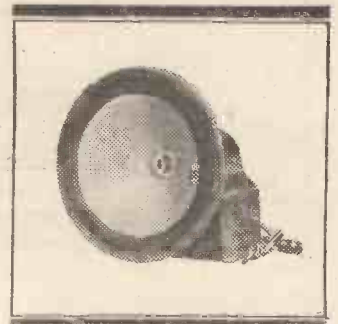


The Junior "R.K." Unit has a 6in. straight-sided cone with moving coil, having an impedance of 10-15 ohms at 50/4,000 cycles. Copper damping rings are fitted to reduce the impedance at the higher frequencies. Price £ 6/6/0.

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Senior "R.K." Unit with A.C. Field Excitation.—This "R.K." Unit has a 10in. corrugated cone with moving coil, having an impedance of 10-15 ohms at 50/4,000 cycles. The pot magnet is mounted in a pressed metal base which also contains a mains transformer, Mazda U.U. 60/250 rectifier valve, and smoothing condenser for the supply of field current. Price £ 11/10/0.



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Showrooms in all the Principal Towns.

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Four years have elapsed since then, but still the "R.K." maintains its leadership.

The new range of models includes the 10in. cone "Senior," with or without built-in rectifier for use with A.C. mains supply, and the "Junior" with 6in. cone.

W.68.

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THE SLAVE MARKET

By

**FRANK
BRANGWYN R.A.**

This is a very small reproduction of Frank Brangwyn's beautiful picture which is reproduced in COLOUR on the Cover of PART 1, and is also included among the EIGHT choice colour pictures in this part.

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OUR NEWS BULLETIN

—continued from page 414

the clergy should not be paid a fee for broadcasting, and that only out-of-pocket expenses should be met."

This is remarkable in view of the considerable attention paid by the B.B.C. to religious broadcasting, and the importance attached to it by Sir John Reith, the Director-General—who, by the way, is the son of a parson.

As the "Daily News" points out, it is interesting that Sir Harry Lauder should be paid £1,000 for three broadcasts, and yet the parson when he broadcasts a religious service should receive nothing.

The Situation in France

Wireless broadcasting is certainly not so successful and so popular in France as it is in other countries in the world. To begin with, ranked by power of stations, France is about the thirtieth on the list, and according to the "Star," even Finland has a more powerful station than France's best, while Britain's total wireless power is more than twenty

times greater than that of France; Germany's is five times greater. As regards exports, Germany exports nine times as much wireless material as France, while Britain's total wireless business is about ten times greater than that of France.

Indian Broadcasting to Continue

The Government of India has decided to take over broadcasting. It looked at first as though, when the Indian Broadcasting Company closed down, broadcasting in India would not be continued at all, but, having made strenuous efforts, the Bombay Radio Club—the pioneers of broadcasting in India—have at last succeeded in persuading the Government to carry on.

Over Three Million!

Sixty-eight thousand extra licences were taken out in January, and the B.B.C. attributes this chiefly to the efforts to attract new listeners during Radio Week. Altogether there are 3,017,023 licences in force in Great Britain.

Never Heard of Annie Laurie!

The B.B.C. is rather pleased with itself, for the other day it received a letter from a listener who tuned

in 5 GB and listened to an Old-Time Programme. This listener, who lives in the very heart of Scotland, was very tickled and pleased by a certain melody, and he asked the B.B.C. whether it would be good enough to re-broadcast it. The melody was "Annie Laurie," and he had never heard of it before!

Trans-Pacific Pictures Test

Dr. F. E. W. Alexanderson, the well-known American physicist, recently sent a picture by wireless from New York to Sydney, Australia, and received it back again in recognisable form after it had been rebroadcast by a station in Sydney!

Those Running Commentaries

There is a rumour that football broadcasts will be stopped because of recent small attendances at big matches, such as the Arsenal v. Everton match at Highbury the other week. It is reported that only 33,000 people saw the game instead of the 55,000 expected, and as the Arsenal matches are the only important ones broadcast, the authorities are beginning to put two and two together, and reaching the conclusion that broadcasting does keep people away from matches.



D.C. 9 volts 1 amp., 23/6. Full details and circuits for all types are given in our 32-page book, "The All-Metal Way, 1930." Every constructor should have one. Send 2d. stamp for a copy to:—

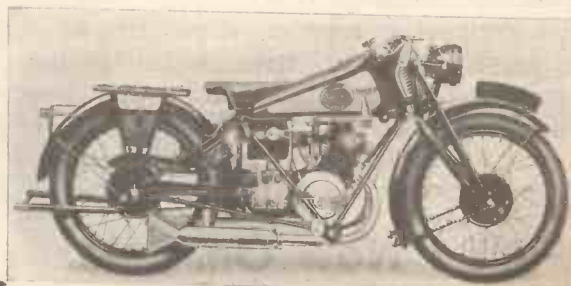
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have no moving or fragile parts, and ARE UNAFFECTED BY SHOCK OR VIBRATION, otherwise they could not form part of the equipment of the Francis-Barnett Motor Cycle (shown below by courtesy of the Villiers Engineering Co., Ltd.). Their mechanical strength is one of the reasons for their widespread adoption for radio mains equipment.



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Of novel construction, using a home-made cabinet, and plug-in coils. Covers ordinary and long waves.

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Circuit is Det. and 2 L.F. Very selective and gives high quality reproduction either of radio or of gramophone records.

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All these sets are for MODERN CONDITIONS, and will enable constructors to take full advantage of the dual programmes under the Regional Scheme.

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For ordinary and long waves. Easy wave-change and very simple operation. Includes the famous "Brookmans Rejector" to cut out interference,

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For all waves including short. Special wave-change switch enables wave-range to be altered without changing coils.

An UP-TO-DATE THREE-VALVER

Using S.G., Det. and Pentode. Highly selective; employs plug-in coils and has volume control and switch for the reproduction of radio or of gramophone records.

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A powerful set for A.C. mains, which comprises H.F., Det., and 2 L.F. stages with the special new A.C. Valves. Covers long and ordinary waves, and is very easy to operate.



6d. each from all Newsagents and Booksellers everywhere, or 7d. post free (Home or Abroad), from "Best Way," 291a, Oxford Street, London, W.1.

CONVENIENT as it is in many ways, the wave-change switch may be a cause of trouble in a sensitive receiving set with one or more good high-frequency stages. The reason is that the coil or transformer is usually mounted at the middle of the baseboard or towards the back of it, whilst the switch itself must be on the panel in order to be handy.

Thus it comes about that leads longer than is desirable have often to be taken from the coil to the switch and back again. Long leads are always to be avoided if possible, for a variety of reasons into which it is impossible to enter here.

A method that the writer has found very satisfactory may be described as taking the switch to the

 * **A TIP FOR SWITCHING** *

leads rather than the leads to the switch!

The principle is to make use of a push-pull switch of the double-pole changeover or single-pole change type, according to the requirements of the case. This is mounted not upon the panel, but upon a small piece of ebonite attached vertically to the baseboard by means of a couple of small Meccano brackets, as shown in the drawing. Where screening is employed the switch may be placed right inside the screening box.

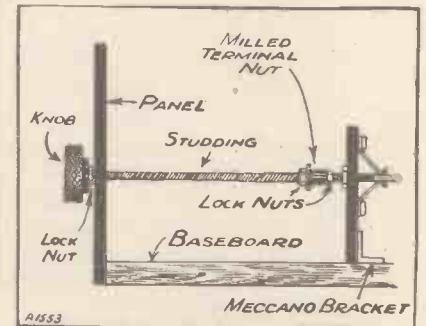
Very Easily Fitted

But if the switch is several inches from the panel, how is it to be operated without opening the lid of the cabinet? The solution is very simple. Unscrew the knob, and you will find that it is attached to a short screw threaded either 4 B.A. or 6 B.A. Let us suppose that the thread is 4 B.A.

On to the threaded portion run a thin 4 B.A. nut. Then take a rather deep 4 B.A. milled-headed terminal

nut and screw this on for two or three turns. Turn the locknut backwards and clamp the two tightly together. Now cut off a piece of 4 B.A. studding long enough to reach from the milled nut just referred to to the front of the panel. Place another locknut upon this and screw the rod into the milled nut. Clamp it in place by means of the second locknut.

You now have an extension from the switch to the front of the panel, and all that you have to do is to screw on to the part of the rod which protrudes from the panel the original knob of the switch. An examination of the accompanying drawing will make this plain. If the threaded portion of the switch is 6 B.A., then a 6 B.A. milled nut, lock nuts, and 6 B.A. studding must be used.



When Writing to the "Wireless Constructor"

please remember the following points:

- (1) Non-technical Queries cannot be answered unless a stamped, addressed envelope is enclosed.
- (2) Technical Queries should be written on the special Application Form, which will be sent on receipt of a postcard.

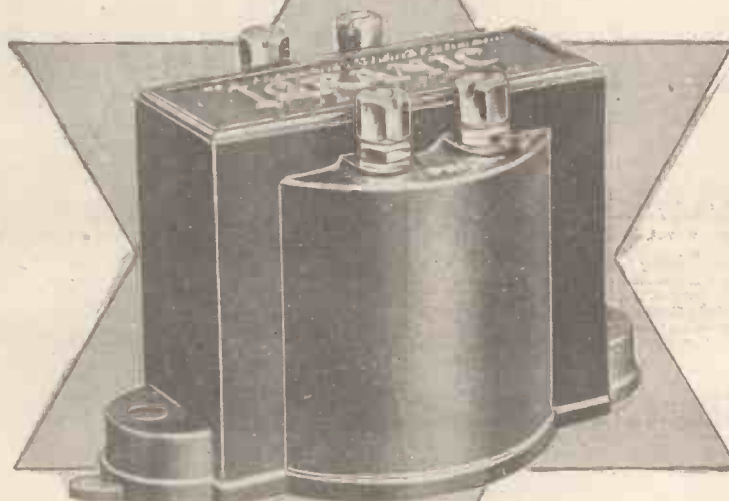
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Obtainable in two ratios 3-1 and 6-1. Ratio 3-1 for valves with impedances of 10,000-20,000 ohms. Ratio 6-1 for valves with impedances of 5,000-10,000 ohms.

Apply to your dealer. If he cannot supply you, please write at once to Dept. J1018.



THE "SKYSCRAPER" TWO

—continued from page 390

H.T.— terminal on the set to the negative plug of the mains unit.

When receiving stations on the set and amplifier combined the gramophone motor must not be left running.

As you know, it is possible to stop the motor without affecting the amplifier by removing one of the fuses at the back of the gramophone. You will not want to do this every time a change from radio to records is made, so a switch should be connected in the lead running from the motor to its fuse. When this switch is in the off position it will have the same effect as a removal of the fuse.

H.T. Plus Voltages

The best positions for the taps on the potentiometer must be found by trial, but as a start take the one feeding H.T.+1 to No. 6 tap, H.T.+2 to No. 8 tap, and H.T.+3 to No. 4 tap.

To change from gramophone to radio you insert the plug in the jack on the gramophone, switch on the set and put the fresh switch on the gramophone to the off position. To change from radio to gramophone the process is, of course, reversed.

The method of joining the receiver to the "Super-Quality Amplifier" when it is not incorporated in the gramophone is exactly the same as joining it to any ordinary amplifier, so we may as well proceed with a description of the latter.

If the amplifier's first valve is preceded by an L.F. transformer, the set output leads are connected directly across the primary of it. If it is preceded by an R.C. coupling device, the two output wires have to be connected across the coupling resistance. They have to be connected a certain way round in this case, so that if you get no results just try reversing these wires.

Connections for Amplifier

Should you have a pick-up amplifier in which the input is direct to the grid of the first valve and a grid-bias tap, it will be necessary to connect the secondary terminals of an extra L.F. transformer to these points and to connect the set output leads to the primary terminals of it. The addition of this transformer will not affect the use of the amplifier with the pick-up, which can be connected

(Continued on page 420.)



A Handful of good points



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The J.B. "Tiny" Condenser combines the most expert workmanship with many ingenious features of design—all in an area little more than that of a match box. The extreme neatness and lightness make the "Tiny" particularly useful for Portables and wherever space is restricted. Its Ball Bearings, Pigtail Connection and thorough insulation are other points which speak for the efficiency of its design.

Supplied complete with knob, pointer and scale and fitted with Slow Motion, ratio 8-1.

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Special sizes for Pentodes.

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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.

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UNIVERSAL RESISTRON **5'6**

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5-1 or 3-1.

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Dept. L, 538, High Rd., Leytonstone, London, E.11.

THE "SKYSCRAPER" TWO

—continued from page 419

across the primary instead of to the usual points.

If you use the same batteries or mains unit for the set as for your amplifier, no connection should be made to H.T.— on the receiver. With a separate L.T. or H.T. supply a lead has to be taken to the H.T.— terminals on both the set and the amplifier.

We can now turn our attention to the accessories required, and also to operating instructions. All the following remarks apply no matter what amplifier is employed.

The Coils Required

The two coils required are a No. 250 "X" or centre-tapped, and a No. 60 "X" or centre-tapped, the No. 60 being inserted in the holder nearer to the screen. The H.F. transformers are made by the "Lewcos" people, and they are known as "B.S.G.5" and "B.S.G.20." The "B.S.G.5," which is the lower-wave one, is placed in the holder nearer to the screen.

For the H.F. grid bias a 1½-volt cell is usually suitable, but sometimes 3 or even 4½ volts make a noticeable improvement. This, of course, is a matter to be determined by trial.

Two-, four-, or six-volt valves can be used according to choice. The first valve is of the upright screen-grid type, and the second should be one of the so-called H.F. type, or the H.L. type.

Approximate voltages for the H.T. positive terminals are as follow: H.T. + 1, 86 volts; H.T. + 2, 120; and H.T. + 3, 60 volts.

A Real Skyscraper!

The flexible leads to the aerial coils should be tried on all the terminals provided on these coils to find out which is the most suitable for your particular aerial. When the wave-change switch is pushed in the set will receive the lower band of broadcast waves and, when pulled out, the long waves.

You will find the tuning quite sharp, so keep the two tuning dials in step as far as possible when searching for stations.

Turning the reaction condenser knob in a clockwise direction increases reaction, but you will find that very little reaction is required, and will probably be agreeably surprised at the way in which stations roll in on the "Skyscraper" Two—a truly good name for this excellent receiver!



POLAR "No. 3" CONDENSER

FOR EFFICIENCY WITH ECONOMY

For combining these two essentials, the Polar No. 3 is supreme. An efficient, silent working, smooth and precise direct-drive condenser. Excellent for normal or short waves.

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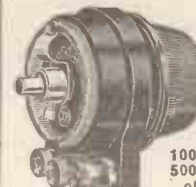
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Standard Screen as specified	2/-
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Standard Screen, 9" x 6"	1/9
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PICKETT'S, Radio Furniture Makers, (C.W.) Works, Bexleyheath, KENT.
Established at the beginning of Broadcasting.

TRY AN EARTH

Most frame aerials are employed with the object of making a set either portable or transportable. Some, however, are used because an outside aerial is not possible, or because there are objections to it.

In such cases there is no reason why an earth should not be employed, since the question of a permanent connection to the set does not matter. An earth connection cannot be objected to on the score of unsightliness, since it can be tucked away out of view.

The addition of an earth will have a considerable effect on results from a frame-aerial set. If no special terminal is provided for earth on your set, try connecting it direct to the negative terminal of the L.T. accumulator.

A. S. C.

THE NEW LONDON STATION

—continued from page 376

gauze, embedded in the walls and ceilings.

Actually some trouble was experienced from induction effects before any public transmissions were made, but it was short-lived, a cure being effected by revising the method of earthing the amplifiers and screens. Apart from this and the backsliding of a condenser, which broke down for no apparent reason during the first public test transmission of two programmes, the transmitters have behaved extremely well and fully come up to expectations of performance. The broken telephone cable which affected the whole programme on Saturday, December 14th, was a most unusual and unlucky accident, but this had nothing to do with the transmitting station itself.

The Selectivity Problem

From the listener's point of view it has always been anticipated that a considerable number of people would have trouble with the selectivity of their receivers, because the need for a definite degree of selectivity had not existed before. So far as can be judged from correspondence, fewer people are experiencing this difficulty than was expected.

Neither of these troubles is likely to present much difficulty to regular readers of this periodical. It remains to be determined, however, what proportion of listeners have actually taken advantage of the preliminary public tests.



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KIT A	less valves and cabinet	£5:16:6
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Send for detailed list of specified components— all kits include short- and medium-wave coils, and special Ready Radio NON-SOLDERING connecting links.

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THE "VI-KING" THREE

—continued from page 374

When listening on short waves the aerial coil should be placed as near to the grid coil as possible. If, however, you have any difficulty in obtaining reaction it may be necessary to separate these two coils bit by bit until oscillation commences.

For completely satisfactory results on short waves, much more so than in the case of the broadcast waves it is imperative for reaction control to be absolutely smooth. It should commence with a "swishing" sound, and if there is the slightest tendency towards "ploppiness" such things as variation of the potentiometer slider position, reduction of H.T. voltage on the detector valve (H.T. +1), and variations in the degree of aerial coupling should all be tried.

With oscillation adjusted as is desirable, and by slow and careful rotation of the short-wave tuning condenser, it should not take you very long to "feel" your way about in the short-wave ether.

Tuning In Short-Wavers

Remember that to simplify the finding of stations on this band (and

only on this band!) the set should be operated in an oscillating condition, but the setting of the reaction condenser should be so arranged that the set—or, more correctly, the "short-wave" side of it—is only just beyond the point at which oscillation commences.

The setting of the reaction condenser at which oscillation commences will not remain constant over the whole range of the tuning condenser, and periodical readjustment may be necessary.

Do not forget that it is necessary to use the terminals marked L.S. when the amplifier is in use after one or other of the detector valves, and perhaps I should warn you that it is only under exceptional conditions that short-wave loud-speaker results will be possible. Nevertheless, it is very useful to be able to employ the amplifier when desired after the "short-wave" detector for stations which come over on the weak side.

Finally, to derive the full benefits from the "short-wave" side of the set you should obtain a schedule of short-wave transmission times together with the wave-lengths upon which the stations are to be found. You will then be unlikely to waste time by searching for stations which happen not to be transmitting.

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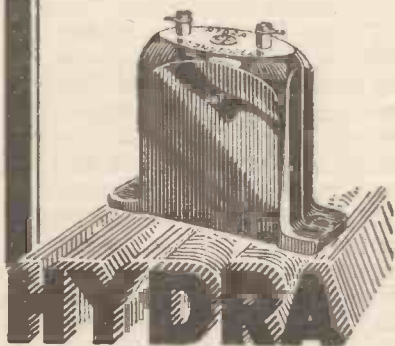
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Please be sure to mention WIRELESS CONSTRUCTOR when replying to Advertisements.

THE EMPIRE BROADCASTER

—continued from page 398

equally good service for the benefit of British short-wave listeners in this country.

Another correspondent writes from Spain and points out that we maintain that listeners' fees are paid on the distinct understanding that the money is spent on improving the B.B.C. ¶

The Experimental Service

Our correspondent says that may or may not be an exact statement (as a matter of fact, it is.—Editor), but the fact is that the British listener is not, and cannot be, limited to his home programmes, and a not inconsiderable proportion of British listeners reach out to the broadcasting transmissions of other countries, including several short-wave transmissions. For these he does not directly contribute, and, on the other hand, they are paid for in some way or another by the residents of the various countries concerned.

"Obviously, therefore, while 5 S W is giving a partial and experimental service, the British listener is getting more than he is giving. At present he is receiving good short-wave programmes from various countries, and is giving an inferior service in return."

This is not quite accurate. It is quite true that British listeners do pick up many good short-wave transmissions from America, but the point of the argument is that from our own Colonies and Dominions there are no really first-class short-wave transmissions upon which British short-wave listeners can rely for reception in this country.

Foreign Transmitter

The question of the excellence and usefulness of the transmissions from P C J, Zeesen and other famous short-wave transmitters does not arise, for these transmissions emanate from countries other than those under the British flag.

If we are supposed to supply British listeners abroad with good short-wave transmissions, we maintain that this should be done either by the Government or on an understanding that the service was reciprocated.

In any case, the B.B.C. spends many thousands of pounds a year on 5 S W. The transmissions are of no interest to listeners in this country, for technical reasons, and we think that our British friends abroad should consider themselves lucky.

THE

LOTUS

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with minimum trouble
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LOTUS WORKS, MILL LANE,
LIVERPOOL.

Causton

TRADE JOTTINGS

A Book About Condensers

GLANCING through my post the other morning I had a very pleasant surprise in the form of a book entitled "Condensers." It was from the "Polar" people, neatly got up with 36 pages, and some very intriguing illustrations, and I got completely interested in it.

Instead of employing the usual trade tactics, somebody had hit upon the ingenious idea of making the condenser interesting to the non-technical reader, writing an entertaining book about it, and packing quite a lot of information and several smiles between its covers, thus setting an interesting and welcome fashion in publicity presentation.

Marked "Price 6d." on the cover, the book is well worth it, but I understand that any reader of the WIRELESS CONSTRUCTOR who would like a copy free of all charge can obtain it on sending a postcard to Messrs. Wingrove & Rogers, Ltd., Arundel Chambers, 188-189, Strand, W.C.2. This is a chance that you ought not to miss.

Transformers for the New A.C. Valves

We have received from Philips Lamps, Ltd., details of a special filament-heating transformer for use with the new indirectly-heated A.C. valves. At first sight such a transformer—consisting as it does of only two windings on an iron core—appears a pretty simple proposition, but in point of fact it really calls for a good deal of careful design. The losses in the iron must be as small as possible, and the windings should be so designed that any number of valves, up to, say, five, can be fed from the

secondary winding without an appreciable drop in voltage as the number of the valves is increased.

This new Philips filament-current transformer has been designed so that there is only a fraction of a volt drop when the current taken from the secondary varies from one to five amps., ensuring under all practical conditions that the filaments of any number of valves up to five are neither under-heated nor over-run.

A point to remember when fitting one of these transformers to work the new indirectly-heated A.C. valves is that care should be taken to see that the connections between the valve holder and the terminals of the transformer should be short, and of really stout wire, so that there is no appreciable voltage drop here.

The Philips filament-transformer, which, by the way, is completely shrouded, is supplied in all the usual A.C. mains voltages, and full details of it can be obtained from the manufacturers, Philips Lamps, Ltd., Philips House, 145, Charing Cross Road, London, W.C.2.

Igranic's seem to be enthusiastically adding new lines to their already long list, judging by the number and variety of illustrated leaflets received from that famous firm.

Among these is a leaflet dealing with the A.C.2 All-Electric Receiver, which has been developed as a local-station set, but which has picked up many long-distance stations under favourable conditions.

Another leaflet—particularly well illustrated—shows notable features of the Igranic Phonomotor. This was designed to please the Radio-Gramophone enthusiast.

By operating a small switch any number of records may be played without further attention to the motor, and the changing of records can be effected with a minimum of trouble and delay

P. B.

DEAD-BEAT MILLIAMMETERS
 By A. S. CLARK.

QUALITY of reproduction receives great attention nowadays, and in order to check up results milliammeters are being used more and more in the plate circuit of the power or super-power valve.

As you all know, the work of such a milliammeter is to kick. It has to kick when the valve is overloaded or when the grid bias is not properly adjusted and show whether more or less should be employed. Therefore it would appear that so long as the current range of the instrument is suitable, since it only has to "kick about," that any meter will serve the purpose.

This, however, is far from being the case, and there is a very important quality that the meter must possess if it is to be of much help. It must be dead-beat. That means that when the current changes the needle must record the change only, and must not swing too far over by means of its own inertia given to it by the "kick." In the same way, it must not swing back in the opposite direction before becoming still.

If the meter is not dead-beat, peak effects will merely cause it to swing to and fro in such a way that it is impossible to tell whether it is kicking up or down.

The better the instrument the more dead-beat it will be, so bear this point in mind when buying a milliammeter. Incidentally, it is often suggested that a moving-coil L.T. voltmeter could be used to indicate distortion in the plate circuit of a small power valve.

With cheap instruments this scheme often fails miserably, because they are far from being dead-beat.

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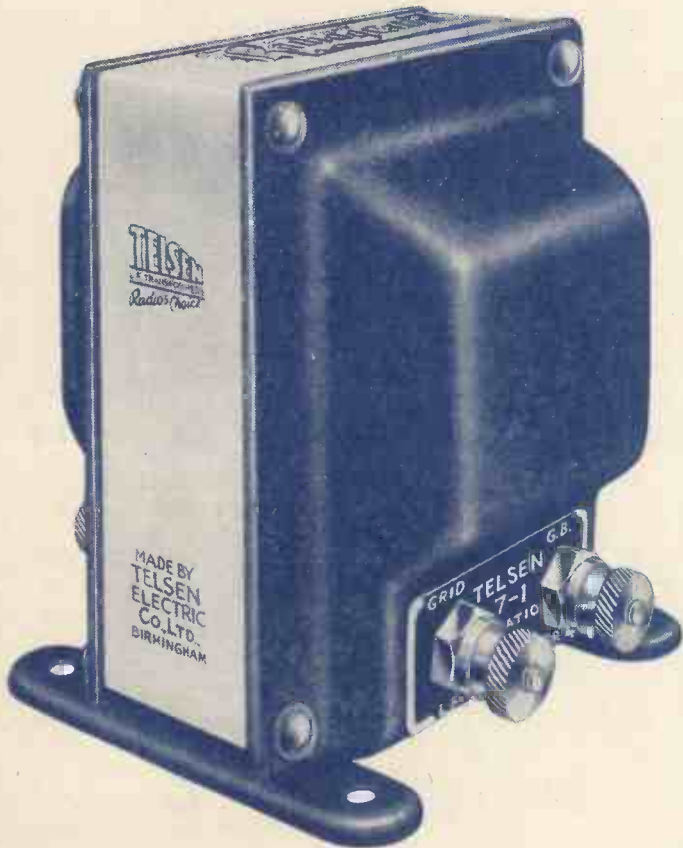
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This transformer gives amazing amplification and undoubtedly will be one of radio's greatest achievements.

It is *the* transformer you have been waiting for, go along to your dealer now, and ask for the Telsen New Ratio 7-1 Transformer and delight your family with the amazing reception which only this transformer can give.

You will then want to invite your friends round to hear it, too!

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TRANSFORMER**

PRICE 17'6

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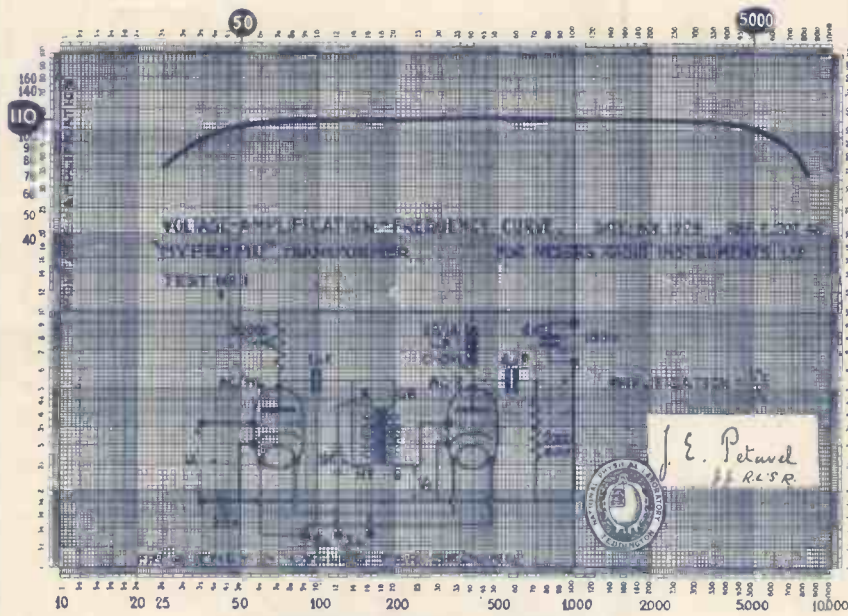
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Ask your dealer, or write to us, for the leaflet showing the latest "Hypermu" N.P.L. Curves, taken in conjunction with modern valves, and the "Hypermite" leaflet containing full description and diagrams. Ask also for the complete R.I. Catalogue.



and then the **HYPERMITE**

Weighing only 7 ozs. yet possessing a Primary Inductance of OVER 50 HENRIES, the "Hypermite"

is the first transformer giving ample reproduction of the low notes without loss of the higher frequencies, that is available at a low price. Obtain one from your dealer and test it in your set, and note the exceptional fidelity of reproduction it occasions. This is your chance to test out a modern nickel iron transformer.

The "Hypermite," a transformer of amazing performance and value. Weight, 7 ozs. Size 2½" x 1½" x 2½"

12/6



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