BRITAIN'S LEADING RADIO MAGAZINE

MODERN WIRELESS

1/-

VOL:XVI. No57 SEPTEMBER 1931

PLENTY of FOREIGN PROGRAMMES

are now available nightly, and

"THE WORLD'S PROGRAMMES"

tells you

HOW, WHEN AND WHERE TO LISTEN

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Short-Wave Shorts
Scenes from Sottens
Regulating Reaction
Listen for Switzerland
Wave-length Wanderings
On Long Waves
Dual-Range Difficulties
Other Listeners' "Locals"

and

Where the Stations are to be Found.

ALSO INSIDE—

MORE STATIONS for "TITANS"

THE "M.W." "SUPER" FIVE

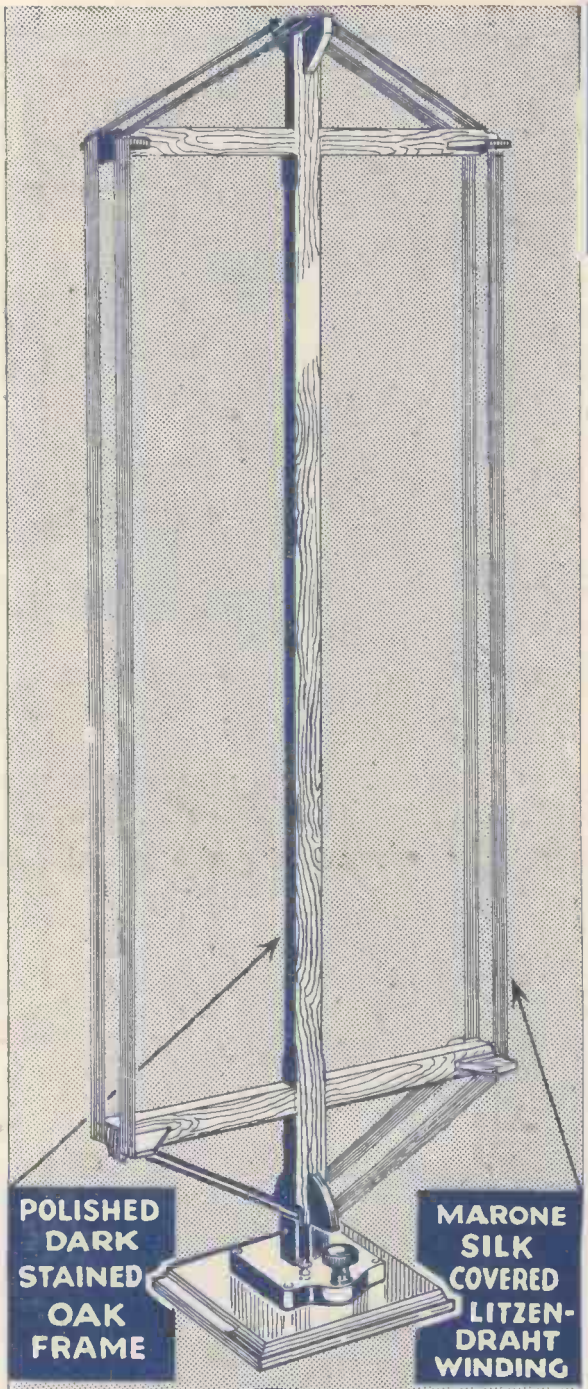
THE

"M.W." "EXTENSER-POWER"

And

Compton Mackenzie on Radio v. Records

AN UNBEATABLE SHILLINGSWORTH!



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THE LEWCOS H.F. CHOKE AND SPAGHETTI RESISTANCE ARE SPECIFIED FOR THE "M.W." "SUPER" FIVE AND THE "M.W." "EXTENSER-POWER" RECEIVERS described in this issue.

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CONTENTS

VOL. XVI. No. 57. MODERN WIRELESS SEPTEMBER, 1931.

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 patentees to use the patents before doing so

Edited by NORMAN EDWARDS.
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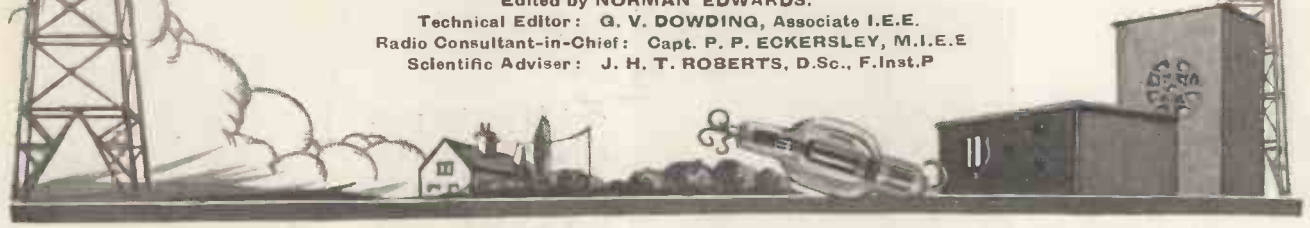


MODERN WIRELESS

Vol. XVI. No. 57. BRITAIN'S LEADING RADIO MAGAZINE SEPTEMBER, 1931

The Radio Exhibition—Price Reductions—The Future of Television—American Progress

The Radio Exhibition

THE topic of the moment is the Radio Exhibition at Olympia. That it will prove to be amazingly successful is a foregone conclusion. News reaches us from day to day which clearly indicates another record for the R.M.A. organisers, for stand-holders, and for visitors.

Much more space will be available for stands at Olympia this year; and it is particularly good news to hear that the gallery of the National Hall will be given over to demonstration rooms. In past years we have noticed that demonstration facilities have been scarcely adequate; this year there should be no grounds for such criticism.

Some indication of the importance of the exhibition may be gathered from the energetic preparations now being made by the radio industry. Everywhere there are definite signs of a real radio boom season—and despite sinister rumours of an American invasion of "dumped" sets at cut-throat prices, British radio manufacturers are confident of the superiority and pulling power of their own goods.

They have nothing to fear. Quality always tells in the long run, and the non-technical fan is just as aware to-day, as is the technical amateur, that good money spent on good components and good sets is good money well invested, whereas good money spent on low-priced foreign "bargains" usually turns out to be good money thrown away.

Price Reductions

AND talking of money reminds us that visitors to Olympia this year will be agreeably surprised by the number of price reductions they will notice.

The day when radio was classed as an expensive hobby has definitely passed into radio history; to-day, radio for all is true in every sense.

We hope to see you at Olympia. You will find us at Stand No. 67, where MODERN WIRELESS staff men will be on duty. They will welcome the opportunity of meeting you, of answering your queries, and of doing everything in their power to make your visit to the exhibition a happy and instructive one.

The Future of Television

"DESPITE the excellent progress in television made by Mr. J. L. Baird, and his recent triumph in transmitting, with the aid of the B.B.C., a reasonably recognisable scene from the Derby, there is a general realisation that further advances along present lines will be difficult, if not impossible."

Thus Captain E. H. Robinson (G-5 Y M), in a recent article on "Television" in the "Observer."

Captain Robinson knows his subject, and his considered views on television must command attention. Our readers will also note that his views are in accord with those which have been expressed by Sir Oliver Lodge, Captain Eckersley, and other acknowledged experts.

The words "along present lines" are vitally significant. America has realised that the scanning disc principle has definite limitations, and, consequently, intensive research work has been carried out during the last few months on a television system embodying the cathode ray method (which the late Mr. Campbell-Swinton so strongly advocated) in conjunction with the use of ultra-short waves.

American Progress

REPORTS from America indicate that very considerable progress has been made, and we have it on no mean authority that commercial television, with definite entertainment value, is now a practical proposition.

The pioneer laurels in television must go in large part to Mr. Baird; but Mr. Baird must realise by now that he is faced with very serious rivalry in the States. We urge him to consider Captain Robinson's words, which we have quoted above, and to make the bold decision to acknowledge the limitations of the system he at present favours, and to devote in the future his undoubted energies and genius to the development of methods which, as he must know by now, offer greater potential possibilities of placing television on a level footing with normal broadcasting.

We believe Mr. Baird would be successful. We have faith in him—but not in his present system.

Compton Mackenzie on

SOME time ago I read in a book by Compton Mackenzie the amazing statement that he actually preferred the gramophone to the wireless and, I think, that he would rather hear a piece of music on the worst gramophone than on the best loud speaker. To many a wireless enthusiast such an opinion must sound very much like either complete foolishness or rank ignorance.

I, on seeing such thoughts in cold, hard print, was very shocked. Then I reflected that the words were written long ago when loud speakers were very young. And the upshot of it all was that I went along to see Mr. Mackenzie and to talk of gramophones, broadcasting, and the B.B.C. in these pleasant days of 1931.

As he sat at the editorial desk of a periodical devoted solely to the gramophone and gramophone records, I brought up those earlier forthright words. It seemed sacrilegious to breathe the mere name of a wireless set in this room, with gramophones in every corner and piles of records stacked here and there.

He Still Prefers the Gramophone !

One was little consoled by the thought that Christopher Stone sat in another room not so very far away. Nor by the fact that Compton Mackenzie certainly had not changed his point of view !

" Loud speakers have improved tremendously during the past few years," he admitted. " But then—so have gramophones. And I still prefer them.

" Of course, a wireless set is worth having for music only, particularly if you are unable to afford more than a few records, but otherwise I would rather have the gramophone. If I had to choose between, say, a broadcast of the Fifth Symphony of Beethoven and the same thing

THE ONLY ALTERNATIVE!

" I get angry when I find that the only alternative is dance music," says the author of " Carnival." Our photo shows Marius B. Winter and his dance orchestra—a very popular broadcast " turn."

Radio v. Records

played from gramophone records, I know which I would choose.

"The average radio is curiously unable to get over sufficient 'punch.' You may have volume and power and seemingly perfect reproduction of instruments—there is something missing.

"Stravinsky's 'Sacré du Printemps' is a failure as a broadcast. It seems impossible to transmit through the ether the essential vitality of the piece. Yet it is heard almost as well by gramophone as in the concert hall itself.

"Without doubt, at present I prefer the acoustic type of reproduction to the electrical. Loud speakers may have the desirable stereo-

The famous author, in an interview with Harold A. Albert, has some interesting and provocative things to say about broadcasting in general and the question of the rival merits of the loud speaker and the gramophone in particular. (The two portraits are: left, Compton Mackenzie, and right, Christopher Stone.)

scopic effect, but there is not that vim. My cats remain unmoved by broadcast music. You can drive them out of the room by the right gramophone record. Wireless supporters will not be surprised by this.

Only His Personal Views

"Of course, I am merely expressing my own personal taste. I think that to get the best out of music through a loud speaker you have to understand it—and it needs the Dickens of a lot of understanding.

"You have to be an electrician, a mechanic, and a musician, all rolled into one. I'm such a duffer over electricity that I dare say that accounts for my prejudice."

At that we branched off into technicalities. As a gramophone user myself I was naturally anxious to know how to get the best out of my machine—and, particularly, how my friends could get the best out of their radio-gram.

NUMBER SIX STUDIO

This is the studio in which Christopher Stone gives his record recitals. Part of the new gramophone can be seen on the right.

"I Cannot get Chamber Music at Five o'clock"

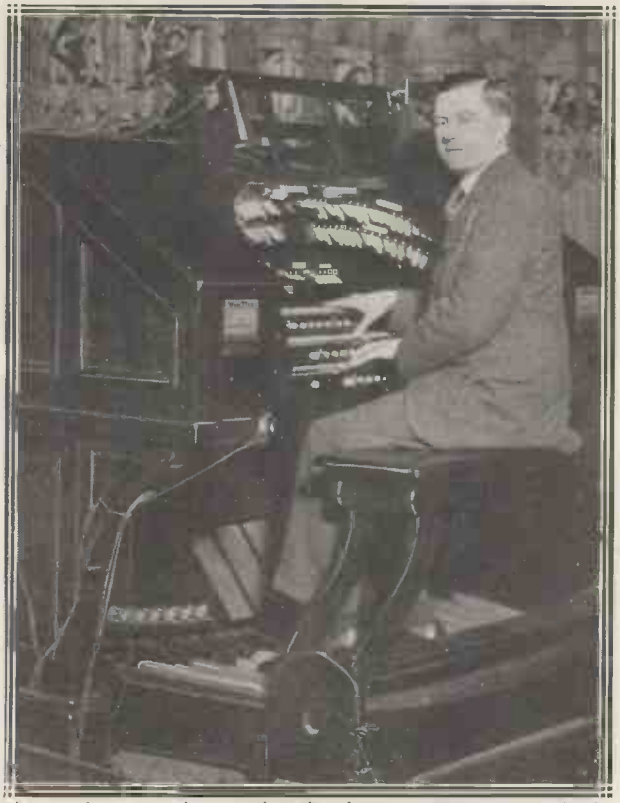
This gramophone fiend advocated fibre needles, or the new composite needles, and, if possible, a very long and almost straight horn. He placed a record on a machine standing in the corner of the room that had a huge horn rather like a giant's ear-trumpet towering—or flowering—above it.

A "Canned Music" Enthusiast

I turned my back to give the reproduction a fair test. I must admit it sounded good. But not so good as to cause me to damn for evermore all cones, moving coils, and other electrical methods of reproduction.

Yet, at the mention of a moving coil, Mr. Mackenzie became as excited as the frequent calls to the telephone would allow him to be. He has a trick of staring very directly at you, and this, combined with his saturnine face, compels you to feel interested in his words.

THE FOREMOST INSTRUMENT



"I was about to point out that the cinema organ was surely the foremost instrument of the day. . . . "

"It seems to me that we must be developing a wireless ear. Some people are forgetting what real music really is. They hear a noise similar to the sound of an omnibus going up Regent Street, and immediately say: 'What magnificent bass notes!'—whereas no one ever heard the bass sound like that in Queen's Hall. The 'talkies' are helping this forgetfulness of the true sounds. There is always some distortion, however slight."

We turned then to the subject of the B.B.C. Here Compton Mackenzie had nothing but praise to offer.

"I think they're doing splendidly," said he. "I don't think the wireless programme could be very much improved. It is all very well to *talk* about making the programmes better, but how on earth are you going to do it?

"You can't go very much higher and keep at that higher level all the year round! Try to better the B.B.C.'s programmes yourself—remembering that your taste may not be the taste of other people, and that you have to please others as well as yourself. You will find it very difficult.

The B.B.C. Doing Their Best

"In fact, one marvels that the broadcast programmes are as good as they are. The musical portions are catholic and very well balanced. The variety programmes, remembering that something new is always in demand, thoroughly deserve praise.

"I know that they are criticised. This is to be expected. Some people will criticise anything. I myself loathe the Children's Hour and get angry when I find that the only alternative is dance music, which also offers no appeal.

"It seems tiresome that I cannot get chamber music at five o'clock, which is the very time I want it. Nevertheless, I must remember that thousands of people find this tea-time dance music most enjoyable.

"One must give way somewhere. It is when the B.B.C. attempts to please everybody at one and the same time that it pleases no one at all.

"And the wireless play, too. That has received a good deal of criticism of late. People say that they cannot distinguish who is who, and that it is impossible to know what the sound effects are supposed to represent.

"Well, I must say that I consider the transmission of my play 'Carnival' to have been pretty good—though I admit that I heard it only at Savoy Hill and not at home. And as for the voices, you cannot blame the B.B.C. Here the actors are at fault. In these days voices tend to become more and more indistinct, more and more monotonous. Which is not to the good from any point of view.

Our Voices Resemble Saxophones!

"Perhaps for this we have to blame the externals of the age. Have you noticed how the predominant musical instrument of the period governs the mode of speech? The men of the eighteenth century, who are supposed to have had very clear enunciation, had the spinet; the elocution of the Victorians was controlled by the piano; in these days we are under the sway of the saxophone. I am convinced there is a connection between the two."

I was about to point out then that the cinema organ was surely the foremost instrument of the day, and had in mind the voice of my Uncle Arthur to prove it, but some other thought made me decide to depart—before my voice acquired the properties of a gramophone. And as Mr. Mackenzie reads this, I can imagine him saying: "All the better if it had!"

The "M.W." "Super" Five

By K. D. ROGERS.

Using only five valves, this easy-to-make set achieves an extraordinary power plus selectivity sufficiently keen to separate programmes that ordinary sets receive only as confused medleys of weird-sounding noises. Further, the H.T. consumption of the "M.W." "Super" Five is quite reasonable and well within the scope of dry batteries.

Two months ago we gave details of the "Simplicity" Super, which was a super-heterodyne in one of the most simple forms (from the point of view of home construction) which could be designed. The intermediate units were obtainable ready wired up on a neat platform and all that had to be done was to place this complete assembly on the baseboard of the set, connect up a few wires, and there you were.

The success of this "super" has made it evident that the five-valve super-het is one of the most popular forms of this interesting and fascinating form of radio receiver. Consequently I have gone very deeply into the subject of five-valve super-hets, and have spent a great deal of time in trying out various types of circuits and designs.

Layout Latitude

In order that the home constructor shall be assured of success in building a super-het it is absolutely essential that the layout be of such a type that he can easily copy it, even with a certain amount of latitude, without any form of trouble due to small deviations from the original layout.

What I mean is this. If you consider a complicated receiver, one whose results depend very greatly on the layout, and note the careful spacing of components, positions of wires, etc., and then ask someone else to build it, someone perhaps who is not exactly an expert at the job, it is ten to one that some very slight alteration either in the position of a wire or the spacing of a component will take place, and the results may be inferior to those obtained with the original set.

A SELECTION OF RELIABLE AND EFFICIENT COMPONENT MAKES

PANEL
18 × 7 in. (Goltone, or Peto-Scott, Permcol).

CABINET
To take panel with baseboard 12 in. deep (Camco, or Pickett, Ready Radio, Peto-Scott).

VARIABLE CONDENSERS
2 ·0005-mfd. with slow motion (J.B. Tiny, or Astra, Formo, Ready Radio, Telsen, Cyldon).

SPECIAL SUPER-HET UNITS
1 Oscillator (R.I.).
2 Intermediates (R.I.).

VALVE HOLDERS
5 4-pin (Telsen, or Lotus, Clix, Bulgin, Igranic).
1 5-pin (Telsen, or Wearite, Formo, Magnum).

L.F. TRANSFORMER
1 Ordinary ratio (Igranic, or Telsen, Ferranti, R.I., Varley, Lewcos)

FIXED CONDENSERS
2 ·001-mfd. (T.C.C. and Telsen, or Ready Radio, Dubilier, Ediswan, Ferranti, Igranic, Watmel, Graham Farish, Formo, Goltone).
1 ·002-mfd. (Telsen, etc.).
1 ·0002-mfd. (T.C.C., etc.).
1 ·1-mfd. (Dubilier, etc.).
1 ·0005-mfd. (T.C.C., etc.).
4 1-mfd. (T.C.C. and Formo, or Peto-Scott, Ferranti, Dubilier, Igranic, Hydra, Helsby).
2 2-mfd. (Ferranti, etc.).

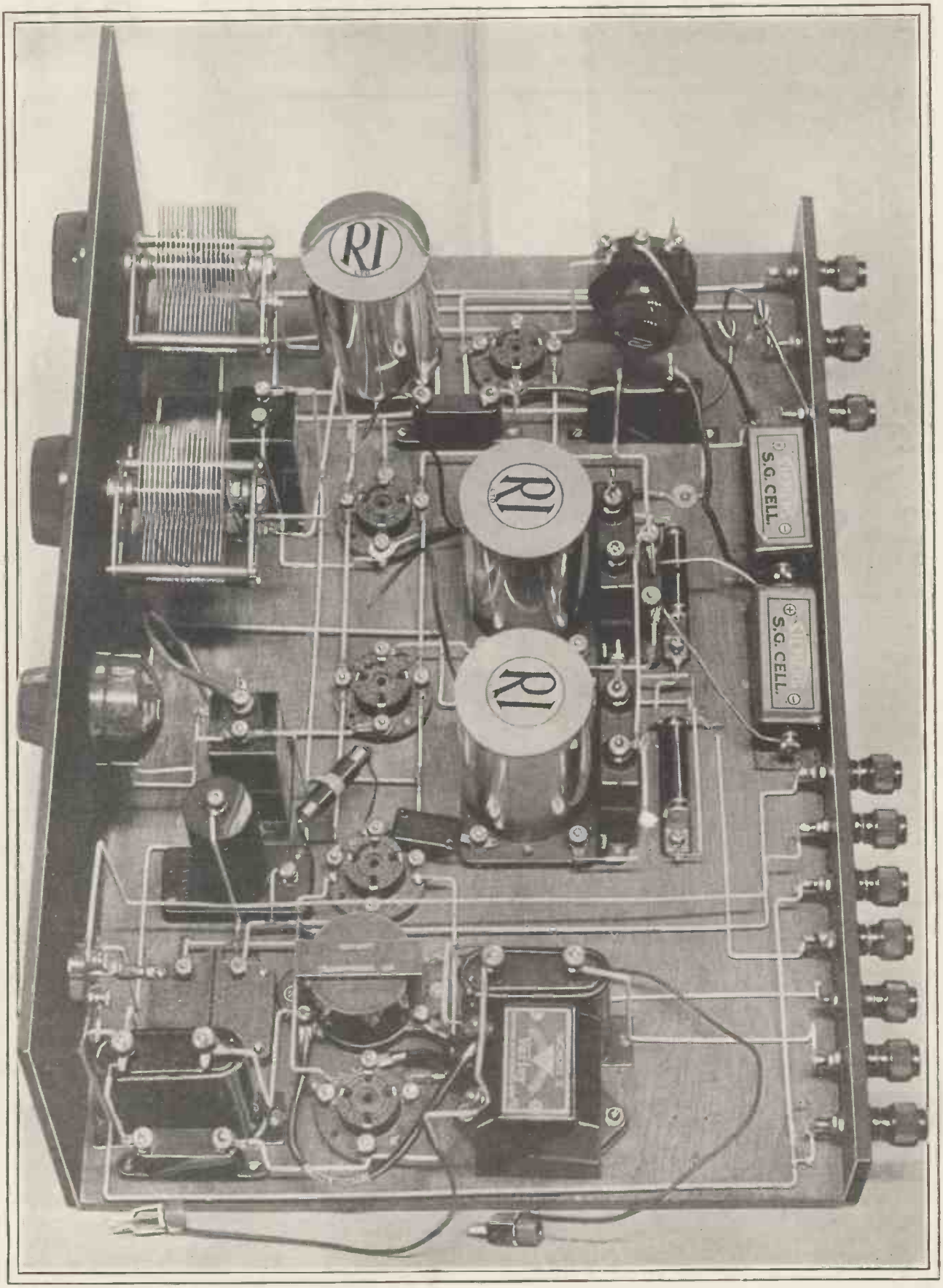
RESISTANCES
1 600-ohm Spaghetti (Tunewell, or Ready Radio, Bulgin, Peto-Scott, Varley, Sovereign, Lewcos, Magnum).
2 600-ohm and holders (Ready Radio, etc.).
1 50,000-ohm Spaghetti (Bulgin, etc.).
2 25,000-ohm Spaghetti (Lewcos, etc.).
1 100,000-ohm Spaghetti (Telsen, etc.).
1 50,000-ohm potentiometer (Sovereign, or Wearite, Magnum).
1 400-ohm potentiometer (R.I., or Peto-Scott, Igranic, Ready Radio).
1 2-meg. grid leak (Igranic, or Telsen, Ferranti, Ediswan, Ready Radio, Varley, Watmel, Dubilier).

CHOKES
1 H.F. (Lewcos, or Telsen, Ready Radio, Lotus, Peto-Scott, Varley, Wearite, Watmel).
1 Output (Varley, or R.I., Igranic, Ferranti, Telsen, Lotus).

SWITCHES
1 3-contact type on-off (Bulgin, or Goltone, Telsen, Ready Radio, Peto-Scott, Igranic).
1 "On-off" (Ready Radio, or Telsen, Peto-Scott, Igranic, Magnum, Lotus, Bulgin, Wearite).

MISCELLANEOUS
1 Terminal strip, 18 in. × 2 in.
10 Terminals (Belling & Lee, or Clix, Igranic, Eelex, Goltone).
2 G.B. plugs (Igranic, or above).
Flex, screws, Glazite or Lacoline, etc.

Another First-class "Super-Het" Receiver



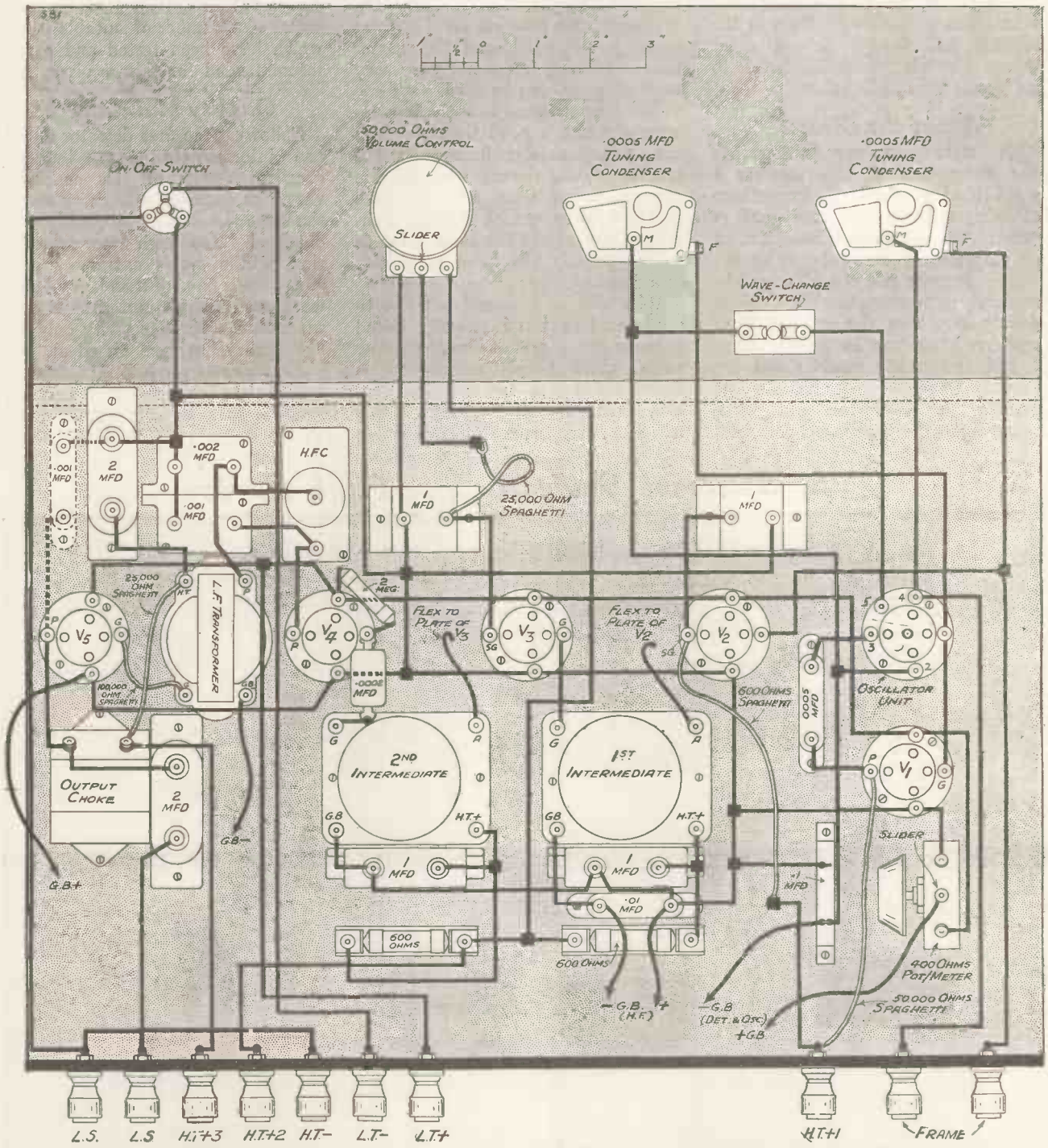
The average super-het is a tricky receiver to design, and though it is possible to build big sets of six, seven, eight or nine valves, with perfect stability and capable of giving colossal amplification, such success is only achieved by very careful arrangement of components. And unless stamped chassis (such as are used in radio factories) are employed it is extremely doubtful whether duplicates can be made with any guarantee of success.

Certainly these are not the types of receivers suitable for home construction, and so it is necessary in the design of a set such as the super to choose components and a circuit so that the layout will not be unduly critical.

I would not like to say that the layout does not matter—it does, it matters very much—but there is a slight latitude necessary to enable the home constructor to build the set without having to go to "micrometer" adjustments of position, and yet to get satisfactory results.

It will not matter, for instance, whether he moves the intermediate

Note the Comparatively Few Components Needed



The "M.W." "Super" Five is very far from having a complicated construction, as you can see from this complete wiring diagram.

An Ordinary Frame Aerial Can Be Used

coil an inch or so one way or the other; it will not matter if he does not get his valve holders dead straight in line; it will not matter if such and such a wire is an inch or two inches or even three inches longer than in the original set, though it will upset things if he tries to rebuild the set to a different layout altogether.

About the Circuit

So before going any farther into the description of the receiver I should like to emphasise the importance of using a panel and baseboard of exactly the same dimensions, and in copying the layout as shown by the wiring diagram and the photographs as closely as you can, in order to make doubly sure that the set will work properly when you have built it.

And now a few words about the circuit. It will be seen that the first detector is a screened-grid valve operating on the anode-bend principle, its bias being adjusted at the same time as that of the oscillator valve by means of the potentiometer across the filament, and a grid-bias battery in series with the slider of the potentiometer. No reaction on the frame aerial is employed, and this means that an ordinary frame, not necessarily centre-tapped, can be used.

But I must stress here the importance of using a good frame. There are, unfortunately, frames on the market which, though *adequate*, are not really first-class, and there are also frames so wound that their inductance is not of the right value to cover properly the band of British broadcasting.

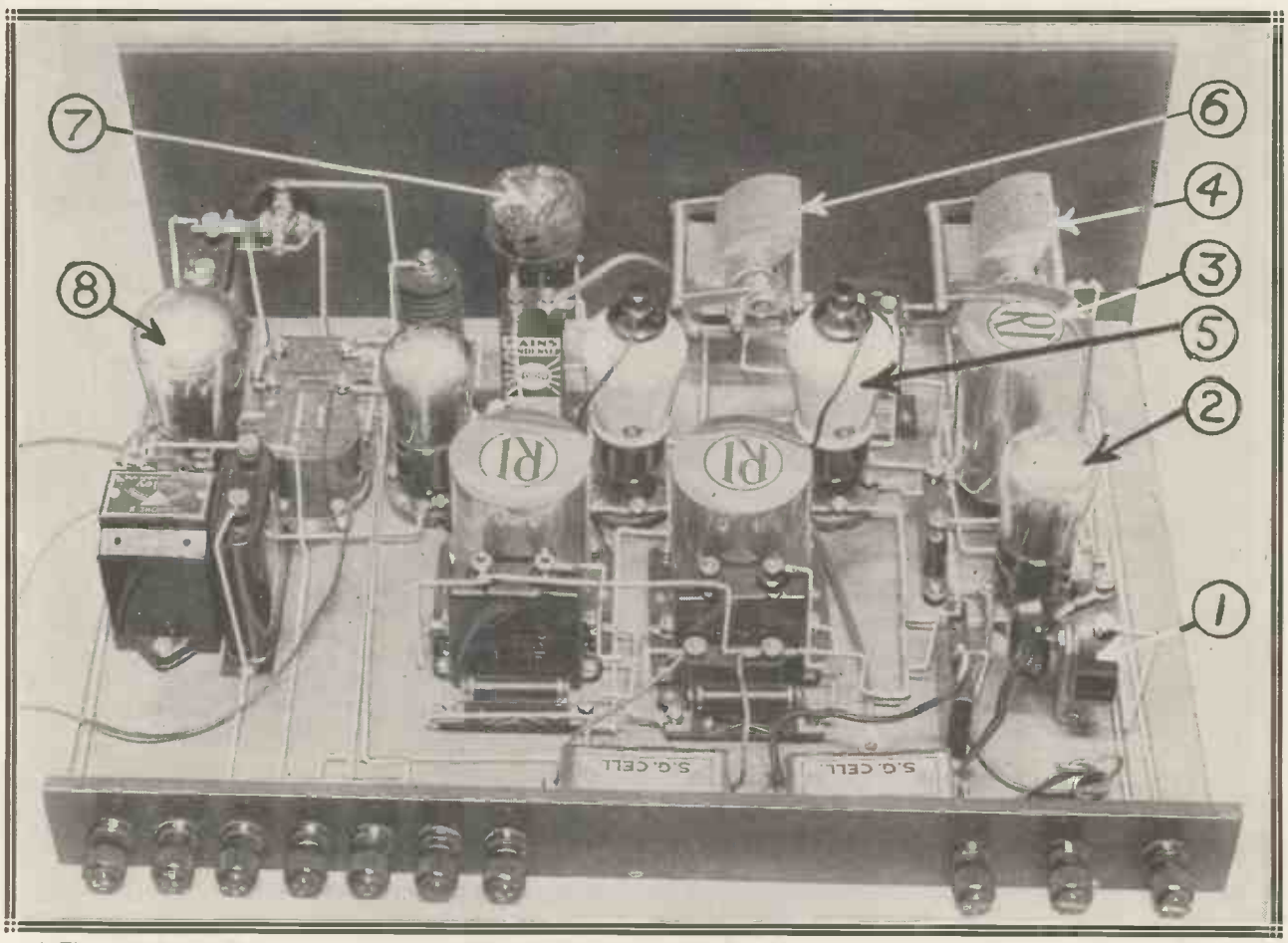
Why this is I should not like to try to explain, but I recently tested a frame aerial, sold at a very popular price, which simply refused to go down below the London National, using a ·0005-mfd. condenser across it. The reason is that it has too many turns, but why on earth the firm who made it put on all those turns goodness only knows! You will find in the list of accessories accompanying this article the names of manufacturers of a number of suitable frames which have been tested and can be recommended for this receiver.

Quality Maintained

Following the first detector is only one intermediate stage, but the excellent design of this enables a very high degree of selectivity and, at the same time, excellent quality to be obtained. The high-note reproduction of the set is extremely good, and there is none of that nasty hollow wooliness which characterises so many super-hets where selectivity only and not quality has been aimed at.

Next comes an ordinary detector working on the leaky-grid principle, and finally a pentode output valve. You will note by looking at the

A Pictorial Guide to the Vital Parts



(1) The 400-ohm potentiometer; (2) the oscillator valve; (3) the oscillator unit; (4) and (6) ·0005-mfd. tuning condensers; (5) first detector valve—it is a metallised S.G.; (7) volume control; (8) L.F. valve.

theoretical diagram that the H.F. choke in the anode circuit of the detector valve (the second detector) has condensers on *both* sides of it going to L.T. This is a precaution against H.F. getting into the L.F. side of the set, a trouble from which super-hets far too often suffer.

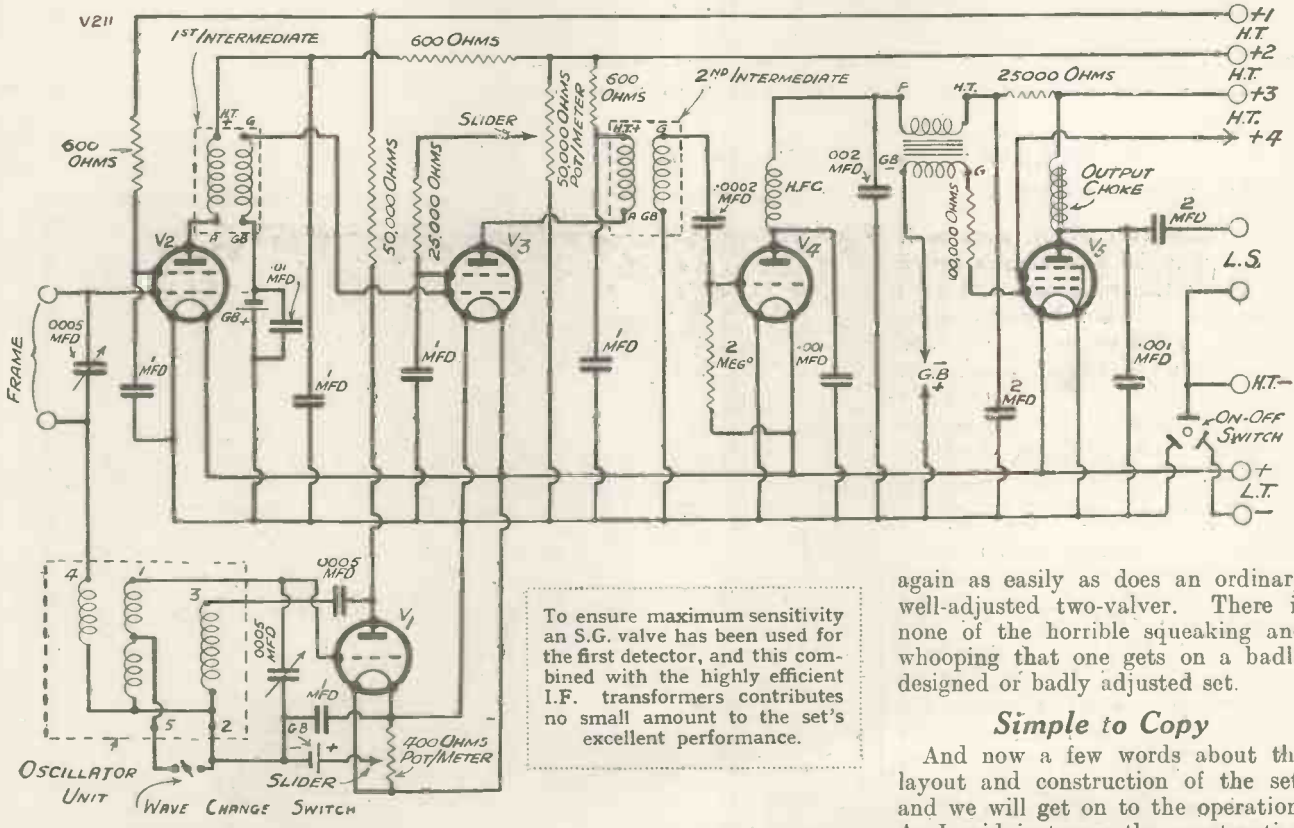
Stopping the H.F.

A very high degree of amplification is obtained in these receivers, and as this is at a comparatively low frequency (being something of the order of 120 k.c.) there is a very great danger of this H.F. getting through the detector and on to the L.F. side of the receiver and, if a pentode is used, being amplified by the pentode and passed through to the loud speaker. The results, of course, are instability and terrible quality.

Also, the second detector is well de-coupled, and, in fact, the whole set is de-coupled very thoroughly. This is the essential factor in a highly sensitive super-het, as any battery coupling will rapidly ruin results. As a matter of fact, this set is so well de-coupled that it can be used with confidence on a mains unit, provided that the mains unit will give the voltage necessary *and* the current.

Up to 150 volts should be used, the higher the voltage within reason on the intermediates, of course, the better the results, owing to greater magnification; and the milliamperage available from the mains unit should be something of the order of 20 milliamps. if sufficient margin for really first-class results is to be obtained. It is possible to bias the pentode valve down very considerably, but for the full output something of the order of 18 millamps. anode current is required for the set.

A Five-Valve Circuit With Many Fine Features



To ensure maximum sensitivity an S.G. valve has been used for the first detector, and this combined with the highly efficient I.F. transformers contributes no small amount to the set's excellent performance.

So I have taken special precautions in this set to prevent any H.F. getting through to the L.F. side, hence the two condensers from either end of the choke, and the grid stopper in the grid lead, and, finally, once more to get rid of the last trace of H.F. and also to correct the pentode quality to a certain extent, a ·001-mfd. from the pentode anode to L.T. This condenser can be omitted if an ordinary valve instead of a pentode is used.

Control of Volume

The volume control consists of the usual screened-grid potentiometer of 50,000 ohms, controlling the screening grid potential of the intermediate valve. As a matter of fact, quality and sensitivity can also be very largely controlled by means of the potentiometer which varies the bias of the first detector. This potentiometer is mounted on the baseboard, and when once the best position has been found it is left "set," while the screened-grid potentiometer is on the panel and should be used solely as a volume control.

Sensitivity Adjustment

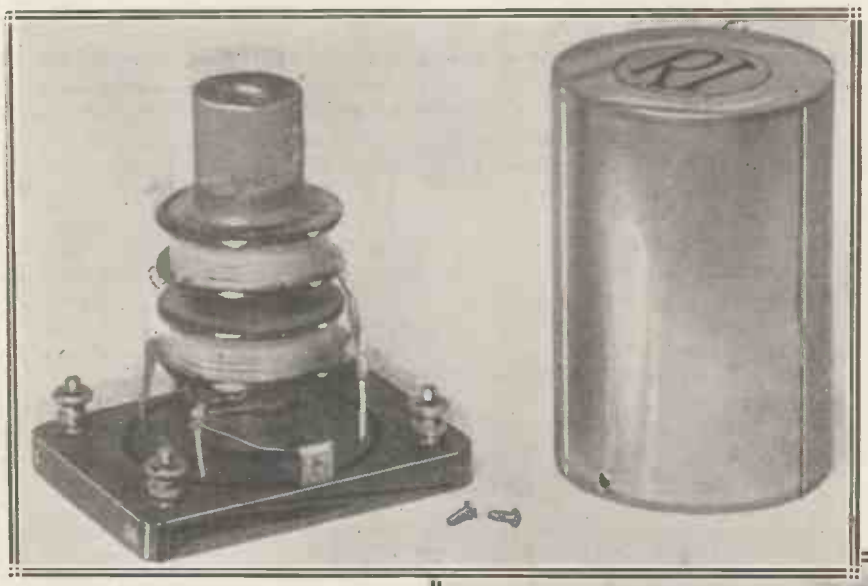
It will be found that on the medium waves with the volume control at maximum the set does not oscillate, though this state is approached, enabling the maximum sensitivity to be achieved. On the long waves, however, it is possible to make the set go into oscillation if a high H.T. voltage is used and maximum position of the volume control is employed. This will aid in finding stations, as the set slides into oscillation and out again as easily as does an ordinary well-adjusted two-valver. There is none of the horrible squeaking and whooping that one gets on a badly designed or badly adjusted set.

Simple to Copy

And now a few words about the layout and construction of the set, and we will get on to the operation. As I said just now, the construction is extremely simple, and the layout is such that there is no reason why anyone who desires to build the set should not be able to copy it with the greatest of ease. One essential point is the oscillator condenser, which *must* be of slow-motion type, and, of course, it is a great advantage if the frame-aerial condenser be of slow-motion type as well. And so in the original set we have used a couple of J.B. "Tiny" condensers

It Will Give You the Choice of Many Programmes

WELL-DESIGNED WINDINGS



that have very smooth slow-motion gearing, and also do not take up a lot of room behind the panel.

The panel controls consist of the frame tuning on the left, next to it and below is the wave-change switch controlling the oscillator, and then comes the oscillator tuning control, followed by the volume control, and finally the on-off switch, which is of the three-point variety, so that the H.T. negative lead is broken as well as the L.T. negative lead when the set is off.

The "On-off" Switch

This is an extremely important point, because we have a potentiometer across the H.T. supply for controlling the volume, and if the L.T. only is switched off there will be a steady flow of H.T. through this potentiometer round through the valve filaments and through the L.T. battery and back to H.T. — *all the time*, even though the set is off. So we have to break the H.T.—supply in order to ensure that there is no H.T. leakage when the set is not being used.

Many people forget that although with an ordinary set which has not H.T. potentiometer control there is no H.T. flowing when the valves are "out," yet with a set where a potentiometer control *is* employed the fact that the valves are "off" does not mean that no H.T. is flowing, because there is a steady flow through the potentiometer.

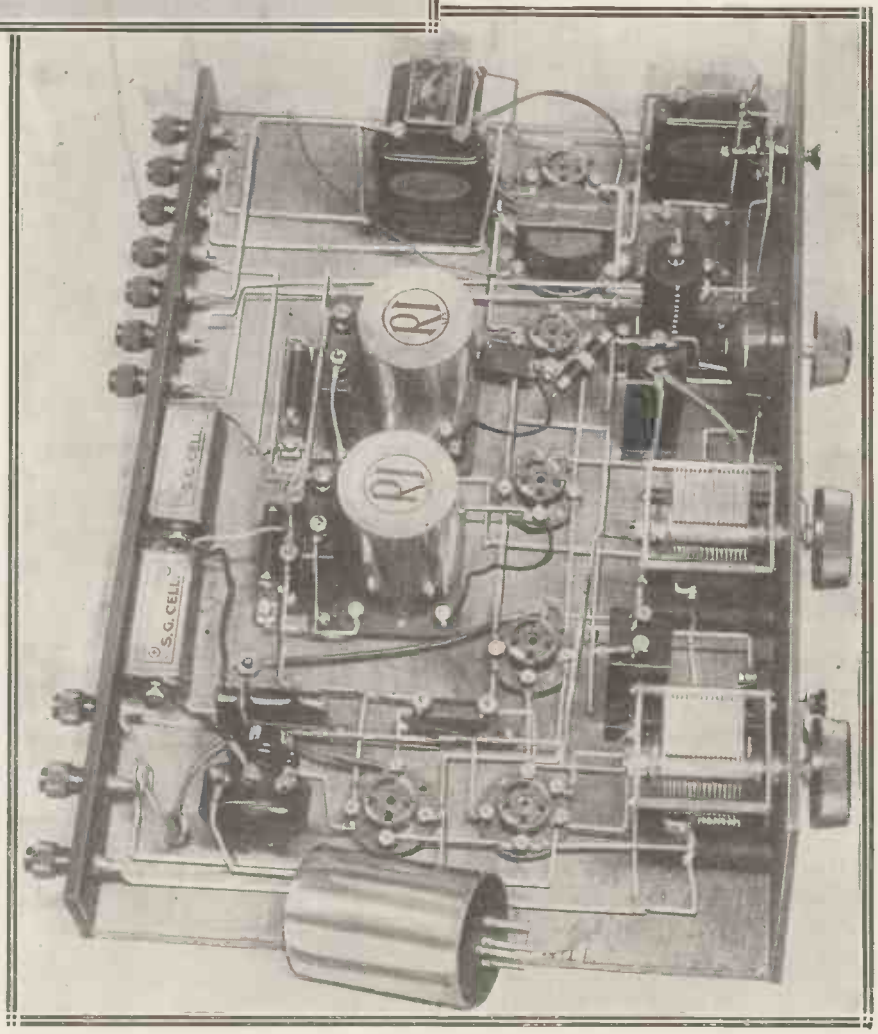
So if you are tempted to use an L.T. switch which is not of the three-point variety—don't, or you will be wasting your H.T. battery the whole time the set is connected up. An L.T. switch with three definite points which are all broken when the switch is off is an essential component in a receiver of this description.

Make Good Joints

As you will see, the set is soldered throughout, and it is very important that all soldered joints be good ones. A "dry" joint in a super-het may mean hours and hours of trouble in trying to find what is the matter.

So carefully test each joint when it is made. Be sure that the wire is

SEEN FROM ABOVE



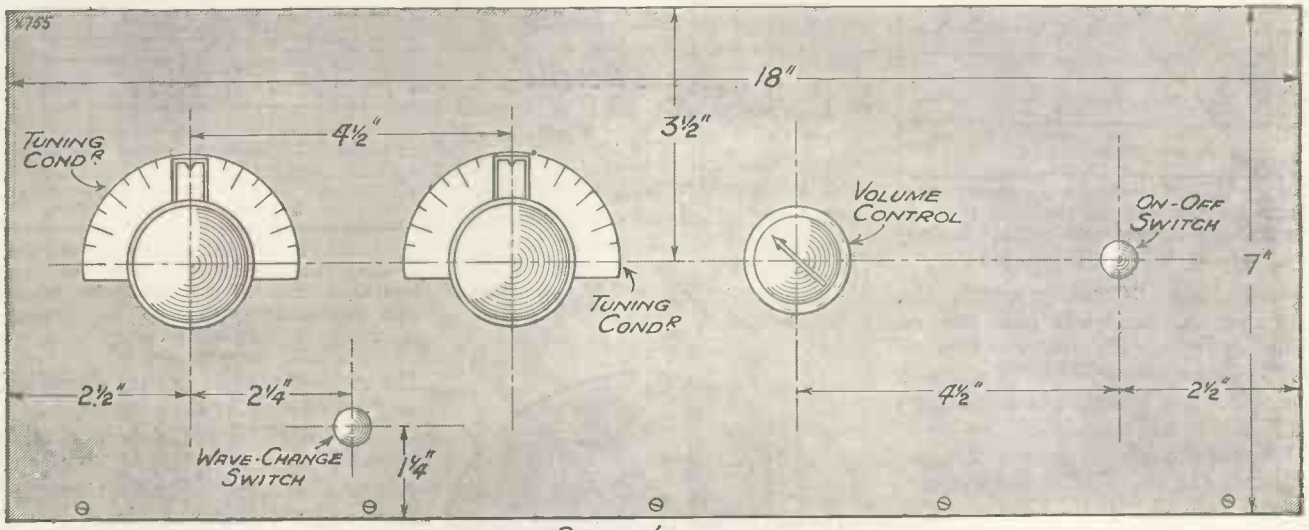
The upper photograph shows one of the intermediate H.F. transformers with the metal cover removed. Below it is a general view of the completed receiver with the oscillator unit lying on its side in the foreground.

clean, that all terminal points are well tinned, using just a spot of Fluxite—do not use killed spirits or similar fluid, or you will have trouble later on; wipe off the remaining Fluxite while still hot after the joint has been made, and give the joint a good tug to make sure it is secure. Few things can cause a more misleading fault in a set of this description than a badly soldered joint.

A super-het that goes wrong is a very nasty thing to tackle. It is far more difficult to trace a fault in this valve. I would strongly advise those who make this set to use a pentode, and in this case a further H.T.+ tapping is required. This can easily be taken direct from the pentode terminal on the base of the valve (for we have made arrangements for a four-pin pentode, which has its priming grid taken to a terminal on the side), and the H.T. plug should be plugged into something like 20 to 30 volts below the maximum of the set. So if you give the set 150, put the pentode priming grid in at about 120 or 130. If you give the set 120, then place the priming grid at 100.

You will see that no provision is made for the pentode priming grid H.T. supply in the actual wiring of the set and in the wiring diagram. This is because we think it is more suitable for a separate lead to be taken direct from the valve to the H.T. battery or mains unit, as the case may be, rather than to put another terminal on the set and so add a complication which will not be necessary for the man who prefers to

Simplicity in Tuning is One of the Main Points of the Design



PANEL LAYOUT.

Although this receiver employs five valves all working at high efficiency, it is exceptionally easy to handle, as there are only two tuning controls, one for the frame aerial and the other for the oscillator. Then there is a volume control, which, by the way, is very necessary at times!

type of set than in an ordinary receiver, so do not take any risks at the beginning. Make sure that the joints are all right, wires are properly connected and correctly carried out in accordance with the diagrams, and then you may be sure that you will not get trouble. If any trouble does occur, then it is due to a fault in a component, and if you use well-known components of good manufacture this will be a very remote possibility.

Battery Connections

The layout and the wiring, as I said before, is easy, and so I think we can pass on to the operation of the set. Connections from the set to batteries, etc., are quite normal. You want three H.T.+ tappings: H.T.+1 for the screening grid of the first detector, and also the oscillator valve; H.T.+2 for the anode of the first detector and the intermediate valve; and H.T.+3 to supply the second detector and the pentode, or other output valve, whichever is used.

Now with regard to the pentode use an ordinary high-mag. output valve. If desired, an additional terminal can easily be added.

Such a valve as the L.P.2 or the P.2 are quite suitable types in the 2-volt range where a pentode is not required, otherwise I would recommend a Mazda or Cossor 230 P.T.

Grid-Bias Cells

Grid bias suitable for a pentode must be employed, and a 1½-volt cell (or, better, a ·9 and a 1½-volt cell respectively) should be used for biasing the intermediate valve and the first detector. The bias lead from the intermediade screened-grid valve is taken from the ·01-mfd. condenser at the back of the first intermediate coil, and this lead should be taken to the negative end of the ·9-volt cell. A 1½-volt cell will do if you cannot get hold of a ·9. The two bias leads from the first detector go, in the case of the positive, to the slider of the 400-ohm potentiometer, and the minus to one end of the ·1-mfd. condenser close to that component.

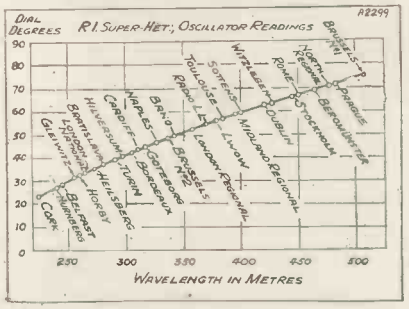
RECOMMENDED ACCESSORIES

Loud-Speaker. (Blue Spot, B.T.-H., Amplion, Celestion, Undy.)
Frame Aerial. (Lewcos, Wearite, Peto-Scott, Ready Radio.)
Valves. 2 S.G. valves (Cossor metallised S.215's in set).
1 H.L. or H. type (Osram H.2 in set).
1 L.F. type (Six-Sixty L.210 in set).
1 Pentode (Mazda 230 P.T. in set).
Recommended alternatives are: Cossor, Mazda, Osram, Six-Sixty, Fotos (H.L. and L.F. types), Eta (except pentode), Lissen.
(If pentode not used output valve should be of power or small super-power type.)
Batteries. 120–150-volt H.T. super-capacity.
9–18-volt bias (to suit output valve).
(G.E.C., Pertrix, Ever Ready, Drydex, Lissen).
Accumulators. Voltage to suit valves. (Exide, Ediswan, Pertrix, G.E.C., Lissen.)
Mains Unit. State type and voltage of mains and give details of set when ordering. (Regentone, R.I., Atlas, Tannoy, Ekco, Heayberd, Lotus.)

There is No Screening to Worry About in This Set

With the batteries, frame and the loud speaker connected you are ready to test the set. The on-off switch is pulled out and the switch on the frame aerial is placed at "medium," and the wave-change switch on the set

WHERE TO LOOK



Your oscillator readings will not vary much from these, which will therefore help you to find the approximate settings for any wave-lengths.

is pulled out. Carefully rotating the frame-aerial condenser (the one on the left), rotate the oscillator condenser, keeping in step until you hear a faint rushing sound, which indicates a carrier of a station.

You will probably hear nothing at all until you are tuned to the carrier of a station. That is the beauty of this receiver—there is no horrible background the whole time you are listening, and only when you come across a station do you hear that rushing sound, enabling you to tune it right in.

Stations Will Roll In

So you must be very careful when tuning to make sure that the condensers are moving very slowly, otherwise you will miss stations. The graphs which we publish with this article give a rough idea of where the stations should be tuned in, and have been taken on the original set, so that if you put your oscillator round about the figures shown for a particular station, and just rotate it slightly from side to side at that reading, putting the frame condenser roughly to the same reading and sweeping that fairly widely across, you will soon pick up one of these stations. Having found one station, however, it will not be long before you get the hang of the set, and station after station will be rolling in.

You will find, of course, there are two readings on the oscillator condenser for each transmission, which is, of course, quite normal. For the long waves all you have to do is to put the switch on the frame to long, push in the wave-change switch on the set, and there you are.

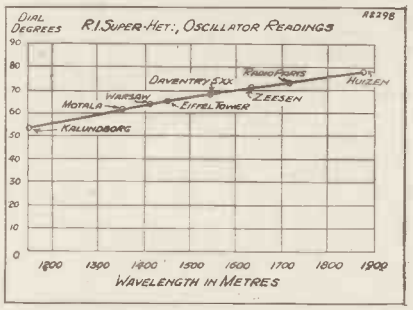
Do not forget, of course, that the frame aerial is directional, and you must turn it towards the station you wish to receive if you want maximum strength, but a very simple and convenient form of volume control on this set is to put the frame at an angle to the station if this station happens to be very near you, and this will reduce the input to the set and avoid overloading of the first detector.

Follow the Details

I do not think there is very much more to be said about the receiver, except that it is essential that you use the intermediate and the oscillator coupler specified, and also one component that might appear to some people to be rather a luxury. I refer to the potentiometer control of the first detector.

One might say: "Oh, we can put that valve direct to the grid-bias battery." You can adjust it this way up to a point, but not to the exact point, and it is essential for the best operation of the set that that potentiometer be used. Also it is essential for those bypass condensers to be used in

THE LONG WAVES

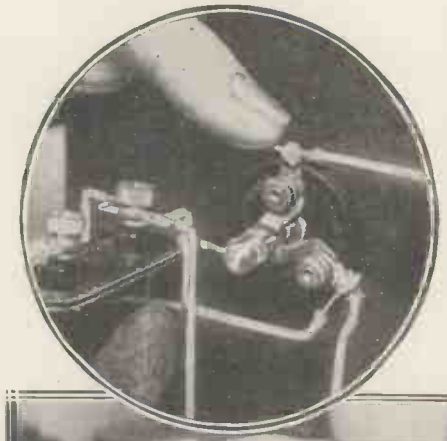


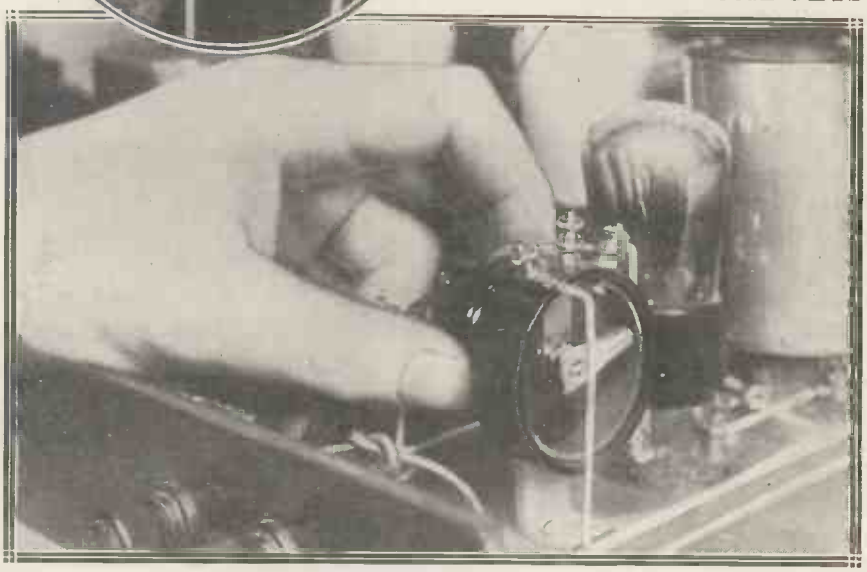
Set the right-hand condenser to the reading shown here for a given station, and then turn the first condenser, when you should easily pick up the desired transmission.

the receiver; so do not try dropping any out or altering their values.

Like all the other details of the complete design, it is just simply a matter of letting the printed instructions and the diagrams "know best." If you make as near a copy as possible of the design illustrated by the photographs you need have no qualms at all as to what is going to happen the first time you pull out the most right-hand knob on the panel, the on-off switch.

TWO USEFUL GADGETS





The top photograph shows the special three-contact switch which completely breaks the H.T. as well as the L.T. circuit. In the lower picture there is the very useful potentiometer, by means of which you can get just the right potential on the grid of the first detector.

AT YOUR SERVICE

by OUR TRADE COMMISSIONER

Under this heading each month will be given news of the radio trade that should prove of interest to the home constructor, general reader, and wireless dealer alike. In order to enable us to provide a close link between the manufacturer, retailer, and the general reader, news of the doings of the wireless trade will be welcomed for inclusion in these pages, for it is only by the close co-operation of the manufacturer and the consumer that both sides can be sure that they are getting the best that radio can offer.

Varley's Advance

WE have just received an illustrated brochure giving details of a number of new Varley "lines." These follow the famous Square Peak coil that was brought out a few months ago, and include the "Niclet" L.F. transformer.

This is a remarkable little component having a primary inductance of 45 henries. It can be used as an ordinary 3·5 to 1 transformer with primary currents up to 3 m.a., but it is preferable to employ it with shunt feed. (Price 7s. 6d.)

Accompanying this are the Nichoke II, and a new range of popular wire-wound resistances which vary in price from 1s. 6d. to 4s. The Varley Junior Multicellular choke is a welcome arrival at 3s. 6d., as are the tag resistances and Spaghettis that complete the range. Well done, Varley!

The Telsen Push

Everybody is discussing the Telsen "Push," and people are asking if they can really do it. They have *done* it, and the first batch of their new components reached these offices not long ago. Telsen certainly mean business and their progress during the next few months will be watched with very great interest by the whole of the radio trade. Valve holders at 6d., Spaghetti resistances at the same price, with 500-volt test, and 2-mfd. condensers at 3s. are sure to make their mark on home construction.

A Good Idea

I hear that B.T.-H., or rather Ediswan's, are bringing out a new loudspeaker of moving coil type, with permanent magnetic field, at the low price of £2 10s., while a D.C. model will sell for 31s. 6d.

But knowing the speaker public probably better than anybody, B.T.-H. have had a brain-wave. They have made the speaker a little unbalanced in musical response—a little lacking in bass. This has been done deliberately because it is believed that the majority of these speakers will be housed in cabinets with the almost inevitable result that not only will the bass reproduction be increased but the speaker will be given a good amount of false bass. Total result—proper balance.

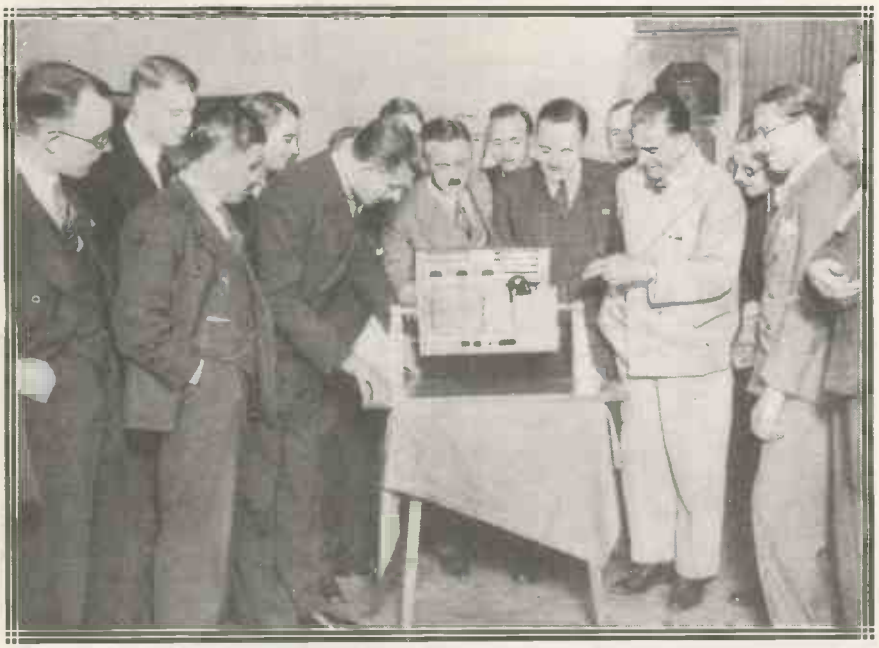
More Price Reductions

We have been informed that Messrs. J. J. Eastick & Sons, of Bunhill Row, makers of the popular "Eelex" products, are contemplating reducing the prices of a number of their items. In the event of these reductions taking place we understand that clients will be given rebate on all stocks held, if purchased this year.

Standard Battery Co., Ltd.

Many new lines are "down" for the S.B. Co.'s programme this season,

PICKING UP TIPS FOR PROSPECTIVE PURCHASERS



The General Electric Company are fully alive to the desirability of keeping dealers *au fait* with the latest developments in radio. They recently invited members of the trade to inspect some of their most up-to-date receivers. You see them here, all very interested in one of the new models.

Items of Interest From Some Famous British Factories

including the "Wates Star" loud-speaker unit, Model S.1 chassis, and the synchronous gramophone motor, and an ingenious automatic motor stop.

Camco Cabinets

Messrs. Carrington Manfg. Co., Ltd., tell us that folders and catalogues of their new range of cabinets, which is very extensive, may be obtained free on application to 24, Hatton Garden, E.C.1. Practically all the Camco designs are registered and the firm is prepared to take action to protect the trade should evidence that the designs are being copied come to hand.

Hold-Up at Hayes

It has been discovered that the inhabitants of Hayes, Middlesex, rely upon the siren of "His Master's Voice" factories as a time-keeper.

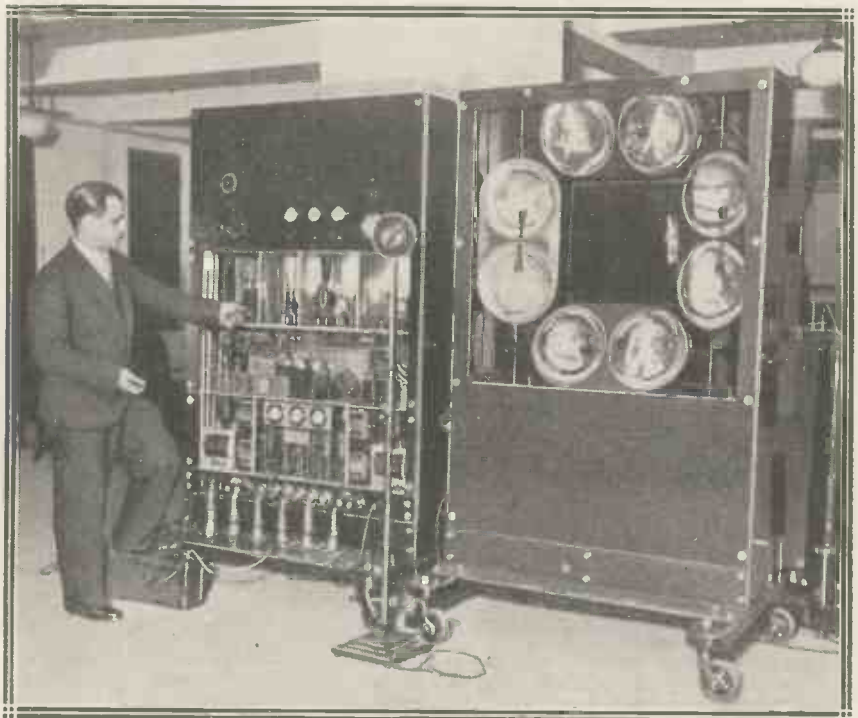
The siren, which blows at 7.30 a.m., 12 noon and 5 p.m., is accurate to one second from a chronometer which is checked with the Greenwich Time Signal received on an H.M.V. Model 521 radio-gramophone at 1 p.m. each day.

On a recent occasion, when the siren was being overhauled, the factory employees were notified that it would not be blown at noon. However, the teachers of a neighbouring school were not aware of this irregularity and not until several anxious mothers arrived at the school to see why their respective children had not come home for lunch was it realised that the siren was not operating. It is extremely fortunate that the children are on holiday during the factory's annual close-down of two weeks!

HAYES RECORDS A "HIT" OF THE SEASON

This is the New Mayfair Dance Band (H.M.V.'s own combination), recording a "hit" of the season, "Good-night, Sweetheart," at Hayes, Middlesex. Electrical recording is almost universal nowadays and is a great improvement over the older methods.

A NEW "ELECTRIC EYE" FOR TELEVISION



A very keen American inventor named Sanabria is making great strides in the field of television. This is his latest "Electric Eye," which has a very large range of vision.

The Bulgin Slogan

"Absolute Reliability at Any Price" is the slogan with which A. F. Bulgin & Co., Ltd., announce their new complete range of switches, and it is one with which we can heartily concur, for we have never been let down by any of their products, no matter whether it be the 1s. on-off switch or the most elaborate mains switch. Mechanical strength of no mean order is an invaluable feature of all these little components, while the design and construction of the self-cleaning nickel-silver contacts with which the switches are fitted have received much careful attention. You're safe with Bulgin.

MY BROADCASTING DIARY

Our own Broadcasting Correspondent records the progress of the British Broadcasting Corporation, and frankly comments on the policies in force at B.B.C. headquarters.

A £3,000 Violin

MISS AMY NEILL, who has just made her B.B.C. debut from Belfast, and who will be heard generally during the autumn, uses a Guarnerius violin, valued at £3,000. During the past seven years Miss Neill has been broadcasting a great deal in America, where she is justly famous.

"Frae a' the Airts"

The series "Frae a' the Airts" has been so far a great success North of the Border. Mr. Cleghorn Thomson and his staff have been combing Scotland for local talent and "atmosphere." They have secured a good measure of success already. The programmes that result take place around the actual homes of the people involved.

The material of the concerts is representative of the particular district, while the participants feel much more at ease singing, playing or speaking in a well-known spot of their own "heath" than they would be if invited to broadcast from a studio.

Broadcasting House, Edinburgh

Public performances are becoming more frequent and popular at Broadcasting House, Edinburgh, which is already the acknowledged centre for the artistic and literary-minded of "Auld Reekie." The Radio-optimists will initiate a "miniature Prom" season there about the middle of September.

Mrs. Snowden's Next Venture

Having been successful with her Opera Subsidy scheme, Mrs. Snowden is now busy completing the plans for the special six weeks' season of Opera (in English) at popular prices at Covent Garden, beginning on Monday, September 14th.

There will be generous broadcasting of the performances, which promise to attain a high standard of excellence. I hear that some of the chief officials of the Russian Opera Season at The Lyceum have been seeking employment at Covent Garden.

A Ghost at Savoy Hill?

A member of the B.B.C. Symphony Orchestra was telling me the other day that one of the announcers at Savoy Hill is supposed to have experienced an actual ghostly visitation. He was not over-communicative about the details, but he did tell me that the ghost was supposed to be that of one of the former occupants of the premises when the building consisted of luxurious flats known as Savoy Chambers.

The place was bombed during the war, taking a direct hit from a particularly big missile from a Zep. It is suggested that the ghost is of one of the victims of this bomb raid; but I have been unable so far to get any more information on this interesting subject.

Encouraging New Ideas

In its research and experimental programme sections the B.B.C. does a lot of useful work in encouraging and developing "idea merchants" such as Mr. Sievking, Mr. King Bull, and Mr. Freeman. Mr. Paley, the head of the Columbia Broadcasting System of the United States (his photograph is overleaf), told me during his recent visit that this was one of the features of the B.B.C. organisation which impressed him most.

LAUGHS FROM THE "LEVIATHAN"

This is a sea-to-shore broadcast for American listeners, and a popular American artiste—"Believe-it-or-not" Bob Ripley—is telling the radio audience what it is like to approach New York from the Atlantic.

Latest News Items for the Listener

That a group of potential originators should be given comparative freedom from routine restriction seemed to Mr. Paley an admirable thing, and one of the reasons for the frequency of " new programme ideas " on the British ether.

Reorganising the World

The big autumn series of talks on reorganising the world is beginning to take shape. Mr. H. G. Wells, who had something to do with the genesis of the idea, will lead off. Speakers will be told to set out what they would do, given a free hand and unlimited power, to cure the ills of mankind.

A MILLIONAIRE AT TWENTY-NINE!

This is Wm. S. Paley, the young President of the Columbia Broadcasting System, who broadcast some months ago from the London studio.

I confess I look forward to this series with exceptional interest: it provides great scope for entertaining and stimulating originality. Mr. Wells and Mr. Churchill will be high lights; and I dare say " Jack " Haldane will make the fur fly in some conventional circles.

I hope the B.B.C. does not get cold feet about this series. There should be no attempts to cramp the style of the distinguished speakers and thinkers who will contribute.

B.B.C. Pensions

At long last the B.B.C. has made up its mind about the possible rewards for retiring employees. There is no pension scheme of the ordinary Civil Service kind, but a very attractive and generous voluntary contribution scheme. Compound interest at the rate of four per cent or thereabouts is to be awarded to accumulating funds, and there is provision for voluntary saving over and above the requirements of the Provident Fund.

Broadcasting and Politics

The disclosure by the Post Office to the Economy Committee of a lot of business secrets of the B.B.C. without consulting that body in advance has raised afresh the problem of the political representation of broadcasting.

Although the P.M.G. has over-riding constitutional powers, it is not the spirit of the Charter that he should exercise normally any functions other than those involved in his carrying out the job of "ether policeman"—that is, wave-length and kindred technical matters.

Thus whenever programmes are raised in the House of Commons the P.M.G. declines to deal with them, referring the questioners back to Savoy Hill. Now, if it is true that the House of Commons finds it difficult to get at the B.B.C., it is equally true that the B.B.C. is handicapped without proper representation politically. One idea of reform is that representation of broadcasting should be made an additional responsibility of the holder for the time being of the Duchy of Lancaster. Another idea is that a new Parliamentary post be set up, consistent with the importance and growing power of broadcasting.

This proposal was seriously advanced in evidence to the Crawford Commission, which, however, was strongly of the opinion that the less broadcasting had to do with political organisation the better.

How it is to be kept clear of the disadvantages of political associations and at the same time responsive to public opinion through Parliament is one of the most difficult of constitutional problems yet encountered.

The Sunday Programme Position

Those who confidently prophesied a broadening of the basis of Sunday programmes this year are doomed to disappointment. There is no chance of any substantial change. The appearance of the new B.B.C. Theatre Orchestra in the afternoon programmes has not been attended by any new popularisation of the items played.

Nor is there any sign of either alternatives to religious services or the re-timing of the evening arrangements to permit the main programmes to begin at 7.30 and 8, as they do on week-days. The B.B.C. " die-hard " attitude about Sunday programmes speaks more for the resolute determination of those in control than for their wisdom and foresight.

Sooner or later there will have to be a considerable development of Sunday programmes on the lines universally desired. It would be better to make the reforms piecemeal and before they become imminent from pressure.

Some Really Practical Suggestions

And here is the way I would set about the task: there should be longer and more varied entertainment during the day. I would not include dance music; nor do I think I would include anything which the B.B.C. now would regard as out of keeping with the " Christian idea of the day." But I would give more and a variety.

Let's have a good morning concert; appropriate lunch-time music; keep on all the present religious features, but let each have a decent entertainment contrast; start the religious broadcasts at 6.30, after a first news at 6.15, and run the programmes on until 11.15, when the Epilogue should be given.

ON OTHER WAVES

By P. R. BIRD.

A glimpse into the fascinating activities which are ceaselessly carried on outside broadcasting wave-lengths by the world's greatest and smallest wireless stations.

ON our ordinary wireless sets the long-wave tuning covers between 1,000 and 2,000 metres, and the lower or ordinary wave-band from about 250 to 600 metres. What goes on between the gap in these wave-lengths, above them, and below?

The "Shorter" Shorts

The short-wave enthusiast knows that quite apart from these two there is another set of wave-lengths on which programmes may be picked up. With a short-wave receiver wave-lengths between about 15 and 100 metres can be explored, but this still leaves a very large number of wave-lengths unaccounted for. What happens there?

It will surprise many listeners to know that broadcasting is one only of many wireless services, and the professional radio engineer generally thinks of broadcasting as a mere side-line. To him it is of much less importance than the other aspect of radio communication.

Above and Below

Surprising as it may seem, the facts are all in favour of this view. Broadcasting is really a kind of luxury service, but in the air and on the sea other wireless services are of truly vital importance. Matters of life and death.

It is easy for listeners to overlook all this activity that goes on off the broadcasting wave-lengths, and to under-estimate its importance; but the chairman of the wireless section of the Institution of Electrical Engineers recently reminded his hearers that, in the event of a national emergency, broadcasting would probably have to be scrapped in favour of these other often forgotten services.

Let us see what some of these non-broadcasting radio activities are. There is, for instance, the question of shipping. About half the world's ships are now fitted for radio, and of these about 10 per cent have valve transmitters, the others being fitted with the old-fashioned spark apparatus.

The number of ships fitted with short-wave apparatus is increasing by leaps and bounds, and no fewer than 1,200 ships now carry an approved automatic alarm apparatus for emergencies.

SERVES THE WHOLE OF EUROPE!

This view shows part of the control table at Rugby, the world's most powerful station, which handles all Europe's telephony to the U.S.A.

Radio Beacons

Moreover, radio is becoming of greater and greater importance as an aid to ordinary navigation. Over 3,000 vessels now carry direction-finding apparatus, and there are fifteen automatic wireless beacons around the coast of Great Britain and Ireland.

Five more of these "beacons" are in the course of construction, and the total number spread over the seaboards of the world is somewhere well over 200. They are proving invaluable to navigation.

Important Services

The really modern sailing vessel and the up-to-date trawler are fitted up for ship-to-ship conversations by wireless, and readers who happen to have heard liners like the Majestic talking with people on shore will realise that this service can also be extended to the public telephone system.

Another wireless activity into which listeners sometimes unexpectedly have a glimpse is the long-distance

New Long-Wave Stations to Work with America?

telephone services, such as between Rugby and New York. Simultaneous conversations can be carried on from either side of the Atlantic on slightly separated wave-lengths, and powerful ship stations are able to talk to either or both of these places from mid-Atlantic.

In a somewhat different class, but equally important, are the aeroplanes. Most of the aeroplane wireless work in this country is done round about 900 metres, right between our two broadcasting wave-bands.

Picture Transmissions

Again, the recent advance in picture telegraph apparatus has convinced the military authorities of the importance and practicability of this particular form of radio work. It is now an open secret that an aircraft can keep in pictorial touch with its base up to distances of 150 miles, and the speed of transmission is, approximately, 9 sq. in. per minute.

Britain Leads!

How many listeners have realised that the queer noises that can be heard on certain wave-lengths may be maps in transit?

So far as Empire communication is concerned, more important than all the telephones is the short-wave long-distance wireless service. The Beam system, with its directional aerials projecting the power along a given path, has proved a tremendous success; the British services easily leading the whole world in their reliability and extent.

The "Beam" to Australia

The actual route which the beam takes in transit round the world is of great importance. It has been found that signals which are made to pass near or over the polar regions suffer severely during Arctic storms.

To Australia two routes are used on 26 metres, the short route being via Asia and the East Indies, and the long route across the Atlantic and South Pacific Oceans. It has been found that alteration in wave-length effects an enormous difference on these long-distance services, and that severe interference can sometimes be overcome merely by shifting the frequency.

Moreover, when magnetic storms are spoiling the short waves, long waves may be totally unaffected. It is surprising to learn that, in spite of the higher cost to erect and maintain long-wave stations, both the Post Office and Imperial and International Communications, Ltd., are contemplating the building of additional ones to work with America.

The latter is for telegraphic purposes, but the projected Post Office long-wave station is to be used for the transatlantic telephone.

Rugby is now the recognised centre of long-distance European telephony, and although the Germans work telephony with South America, virtually all Europe makes use of Rugby as a long-distance link with the Western Continent.

Ether Echoes

Probably the most fascinating of all the problems awaiting solution on wave-lengths outside the broadcasting band are those of facsimile working. The radio engineer has long dreamt of transmitting actual writing, printed pages, manuscripts, etc., by a form of picture telegraphy; and although the problem has largely been solved when working with wires, the vagaries of the Heaviside layer have so far proved a great bar to radio facsimile success.

The trouble in this high-speed picture work is due to the remarkable phenomenon of "echo." Echo effects can produce distortion on telephony without absolutely spoiling it, but in the light and shade of the picture, where every dot must be faithfully reproduced, they are fatal.

In the course of recent tests with high-speed pictures it was found that although the transmitting and receiving apparatus was capable of dealing with the equivalent of nearly 700 words per minute, the distortion produced by echo effects begins to show up badly at about 80 words, is very bad at 150 words per minute, and is quite unreadable at about 300 words a minute!

Tests with Shorter Waves

The present theories arising from these facts suggested that better results might be expected when shorter waves are used, and, theoretically, the maximum echo on a 60-metre transmission to New York should be reduced about one-fifth by working on 22 metres.

With a view to testing this, engineers have recently carried out tests between this country and Canada, and the results which have just been reported upon confirm the fact that the solution to the problem may be found on these very short-wave transmissions.

TRYING OUT A TALKING TANK!

An eight-wheeled armoured car which is able to keep in wireless touch with its headquarters whilst spoiling the landscape around it.

MICROPHONE ATMOSPHERE

by "PHILEMON"

Why are some broadcast talks so dull and lifeless, while others are vital and illuminating? The author can give us some first-hand information, for he will be remembered by many listeners in connection with a popular series of talks entitled "From My Window," which he gave some years ago from the London station.

THIS article has nothing to do with the weather, but with the way in which broadcasters manage to create an atmosphere for whatever it is they wish to get across to us over the air.

Every public performer knows the importance of creating an atmosphere. One of the first lessons you learn in public speaking, for example, is that the important parts of a speech are the beginning and the ending;

SIR OLIVER LODGE, F.R.S.

Despite his own eminence and the complexity of the subjects he speaks upon, Sir Oliver Lodge is an ideal broadcaster, for he always sounds friendly, intimate and interesting.

and if you take care of these, the middle part may pretty well take care of itself.

The beginning is important, because it is in the opening sentences that you create the atmosphere for all that is to follow. Some public speakers, for instance, will start by telling an amusing story, in order to create a friendly atmosphere between themselves and their audience.

A Good Opening Essential!

The way in which a singer walks on to the platform, the way she holds herself, the dress she wears—all these, you may be sure, have been well thought out with a view to creating a favourable atmosphere for her song. The song has already begun before she opens her mouth, before even a note of the accompaniment has been played; it is beginning to breath itself into life in her posture, the poise of her head, the look upon her face.

Similarly, the writer of a play will always try to set the atmosphere of his play, whether tragic or comic, in the opening passages of it; to be able to do that successfully is part of his skill. And a good actor will take great pains with his first appearance in a play; for not only is that an impressionable moment for the audience who are curious to see him, but by the manner of his entrance and the way he speaks his first words he will set the atmosphere of his part.

I call to mind, from my earlier days, a professor who entered the lecture-room, walked in a bee-line to the reading desk without looking to the right hand or the left, opened his manuscript, read through his lecture in a monotonous voice and not raising his eyes, closed his little black book, and walked out again "by that same door" wherein he came.

The Importance of Personality

He was not a popular professor. There were no personal contacts, no uniting atmosphere. We used to think him and his lectures as dead and unprofitable as the moon. On the other hand, everybody knows how there are some people who the moment they enter a room create an atmosphere of either friendliness or antagonism which powerfully influences one way or another all who are there in it.

"PEOPLE AND THINGS"

Mr. Harold Nicolson, who recently abandoned his broadcast talks in favour of politics

Why Some Speakers "Get Over" and Others Do Not

It is much more difficult for those who stand at the microphone to create an atmosphere for their talk, or song, or whatever the performance may be, because we cannot see them. Nevertheless, they must manage to do it somehow or other if they are going to be successful; to "get away with it," as we say.

Sometimes the authorities help them; by giving the comedians an audience, for instance, in the studio, or by providing a suitable musical background to a scene.

Apart from these outside helps, it is entirely a question of voice and the spoken word. I think that broadcasters who come frequently to the microphone would do well to study this point a little. It would be quite worth their while. Some of them seem to get it naturally; although I do not know how much may be due to nature and how much to trick.

He Creates an "Atmosphere" Right Away

In any case, it is a valuable trick. It helps them to engage us at once. It establishes a link. I remember that when I first heard Tommy Handley broadcast it was his "Well, folks!" that got me straightaway. There was a natural simplicity and homeliness and friendliness about it which put me immediately "en rapport," as they say in the classics! Whatever followed was all the more acceptable to me because of that atmosphere which I felt to lie between us.

Mr. Harold Nicolson is another speaker who at once creates an atmosphere. He says, "Good evening." That is all; but it is the way he says it. It is not exactly a friendly good-evening; just as friendly and just as not-friendly as the handshake between two boxers before they begin to spar.

There is a suggestion of challenge in his voice. He is eyeing you from "underneath his eyebrows." He wonders how you will take what he is going to say. He is going to irritate you a little, to "put your back up" a little; but it is to be for your good. That is the sort of atmosphere he creates for me. I like it; but I know people who do not like it. There is no doubt, however, about its being there.

Sir Oliver Lodge is another. He makes a little cough as he settles down. It is a cross between a snort and a grunt and a cough; but it is a very comfortable sound. You settle down with him. You feel that nothing is going to be flurried. You get the impression of strength and ease. Almost at times of playful ease, as if the ether was a rather amusing toy.

A Fine Example of that "Personal" Touch

Many people think that Sir Oliver is an ideal lecturer; so do I; but I am not now thinking of the substance of his talks, or of the extreme clarity with which he arranges his material, but of the atmosphere he creates from the very moment the microphone becomes alive. That atmosphere counts for a great deal. I believe that another man might read Sir Oliver's lectures for him, and they wouldn't sound the same, nor nearly so good.

A similar atmosphere of solidity and confidence comes to the microphone with Mr. Vernon Bartlett, although he is entirely free from mannerism or trick or flourish of any kind. With him it is almost entirely a matter of voice—clear, level, restrained; plus, of course, the personality behind it.

He suggests a quite rare mixture of the judicial and the human. You feel that, however complicated the situation, he sees the kernel truth of it. You trust him. He enlarges your trust of yourself, and of the human heart generally.

"Accent" Creates a Different Impression

An atmosphere of a different kind comes with men who speak with a foreign accent, or with echoes of some dialect. Professor Molanowski, for instance; or Mr. Edward Newman, who always pronounces "one" as "wonn." It is an engaging atmosphere. There is a certain freshness about it, as of a salt wind, which quickens interest. And so on one might go for a long time.

"He suggests a quite rare mixture of the judicial and the human. . . . However complicated the situation he sees the kernel truth of it. You trust him."

Mr. Vernon Bartlett, who tells listeners of "The Way of the World."

I have mentioned only the happier atmospheres; but there are those who create an atmosphere which is sometimes conducive to sleep, and sometimes wherein visibility is not very good. I find that to look out for these things, and to study them a little, adds a good deal to my interest in listening.

I think, also, that if one brings this sort of interest to one's listening, it helps those who provide the programmes; for atmosphere must be to some extent also a question of the listener's frame of mind. But that is another story.

THE WORLD'S PROGRAMMES

HOW, WHEN AND WHERE TO HEAR THOSE FOREIGNERS

The picture in the circle above shows a picnic party near Berlin enjoying a meal to music provided by Jack Payne from 5XX.

CONTENTS OF THIS SPECIAL SUPPLEMENT

ON THE MEDIUM WAVE-BAND

Programme pointers and some notes on conditions.

The rather severe "X's" or "atmospherics" which accompany summer weather that is on the wet or thundery side have recently marred long-distance reception conditions in most parts of the country. On some nights the sharp crackles and "sizzling bacon" effects were so pronounced that weak stations were definitely objectionable to listen to, and one was forced to turn to programmes nearer home.

* * *

Of the "regulars" the two Brussels stations, on 509 and 338·2 metres, deserve special mention, with Bordeaux Lafayette, Toulouse, Mühlacker, Heilsberg, and Hilversum. (The latter station, by the way, has been sending out the Huizen programme and announcements on 298·8 metres, under the arrangement by which Huizen and Hilversum exchange for 3-monthly periods. It should revert to Hilversum programmes on September 1st.)

* * *

Other programmes which have proved specially worthy of attention have been those from Beromünster and Sottens (the two Swiss Regionals), Breslau, Stockholm, and Gleiwitz; while Rome, Vienna, Hamburg, Turin, Goteborg and Milan give really fine shows on the nights they are in form.

Strong Continentals

Many other of the European programme providers have been somewhat unexpectedly strong on certain nights, but have so far failed to retain the new vigour over long periods. This is probably a sign of the return of the long-distance season, which is now due to set in, and will soon be on us with a rush.

* * *

One interesting station to watch has been Langenberg—which incidentally was the star foreign station on medium waves three or four years ago. In conformity with the German Regional Scheme this station is to have its power greatly increased, the present 17-kw. transmitter giving place to a 75-kw. giant of the type already installed at Mühlacker and Heilsberg.

* * *

The present indications are that Germany will be the easiest and most reliable foreign country to receive on medium waves during the autumn. Admittedly, Holland, Belgium and France run it close, but the large number of easily-received and reliable German programmes promise to make that country's transmissions first favourites with British listeners.

* * *

Switzerland has certainly placed itself well and truly on the radio map with Beromünster and Sottens, and both Norway and Sweden have claims to notice; Denmark, too, is represented on each wave-band by a good station.

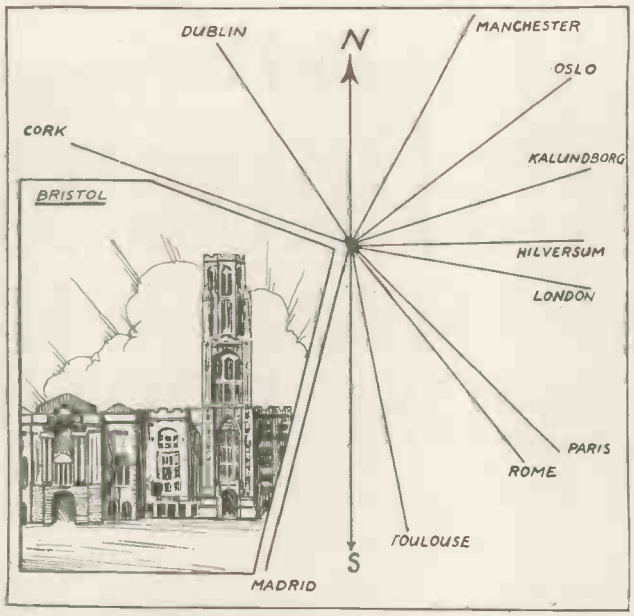
Poland, Italy, Spain, Austria and Czecko-Slovakia are all warmly regarded by listeners in this country, on account of the excellent and easily receivable programmes emanating from those countries. And Russia is shortly to make a big bid for the ears of British listeners, so altogether there should be no lack of variety of programme interest.

* * *

But as Germany, too, is forging ahead with her Regional Scheme, her competitors for the European ether are going to have a hard task to beat transmissions from the Fatherland.

* * *

At the moment of writing there is hardly a German station of considerable power which does not, at some time, put out a programme that is receivable in this country at quite an enjoyable strength.



USING A FRAME AERIAL

Frame-aerial windings must point at the desired station if maximum strength is to be received, and the directions indicated by the radiating lines show how a listener in the Bristol area should align his frame for the stations named.

BELOW FIFTY METRES

Some star turns to watch for.

Among the *really* long-distance programmes to be heard on the shorter wave-lengths there are several of interest, even if some are only in the "coming shortly" stage.

First, we have the Wilkins expedition in the "Nautilus," using the call-sign W S E A on about eight different wave-lengths, chief of which is the 26-metre wave. There will be (at least we hope there will) a chance of hearing signals from the North Pole via the "Nautilus."

* * *

Real jazz will perhaps be heard for the first time when the Fiji Wireless Club have completed the experimental broadcasting station that they are building. This will be the first broadcast, in the entertainment line, from the South Sea Islands.

* * *

Have you yet heard H R B, the station with the unpronounceable name? His full location is Tegucigalpa, Honduras, but he has fortunately chosen the station slogan "The Voice of the Tropics," preceded by *three cuckoos!* Why cuckoos should be connected with the Tropics is not quite clear. He works on 48·62 metres daily except on Mondays.

Very Short

Probably the shortest wave-length used for a broadcast that is picked up here regularly is 15·9 metres, the wave of Bandoeng, Java. He may generally be heard on Tuesdays between 14·00 and 16·00 G.M.T.

* * *

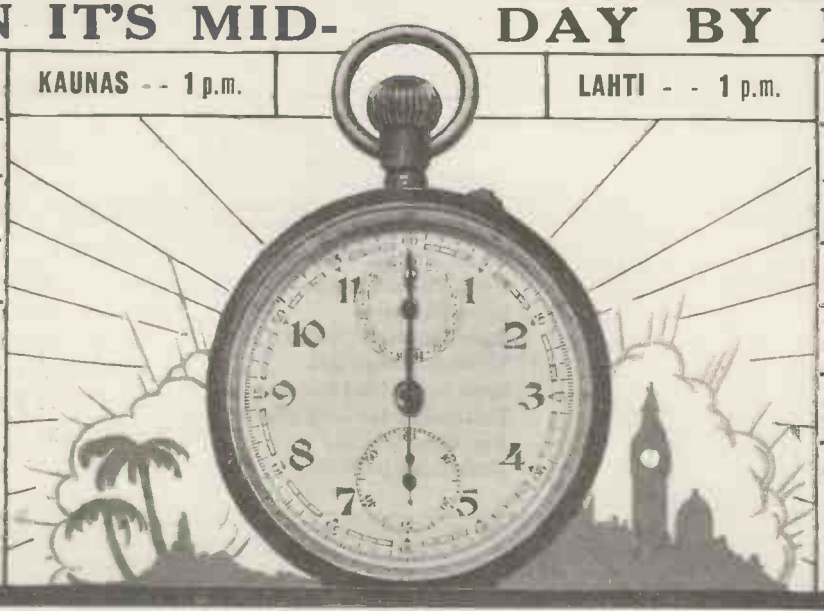
Another 60-kilowatt station is shortly being brought into operation by the Moscow Trades Union, for use on short waves. Some fifty stations are included in the plan for long and medium waves, eleven of which are to use 100 kilowatts!

* * *

The Citroën Automobile Expedition, crossing Asia, is equipped with short-wave transmitters and receivers, and should be broadcasting on 36·3 metres, and 23·6 metres. According to schedule they should be heard after about 8.30 p.m. every evening.

WHEN IT'S MID-DAY BY B.S.T.

ALGIERS - - Noon	KAUNAS - - 1 p.m.	LAHTI - - 1 p.m.	LEIPZIG - - Noon
BARCELONA - 11 a.m.			MADRID - 11 a.m.
BORDEAUX - - Noon			NEW YORK - 7 a.m.
BUENOS AIRES - 8 a.m.			PITTSBURGH - 7 a.m.
CASA BLANCA - Noon			PRAGUE - - Noon
COLOGNE - Noon			SCHENECTADY - 7 a.m.
HUIZEN 12.20 p.m.			TOULOUSE - Noon
KALUNDBORG - Noon			ZEESEN - - Noon



OTHER LISTENERS' "LOCALS"

Condensed news and notes from broadcasting centres in various parts of the world.

BORDEAUX LAFAYETTE generally gives an English lesson at 8.10 p.m. on Saturdays. Wave-length, 304 metres.

* * *

OSLO is still frequently deviating from its allotted wave-length, apparently in order to dodge interference on 1,071 metres.

* * *

BEROMUNSTER. The official name of this station is now given as "Schweizerischer Landessender Beromünster." (Wave-length, 459 metres; power, 77 kw.)

* * *

MOSCOW'S lectures in German, Spanish or Dutch languages start at 9 p.m. B.S.T. Those in French or English at 10 p.m. (Wave-length, 1,304 m.)

* * *

STUTTGART-MUHLACKER is broadcasting special afternoon courses in Spanish and English for the benefit of those wishing to learn these languages. In addition an extension lesson is given in a neighbouring hall after each broadcast

* * *

GRAHAMSTOWN. South African listeners are keenly interested in the proposal to erect a new station at Grahamstown to serve the Port Elizabeth and East London, district.

* * *

CAPE TOWN has recently been overhauling its transmitter, and new plant is being installed to give a more powerful service on 375 metres.

BERLIN'S radio exhibition was held last month at the foot of the "Funkturm" (Radio Tower), and great interest was taken in the development of the latest ultra-short-wave system.

* * *

FRANKFURT, which always used a metronome as an interval signal, has been experimenting with a bell signal.

* * *

KONIGSWUSTERHAUSEN'S metronome, used as an interval signal, beats 200 times to the minute.

* * *

HAMBURG'S harbour hour—a unique broadcast description of the port—usually commences at 7 a.m. on Sundays.

* * *

GOTEBORG (Sweden) is the middle frequency station of Europe, its frequency (932 k.c.) being midway between that of St. Quentin (France) and Kaunas (Lithuania), which have respectively the shortest and longest wavelengths allotted to them.

* * *

ICELAND. The new studios at Reykjavik should be completed by October next, when the full regular programme service on 1,200 metres will be inaugurated.

* * *

RADIO PARIS recently described a motor race, only to find that the land-line hired for the occasion had been cut off without warning by the postal authorities and the description had not therefore been heard by listeners.

* * *

GLASGOW Municipal Transport Committee is scrapping nearly 1,000 trolley wheels and is going to use Fischer Bow collectors, which enable tramways to be run without interference with listeners.

* * *

LANGENBERG'S new regional station (having a power of 75 kw., and comparable with Heilsberg and Mühlacker) may be working by December 15th, the fifth anniversary of Radio Langenberg.

* * *

MUNSTER, the famous German station on 227 metres, may close down or be moved during the forthcoming winter, as the German Regional scheme gets into its swing.

* * *

REYKJAVIK recently decided to announce as "Utvarp Reykjavik" instead of saying "Utvarpsstod Islandsi Reykjavik."

* * *

CRACOW occasionally broadcasts (on 312·8 metres) the ringing of King Sigismund's Bell, which bears the date 1520 and hangs in the tower of Vavel Cathedral.

* * *

DENMARK. The Danish stations have been experimenting with airs from Danish folk songs, for use as an interval signal.

* * *

TREYES. This is the site to which the Cologne transmitter will be moved when the Langenberg transmitter increases its power to 75 kw.

* * *

COLOGNE is not expected to need a separate station under the new regional scheme whereby Langenberg's service area is widened.

* * *

CARLSRUHE clergy decided to adopt silencing devices on the electrical organ blower owing to interference with listeners.

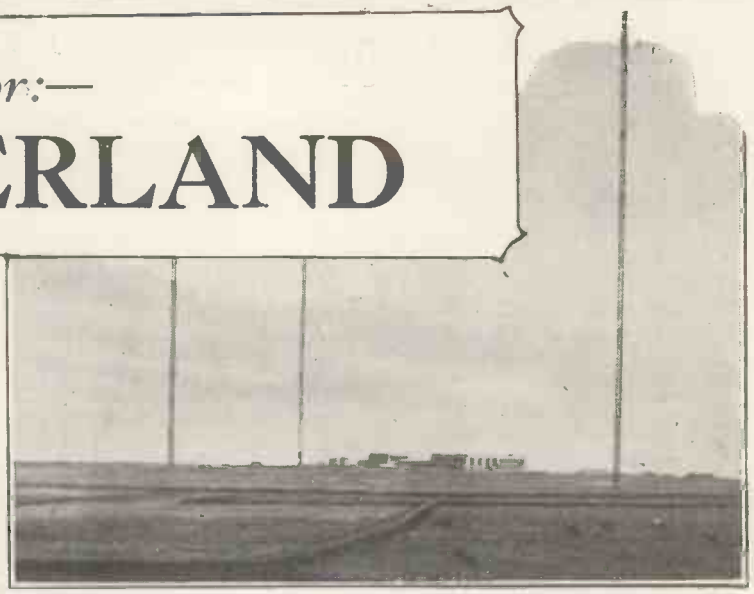
WHO DID THAT?

This debris is not all that was left of a set after lightning had struck it, but is merely the result of a Berlin bailiff's visit! It was decided to sell the expensive cabinet, so the set was unceremoniously pulled out and scattered as shown.

Countries to Listen for:—

SWITZERLAND

The Regional scheme of broadcasting is steadily extending, not only in Great Britain, but also on the Continent, where Switzerland has just reorganised her whole system of broadcasting. At the present her two main stations are Beromunster and Sottens, both of which "come over" extremely well in this country.



Switzerland in 1930 was still one of Europe's most backward countries as far as the number of listeners per hundred inhabitants was concerned. To Britain's six, Germany's five, Denmark's seven or eight, Switzerland only had two radio listeners per hundred inhabitants.

The reason? Not hard to find I'm sure! Geographically, Switzerland is a difficult country to provide with reliable broadcast programmes.

Not Suitable

Wireless waves have a certain antipathy against climbing over hills and then back down into the valleys, and up and out again!

Then there were only two Swiss broadcasting stations worthy of the name. These were Berne and Zürich, the other three—Geneva, Lausanne and Basle—being only telephone transmitters for the air services, and only broadcast programmes when they were not required for earth-to-aeroplane service.

A Poor Service

In Geneva this was only after 8 p.m.; in Lausanne for one hour at noon and after 6 p.m.: Basle only in the evening. Zürich operated with 600 watts in the aerial, Berne with 1 kw. And in spite of this low power Berne used to come through quite nicely until the advent of the German giants.

As far as organisation was concerned all of the five stations had their own studios, their own broadcasting company, and their resources were limited to the service area of their transmitters.

Since February 1st, 1931, all this has been changed. The Swiss Confederation has disgorged some of the money it had been swallowing as its part of the listeners' fees, and it decided to give Swiss inhabitants a really first-class broadcasting service.

High-Power Stations

Two high-power transmitters were ordered from British firms, in spite of competition from Germany and France. One of these stations is now operating on the old Berne wave-length (403 metres) at Sottens, some twelve miles east of Lausanne.

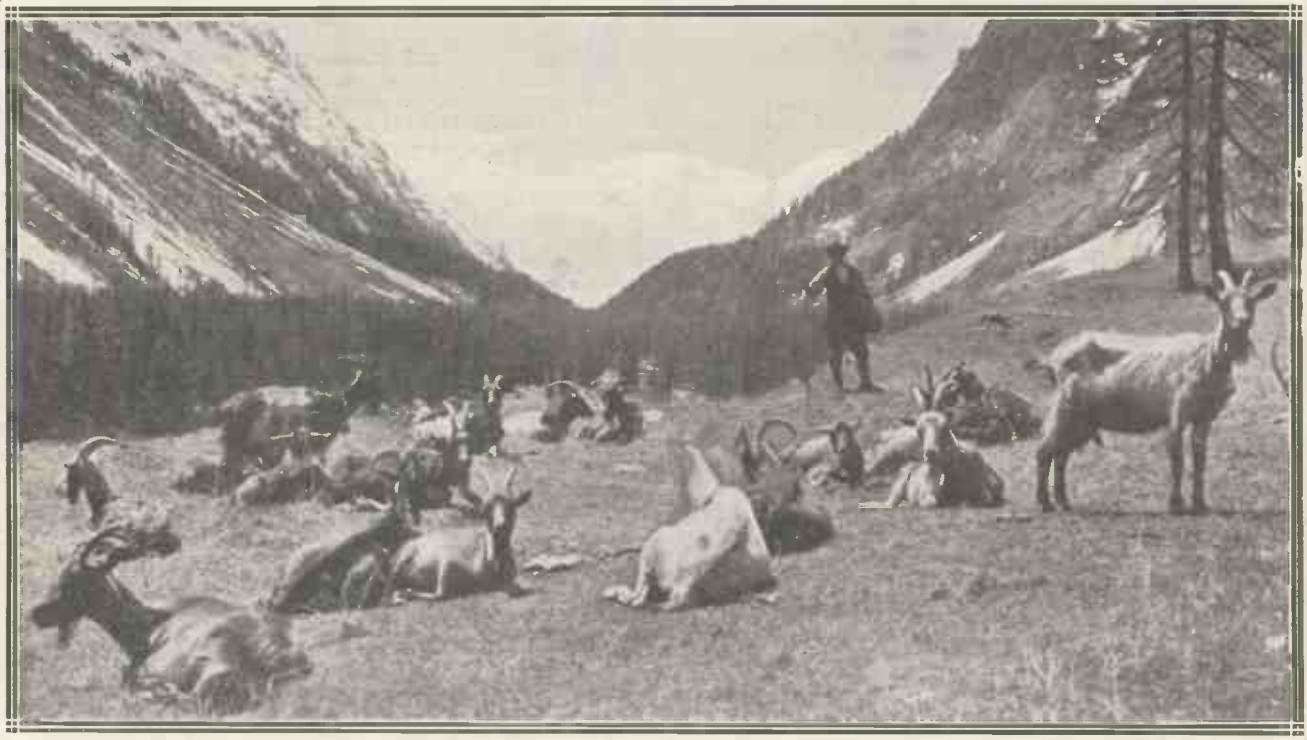
At Sottens

The aerial power of the stations is 25 kw. unmodulated, so that according to the new rating this works out at about 30-40 kw. in the aerial. Sottens furnishes French-speaking Switzerland with its own programmes from the Geneva and Lausanne studios. The call is "Hallo Radio Suisse Romande."

Geneva, in its rather out of the way corner, obtained the former Berne transmitter as a relay station. It works with 1·5 kw. in the aerial on its old wave-length of 760 metres.

The Sottens station is situated far away from any normal means of communication, so if you want to see it, and unless you are on a walk-

A Typical Scene from the World's Most Beautiful Country



The bracing climate of Switzerland, and the many advantages that it brings, have probably been of less service to that country than the glorious natural scenery which makes it a paradise for holiday-makers. Here is a typical pastoral scene of sylvan beauty, ringed about by the everlasting mountains.

Broadcasting Reorganised on Regional Lines

ing tour, you had better get your better-half to make up to those in authority and get them to drive you out from Lausanne in a car. Now Sottens and Geneva look after Western Switzerland, and the number of listeners are already increasing rapidly.

Beromünster.

Eastern, or German-speaking, Switzerland has a fine 60-kw. station, situated at Beromünster, near Lucerne. Beromünster is a quaint little old-world town, and visitors to Switzerland's largest broadcasting station are well advised to see the place.

Beromünster is closer to Zürich than to Berne, so that Berne has obtained a small relay station working on an international common wave, and Zürich relies on Beromünster for good reception. The wave-length used is Zürich's old one, namely 459 metres.

Basle also has a relay station, and St. Gallen would like to have one, but at the moment exhaustive tests are being made to see if Beromünster will or will not be sufficient to cover that part of the country. Beromünster takes its programmes from the Berne, Basle and Zürich studios.

A 10-kw. Station.

Most of Switzerland is thus well looked after, but there is Italian-speaking Switzerland, down in the Tessin, near lovely Lake Lugano, making a fuss about not being considered worth a station. The Confederation have therefore selected the Monte Cenere, a mountain midway between Lugano, Locarno and Bellinzona, as a suitable spot for the erection of a 10-kw. station.

This station will be completed early in 1932. The transmitters proper are all operated by Swiss P.O. staff, whereas the studio control engineers are employees of the broadcasting company concerned.

The five existing broadcasting companies, together with two projected ones, one for the Tessin and one for St. Gallen, have all clubbed together in a kind of association.

This association, called the S.R.G., or Schweizerische Rundspruchgesellschaft, has been granted the broadcasting rights for the whole of Switzerland, and the Swiss Post Office pay the programme companies their part of the listeners' fees via the S.R.G.

Programme Regulation.

The S.R.G. also sees to it that the programmes are up to standard, and represents Swiss broadcasting at international meetings, but otherwise the seven local companies are completely independent. A certain amount of co-operation is naturally required to prevent Berne putting on the same kind of programme during its two days of the week as Zürich, etc.

Sottens, Beromünster and the relay stations rely on the regional or local power companies for their supply of electric current. The aerial masts of the high-power stations and of Geneva have been built according to the standard Swiss system. The masts somewhat resemble miniature Eiffel Towers, but Berne uses wooden masts supported by stays.

New Studios.

Geneva and Berne moved into new studio premises this June; Zürich and Lausanne, of course, retaining their old ones as these are quite adequate. Lausanne, I understand, would like to build new premises, but unfortunately the question of cost has to be considered.

Berne's famous linguistic lady announcer is still going strong, and the last time I saw her she told me she greatly appreciated letters from English listeners, which lately had been rather scarce. I hope that Beromünster will change all that.

A.A.G.

LETTERS FROM LISTENERS

Those "D.X." Results—His "Inter-Star" Three.

THOSE "D.X." RESULTS

Sir,—I have read with great interest the letter from Jean D'Vincent in the June issue of "M.W." and must say that, in so far as distant listening is concerned, I am not entirely in favour of giving the call-sign of the station received. I would much rather see a few of the items published which the listener has heard from these stations. This, in my humble opinion, would be proof positive that the listener has had intelligible reception. For instance, to dispel any doubts which may exist as to the merits of the "M.W." "S.W." Three, of which I wrote to you in February, 1931, I now ask you to be kind enough to publish my report, giving items broadcast on various dates from P C J (Holland) and 5 S W (England), which may be confirmed by those interested.

P C J (HOLLAND).

I.S. TIMES.

June 6th, 9.45 p.m. (Fox-trot).—"Believe Me," and "How About You?"

June 18th, 9 p.m. (Fox-trot).—"What a Fool I've Been," and "Your Eyes."

9.30 p.m.—Folk songs pertaining to Switzerland.

June 19th, 6.30 a.m.—"We are using Aerial 'C' and dedicating this part of our programme to N. and S. America."

June 19th, 7 a.m.—"Hello, U.S.A. and British Colonies. We are dedicating this part of our programme to our listeners in Brazil."

June 25th, 11 p.m.—"I Don't Want to Go Home."

June 27th, 1 a.m.—On Aerial "B." Medley of popular waltzes. Prelude in G Minor as rendered by Jack Hylton's Band. Prelude in C Sharp Minor as rendered by Jack Hylton's Band. A Cossack song, "Evening Bells." Concluding item, "Sunset."

5 S W (ENGLAND).

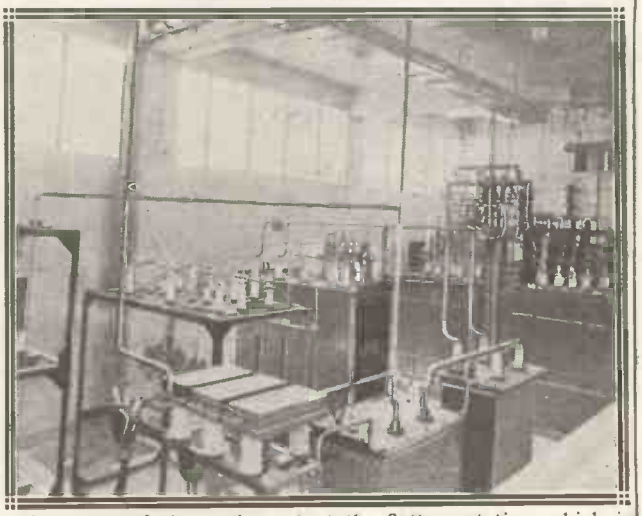
June 25th, midnight.—International talk by a Prime Minister of Europe, at the conclusion of which the listener was asked to send a p.c. to E. Wrench, c.o. B.B.C., giving his views on the talks before and since Christmas. Songs by a Spanish singer: "Colleen of Mine," "You Are My Delight."

June 27th, 11.15 p.m.—Talk on programme for July, from Regional and National. Talk by Sir Francis Younghusband on "The difference of opinion on India." "Tilly of Bloomsbury." Wishing "M.W." every success.

Yours faithfully,
E. HOTCHKISS.

Oorgaum, P.O., S. India.

ON 403 METRES



This is part of the equipment at the Sottens station, which is now heard regularly in this country.

HIS "INTER-STAR" THREE.

Sir,—Enclosed please find a snap of your "Inter-Star" Three "at home." I made the set up a long time ago and have given the same a good try-out, and am highly delighted with it. I have been a regular reader of your highly instructive book for years, and have built up several of your sets, and up to now have never had any trouble with them.

Wishing your paper every success.

Yours faithfully,
WM. J. DOHERTY.

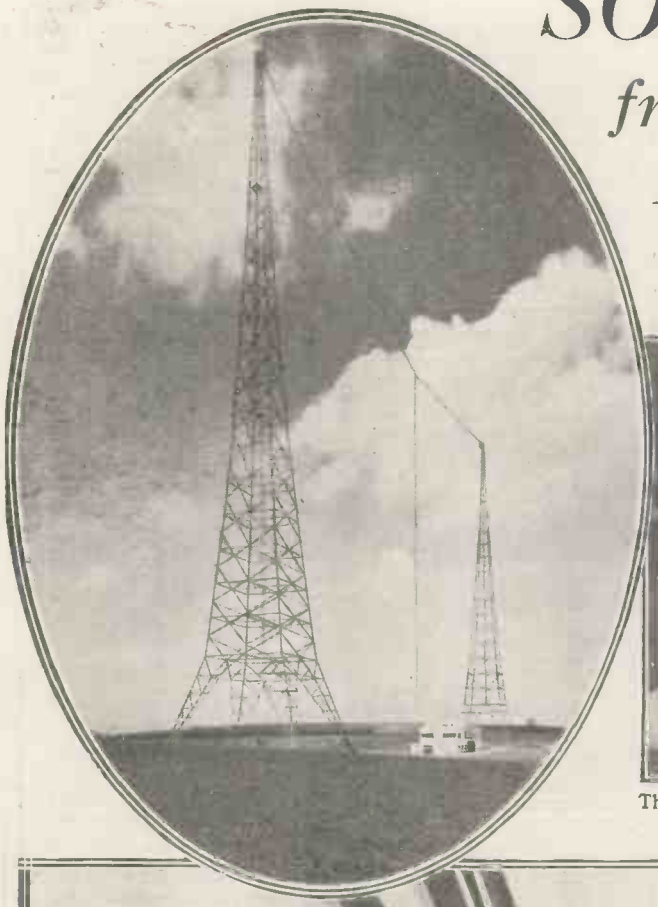
Aston, Birmingham.

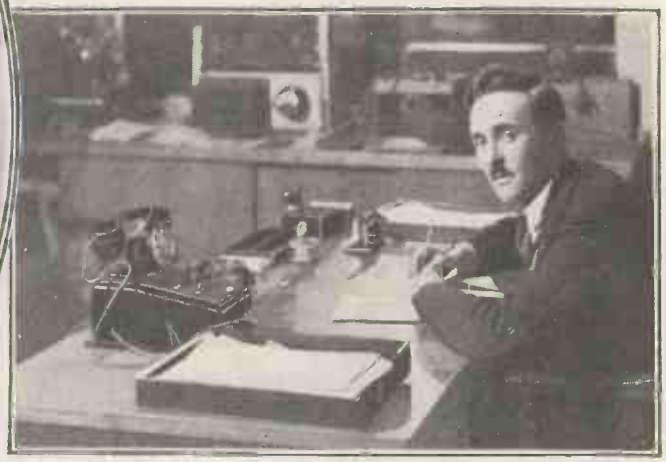
The "INTER-STAR" THREE

This is Mr. Doherty's set referred to in the letter above.

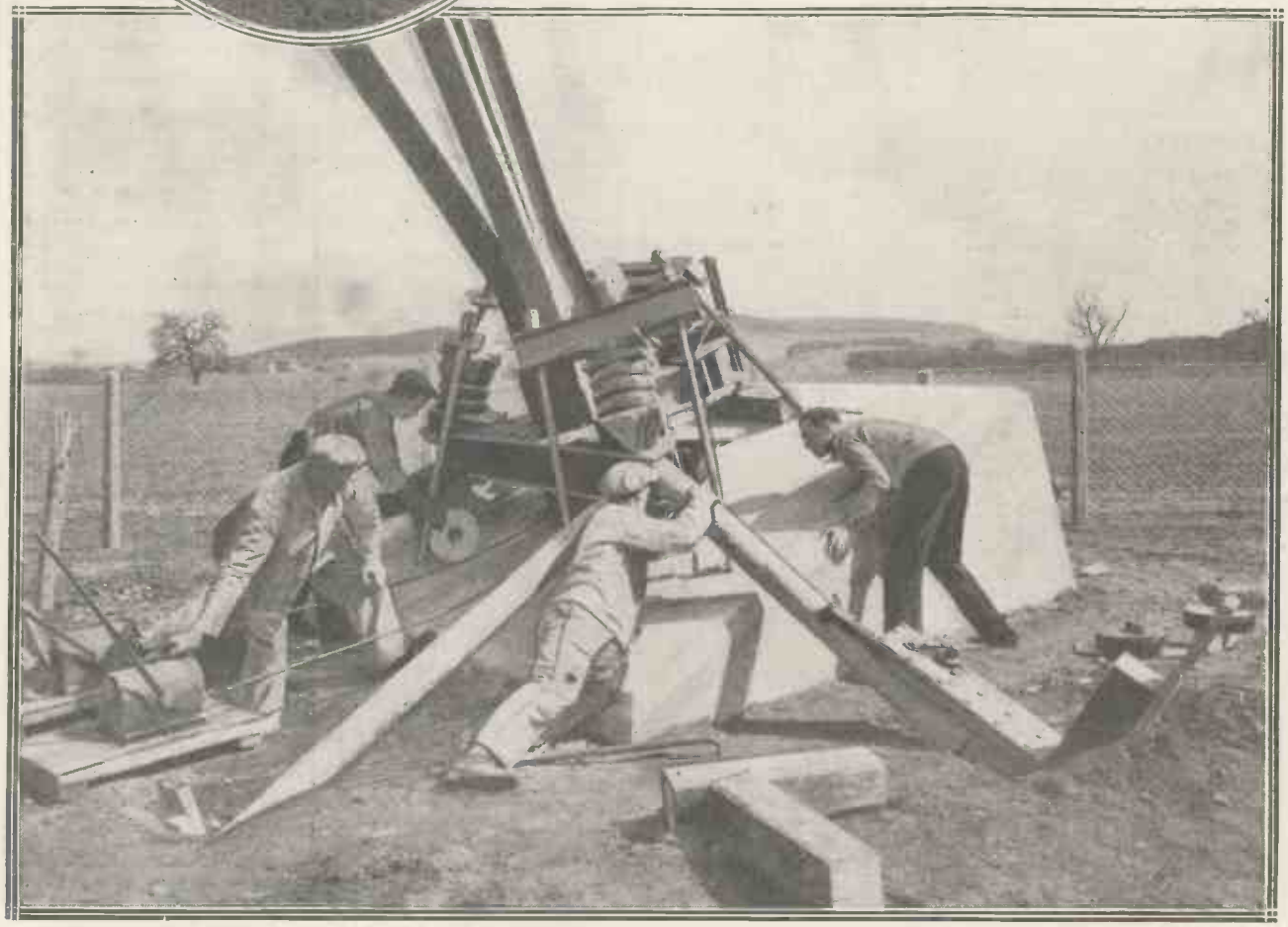
SOME SCENES from SOTTENS

—Switzerland's high-power station now working on 403 metres.

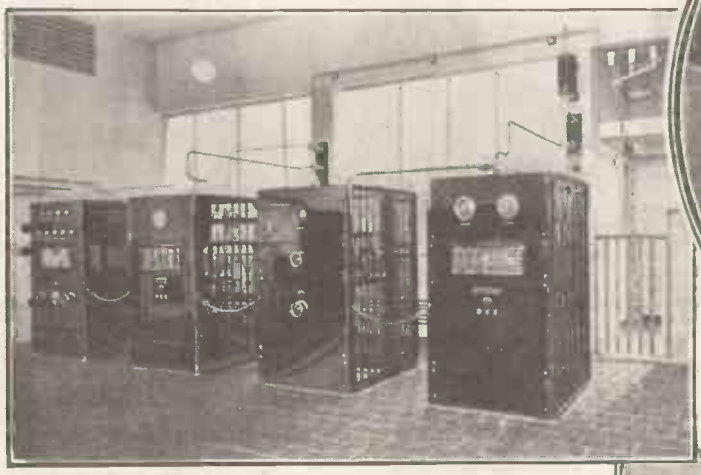


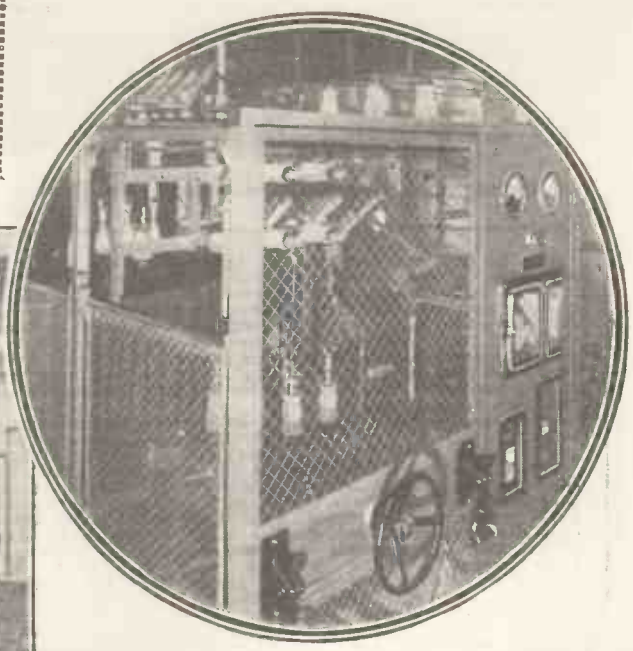


The Station Director at work, and (left) a view of the masts, one of the feet of which is seen being adjusted below.



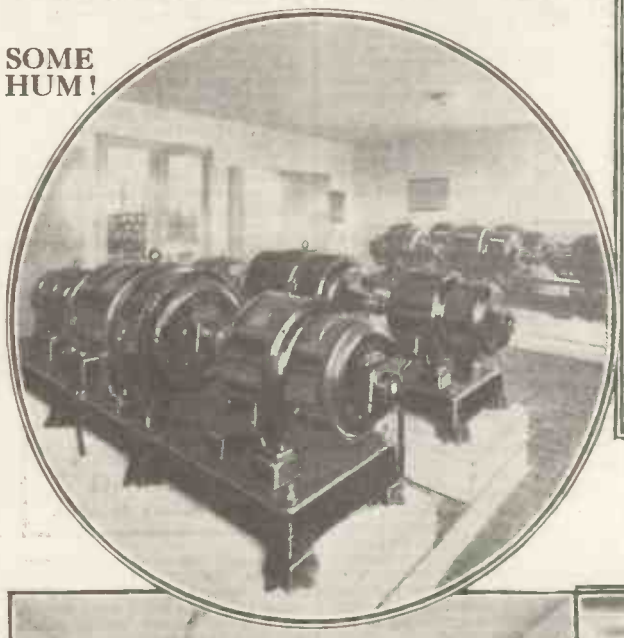
Sottens works on a power rating of thirty-two kilowatts, and many thousands of volts high-tension are handled by the caged-in transformer shown in the circle. Note also the big switches. Below are four of the transmitting panels.

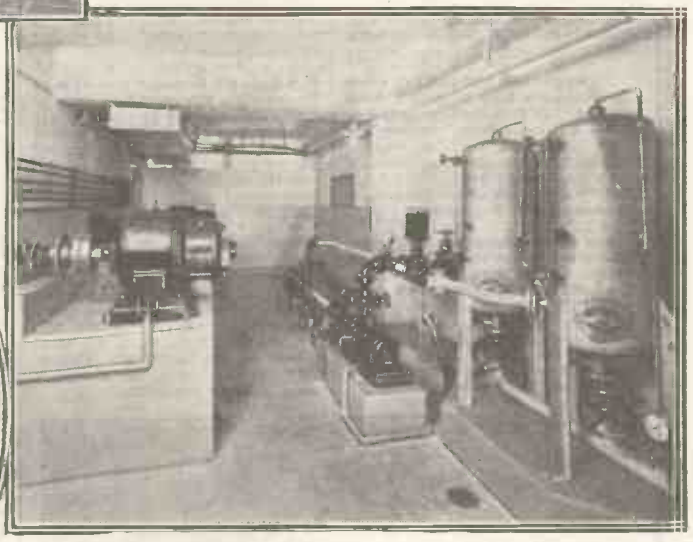




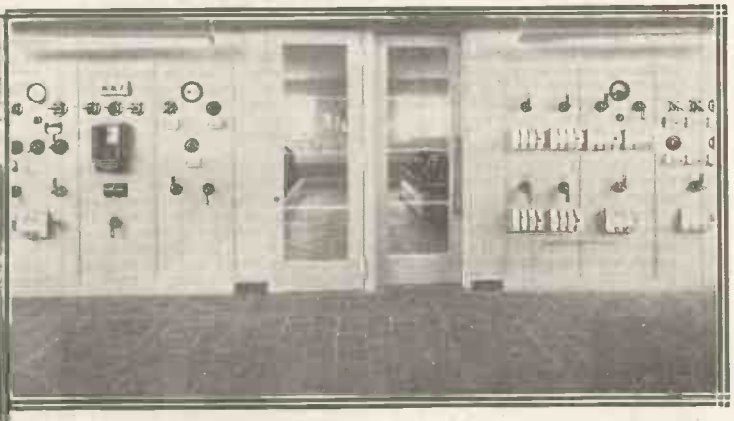
Generators in the Machinery Hall are shown in this circle.

SOME HUM!





To keep the anodes of the valves cool, water has to be circulated round them all the time Sottens is transmitting. Some of the pumping machinery is shown above, and the two lower photographs depict the transmitter and main switchboard.



LISTENING ON THE LONG WAVES

Some notes on recent reception conditions.

Quite the most interesting event of the past few weeks is the debut of the new Radio Paris transmitter. Much has been said and written of the proposal to ginger up this station, it being generally considered important because of the likely effect upon its neighbouring Parisian transmitter, Eiffel Tower. There is a persistent rumour that the Tower may decide to "go one better"!

* * *

At the time of writing there is no official confirmation of the likelihood of an increase for Eiffel Tower, but Radio Paris is testing at intervals on or about his normal wave-length of 1725 metres, with greatly increased power.

The 17 kw. which formerly placed Radio Paris ahead of the 15 kw. of Eiffel Tower is to be increased about five-fold, if necessary, to give the requisite service to the Paris listeners now that the station has moved out into the suburbs. Full power is not being used in the early tests.

* * *

No sooner had last month's notes on Warsaw's lack of punch been penned than that station started to stage a "come-back," which has been developed very effectually. Daylight power has occasionally been surprisingly good, whilst after dark Warsaw has often come right up to earlier expectations.

* * *

For sheer consistency and good strength Kalundborg remains an extremely difficult station to beat. Moreover, the musical items from this station are usually of the sort to please, and there appear to be fewer talks than from other stations, so that the Danish long-waver is generally to be relied upon as a pleasurable alternative.

Apart from a lapse by Oslo the long-wave situation has improved as regards interference. There have, of course, been many heterodyned programmes, and tests in Russia appear to have been responsible for the greater part of these; but on the whole the long waves have been well worth listening to of late.

* * *

An interesting station to tune for during the next few months is Reykjavik, Iceland, on 1200 metres. It will be remembered that a new Marconi transmitter was installed there at the beginning of the year, but it has proved a little difficult to identify owing to its shared wave-length.

* * *

Another factor which made the reception of Reykjavik by British listeners uncertain was the rather long announcement in which the station's name was given, and the preponderance of talks. The announcement is now shortened to "Utvarp Reykjavik," and should be much easier to recognise.

* * *

A final aid to easier reception of Reykjavik is the decision shortly to notify programmes in advance. It appears that the Icelanders regard all transmissions hitherto carried out as more or less experimental, and the regular service will not be inaugurated until October, when the new studio will be completed.

* * *

The new Konigswusterhausen transmitter is still going strong, though at one period its programmes were spoilt by a heterodyne whistle. Moscow Trades Union has been disappointing on 1304 metres, and has not brightened up to the same extent as his neighbour Warsaw with the promise of the arrival of early autumn conditions.

REGULATING REACTION

The most important factor of the ordinary short-wave receiver is its reaction control. If this is good the set is certainly capable of long-distance work.

* * *

Poor reaction, and the tendency to threshold howl, can often be overcome by potentiometer control of the grid potential.

For this, the grid leak should not go to the L.T. wiring directly, but should go to the slider of a potentiometer which is connected across the filaments.

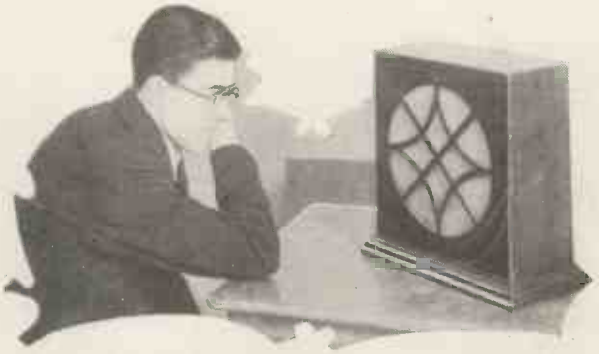
Unless the H.T. supply is particularly "clean," and is absolutely incapable of giving trouble from unwanted couplings, it is essential to use some form of anti-motor-boating device.

* * *

Very often reaction trouble is due to such a simple thing as a wrong value of grid leak or an unsuitable high-frequency choke. And it should be remembered that one of the latter which is perfectly O.K. on ordinary waves may not be good enough for short waves.

Even if your new set does seem inclined to give trouble, do not forget that very often quite a simple alteration will prevent unwanted howling. For instance, connecting a high resistance like a grid leak across the secondary of a transformer, or across the primary or between the secondary of the transformer and the grid of the L.F. valve.

An extra H.F. choke in the plate lead of the detector, or in the 'phone leads, can also be recommended as a likely cure where an output filter has not been incorporated; but for really good short-wave work the latter is a necessity, and the system of H.F. chokes, etc., only a makeshift to overcome troubles caused by lack of a filtered output.



DUAL-RANGE DIFFICULTIES

Some hints on getting good results.

The faults which occur in sets employing the dual-range coil are often caused by the coil itself. In the case of home constructed "M.W." coils, readers frequently use an inner ribbed former of too small a diameter, and in consequence the reaction coupling is too weak and, in addition, the long-wave secondary is too small.

The former should have a diameter of approximately 2½ in. over the ribs. (It is essential to use the gauges of wire specified in the article in the November 1930 issue of "M.W.")

* * *

When no reaction, or extremely erratic reaction, is obtained, a reversed reaction winding should be suspected if the coil has been wound in all other respects to our published specification.

* * *

In sets which employ a stage of resistance capacity L.F. amplification following a detector valve, the value of the anode resistance should be checked. Too high a value of resistance will produce poor, or even complete absence of, reaction effects.

* * *

Another possibility is a faulty long-wave coupling compression type condenser. These coupling condensers should have a maximum value of ·001 or ·002. It is pointed out that the use of a condenser of wrong capacity rating, or one that is in any way defective, will very seriously affect the working of the set on the long waves.

* * *

The differential condenser must be of good make, and have a capacity of ·0001–·0002. In many cases faults have been traced to this source, and it has been found that the maximum capacity of the differential reaction condenser has been below ·0001, and in consequence it has not been possible to obtain sufficient reaction.

* * *

In more than one case we have traced poor long-wave reaction to a defective detector grid condenser, and in these instances, it is interesting to note that the set has behaved normally on the medium waveband. Reaction troubles may also be caused by the use of a poor quality H.F. choke, in sets where the H.F. choke is used for reaction purposes.

* * *

In all cases, the value of H.T. which is applied to the valves should be carefully checked up, and the H.T. batteries, if of the dry cell or accumulator type, should be tested on load after the set has been working for a period.

* * *

H.T. mains units must be capable of giving the required current output, and it should be borne in mind that mains units having a rated output of 20 m/a. or under are only suitable for receivers employing up to three valves, if one of them is of the power type. Sets which utilise super-power or S.G. valves usually require mains units with an output of at least 30 m/a.

REGARDING GANGING

Three points to note.

The adjustment of ganged condensers, whether of the double or triple variety, should always be carried out on a fairly weak station because the correct tuning points will then be more definite.

* * *

Having adjusted the sections of the condenser on one station, turn to a station at another part of the dial and check up the settings by seeing if you can bring this station in louder by making further adjustments.

* * *

To obtain good matching over the whole tuning range, use coils of the same make if you employ commercial ones. If you wind your own, see that they are made similar.

ITEMS OF INTEREST

From Stations all Over the World.

PALERMO, the new Italian transmitter, is still working on 542·1 metres, although its allotted wave is 453·2 metres.

* * *

TURIN station paid a remarkable tribute to the late Duke d'Aosta, who died there not long ago. For two days—as as a mark of respect—the station remained silent.

* * *

BRUSSELS NO. 1 has recently been getting up early on Sundays in connection with pigeon-racing relays. The announcements start as early as 5 a.m. (509 metres.)

* * *

COPENHAGEN. The midnight chimes heard on 281 metres in the interval between dance numbers are from the Copenhagen Town Hall.

* * *

HUIZEN. The Dutch long-wave station is at present transmitting (on 1,875 metres) the Hilversum programmes, under the announcement "Hier Hilversum." It is due to resume the Huizen programmes and announcements on long waves on September 1st.

* * *

BAVARIA. The new high-power stations' site has definitely been fixed, and is at a distance of about 11 miles from Munich.

* * *

MUNICH'S new Regional transmitter will be of the same type as Heilsberg, and will be testing by June of next year.

RADIO TOULOUSE is said to be erecting a new 60-kw. station to work on 150 metres.

* * *

LEAGUE OF NATIONS. The station now being erected in Switzerland for the League of Nations will probably commence transmitting at the beginning of November this year.

THE NORTH REGIONAL. When both the transmitters came into full operation (301·5 metres and 479·2 metres) it was decided that at periods when only one wave-length is in use the programme should go out on 479·2 metres, owing to the better radiation.

* * *

PARIS. The Poste Parisien station has rather spoiled its reputation with British listeners by recent wave-length wobbling, accompanied by heterodynes.

* * *

BERLIN announces a fall in the number of radio licences granted up to midsummer, 1931, the actual number for all Germany being 3,719,594.

* * *

KONIGSWUSTERHAUSEN. The elaborate noon and midnight time signal sent out by this station consists of groups of the letters X, N and G, followed by an O in each case, the last dash of the O terminating at the sixtieth second.

* * *

ITALY. Listeners in the Palermo district are so pleased with the new station that they successfully agitated for extended hours of service.

VIENNA paid a nice compliment to Mr. Bernard Shaw on his 75th birthday last month by rendering three of his short plays in the main evening programme They have decided not to build a new Broadcasting House, but to adapt existing premises to the purpose.

* * *

NEW YORK now exchanges programmes with Berlin regularly on Sundays.

* * *

BERNE recently disbanded its orchestra of 15 players, and the Zurich orchestra is now heard from all the German-Swiss stations.

* * *

"AKRON," the new U.S. dirigible now undergoing tests, has the most powerful radio equipment ever fitted on an airship. It weighs about 1,000 pounds.

* * *

"CENTURION," the British, warship which acts as a target for gunnery praictice, is manoeuvred by wireless whilst being fired on by forts or other warships.

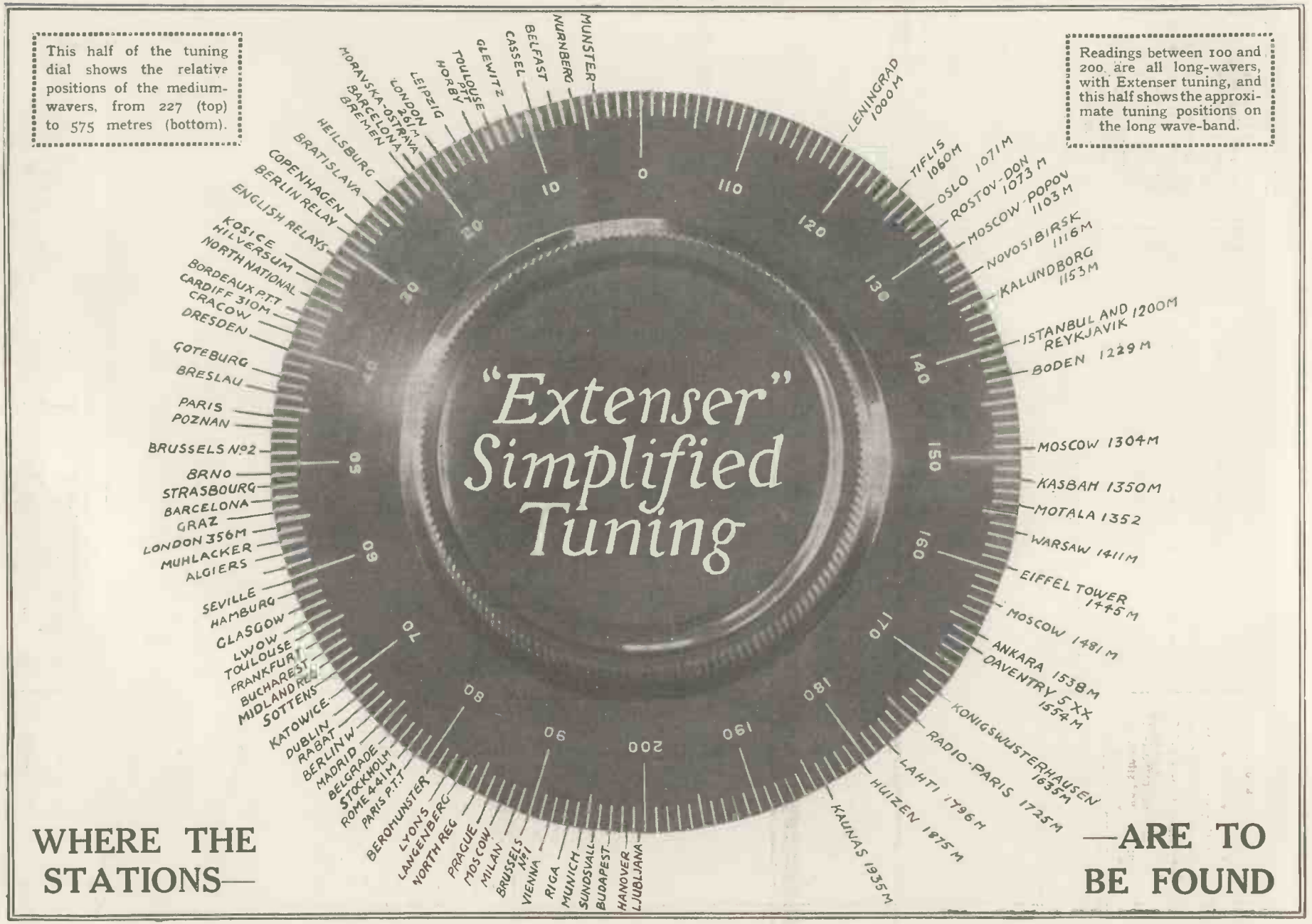
* * *

MÜHLACKER'S new time signal, which consists of the three musical notes C, D and G, is produced by hammers striking metal bars. It is operated by clockwork.

LIPOWKA, a suburb of Wilno, is the actual site of the new Wilno broadcasting station that now works on 244 metres.

AN ORGAN WITH 150 VALVES!

Instead of the usual organ pipes, oscillating valves are used in this remarkable instrument invented by Captain Ranger. It has created intense interest in the U.S.A., where its 50,000 circuits quite captured the fancy of listeners.


This half of the tuning dial shows the relative positions of the medium-wavers, from 227 (top) to 575 metres (bottom).
Readings between 100 and 200 are all long-wavers, with Extenser tuning, and this half shows the approximate tuning positions on the long wave-band.
"Extenser" Simplified Tuning
WHERE THE STATIONS—
—ARE TO BE FOUND
MUNSTER
NURNBERG
BELFAST
CASSEL
GLEIWITZ
TOULOUSE
MORBY
LEIPZIG
LONDON 261M
BARCELONA
BREMEN
HEILSBURG
BRATISLAVA
COPENHAGEN
BERLIN RELAY
ENGLISH RELAYS
KOSICE
HILVERSUM
NORTH NATIONAL
BORDEAUX PTT
CARDIFF 310M
CRACOW
DRESDEN
GOTEBURG
BRESLAU
PARIS
POZNAN
BRUSSELS No2
BRNO
STRASBOURG
BARCELONA
GRAZ
LONDON 356M
MUHLACKER
ALGIERS
SEVILLE
HAMBURG
GLASGOW
LWOW
TOULOUSE
FRANKFURT
BUCHAREST
MIDLAND REG
SOTTENS
KATOWICE
DUBLIN
RABAT
BERLIN W
MADRID
BELGRADE
STOCKHOLM
ROME 441M
PARIS P.T.T
BERGMUNSTER
LYONS
LANGENBERG
NORTH REG
PRAGUE
MOSCOW
MILAN
BRUSSELS No1
VIENNA
RIGA
MUNICH
SUNDSVALL
BUDAPEST
HANOVER
LJUBLJANA
KAUNAS 1935M
HUIZEN 1875M
LAHTI 1796M
RADIO-PARIS 1725M
KONIGSWUSTERHAUSEN 1635M
DAVENTRY 5XX 1554M
MOSCOW 1481M
ANKARA 1538M
EIFFEL TOWER 1445M
WARSAW 1411M
MOTALA 1352
KASBAH 1350M
MOSCOW 1304M
BODEN 1229M
ISTANBUL AND REYKJAVIK 1200M
KALUNDBORG 1153M
NOVOSIBIRSK 1116M
MOSCOW-POPOV 1103M
ROSTOV-DON 1073M
OSLO 1071M
TIFLIS 1060M
LENINGRAD 1000M
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200

SHORT-WAVE SHORTS

Interesting radio facts and developments reported from all over the world.

SS. BREMEN. Germany's record-breaking liner works on 25·62 metres under the call sign D D D X.

* * *

I B D X. This call sign is allotted to Marquis Marconi's yacht, the "Elettra," which can often be heard experimenting on short waves.

* * *

2 M E. All the short-wave programmes from Sydney, 2 M E, on 31·28 metres, include the characteristic signal of the laugh of the Kookaburra.

* * *

MELBOURNE. The Melbourne short-waver 3 M E now transmits on 31·28 metres every Wednesday and Saturday from 10·00 to 23·30 G.M.T.

* * *

DUTCH EAST INDIES. Saigon, the United States, and Siam have recently been testing with the Dutch East Indies with a view to extensive regular services.

* * *

KAMPALA. The station erected at Kampala, Uganda, is Africa's fifth short-waver.

* * *

TEGUCIGALPA HONDURAS. Three "cuckoos" are the "call sign" of this station, which works on 48·62 metres.

* * *

HAWAIIAN ISLANDS. A telephony station at Dixon, California, is to link the U.S. with Hawaii. It should be working early next year, probably between 14 and 44 metres.

* * *

BOUND BROOK, N.J. The W 3 X L transmitter now works on 46·6 metres on Fridays and Saturdays, owing to his wave-length being reserved for transmissions to the Polar submarine "Nautilus" on those days.

* * *

RADIO SPLENDIDE. This Argentine station has been announcing on about 30·05 metres, and was recently relayed by Pittsburgh East (W 8 X K) on 25·25 metres.

* * *

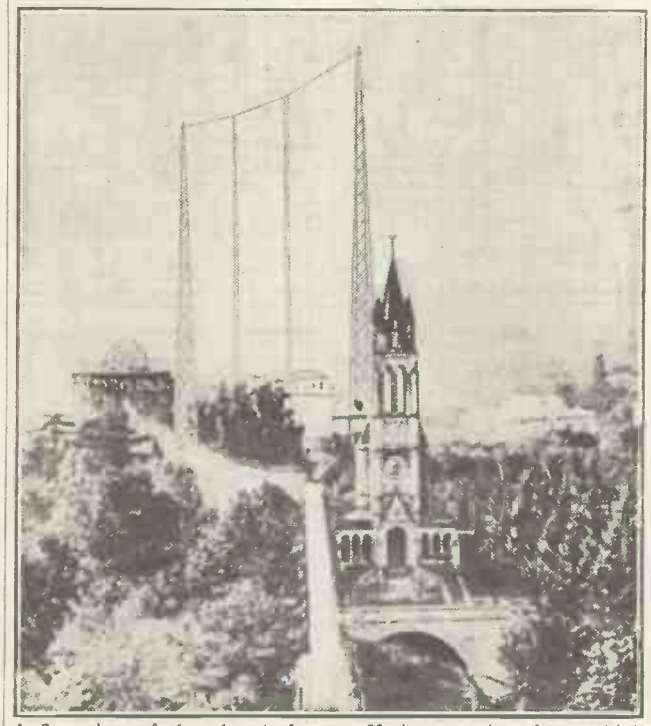
MADRID. A short-wave programme can sometimes be heard very late at night on about 31 metres, the announcements being mainly in Spanish, with some English.

ROTTERDAM. For the benefit of local amateurs very-short-wave broadcasts are being arranged to take place from some high point in the city.

* * *

ST. ASSIZE. The wave-length of 23·25 metres is used by the French high-power

BROADCASTING FROM THE VATICAN



A fine view of the already famous Vatican station, from which the Pope sometimes broadcasts.

BANGKOK. The Siamese capital has been testing on 41 metres, under the call-sign H S P 2. The power employed is 2·5 kw.

* * *

VIENNA. This station has recently been conducting tests on 12·49 metres, from 8 p.m. on Mondays, Wednesdays and Saturdays.

station when working with Buenos Aires.

* * *

PONTOISE. The French Colonial station has altered its hours of working, and now transmits as follows: 19·68 metres, to Indo-China, 3.30–5.30 p.m.; 25·20 metres, to Africa, 6.30–8 p.m.; 25·63 metres, to America, 9–11 p.m.

2 X A D. The famous Schenectady short-waver recently gave a remarkable broadcast description of rescue work from a submarine. One announcer was in a warship, another in the submarine lying below it, and a third in a rescue chamber which was lowered over the submerged vessel during the successful "rescue" operations.

* * *

CONSTANTINE. Constantine-Algeria usually works on Mondays and Fridays from 10 p.m. onwards. Call sign F M 8 K R.

* * *

"RADIO COLONIALE." The French Empire station at Pontoise employs two different transmitters, each rated at 15 kw. They can work separately or simultaneously.

* * *

ARMY TANKS. The wave-lengths employed by British army tanks for inter-communication are round about 7 metres.

* * *

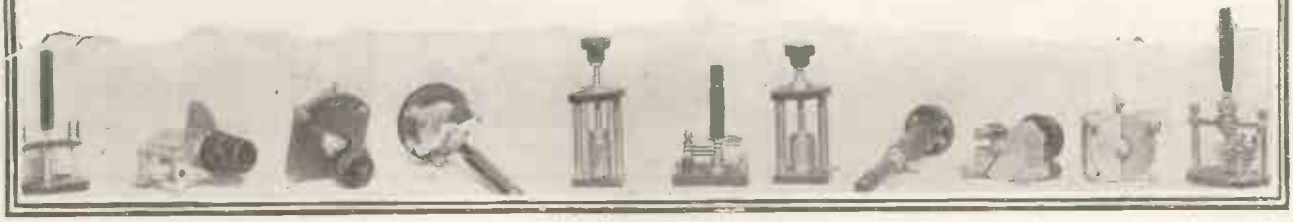
SKAMLEBAEK. The Danish short-waver, which recently moved from Lyngby to Skamlebaek, relays Copenhagen programmes in the evening. During the day it operates a marine medical service, with Blaavand, to ships. (Wave-length 31·51 metres.)

* * *

SYDNEY, N.S.W. The 2 M E Sydney station now transmits on 31·28 metres as follows: G.M.T. 05.00–07.00, to America (Pacific programme); 09.30–11.30, to New Zealand, etc.; 11.30–13.30, to West Australia, India, etc.; 19.00–21.00, to Great Britain and Europe, Africa, etc.

* * *

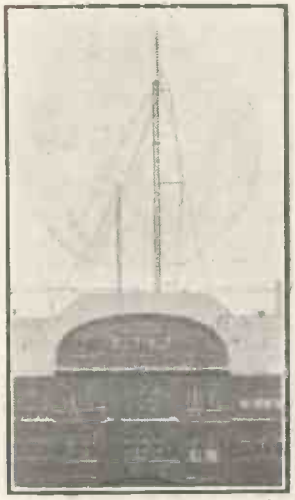
ZURICH. The transmissions of H B 9 O C, on 32·85, is preceded by two strokes on a gong, and the announcement "Hier Radio Zurich."



A GERMAN EXPERIMENT

Exploring the possibilities of the very-short-indeed wave-lengths.

By Dr. ALFRED GRADENWITZ.



An ultra-short-wave aerial erected on the roof of the Telefunken Laboratories.

AN experimental service with ultra-short waves is, according to an official statement by the German Post Office, shortly to be started in Germany. Auxiliary transmitters for such waves will be provided at some of the principal centres, though the present policy of installing a limited number of high-power transmitters is, until further notice, to be continued.

For this reason, and in connection with the remarkable headway recently made in handling them, ultra-short waves are meeting with widespread and general interest.

Prof. Esau, of Jena University, one of the pioneers in the field, was recently asked to allow an interview with himself to be broadcast from Berlin; and about the same time, Dr. F. Schroeter, of the Telefunken Company, gave an account of recent progress and the present status of ultra-short waves before the German Wireless Society.

After referring to the remarkable tests recently made on an 18-cm. wave between Dover and Calais, Dr. Schroeter stated that successful work with these very short waves below 10 metres had been done by him and his assistants as far back as two years ago.

Restricted Range

Moreover, in co-operation with Prof. Karolus, he had, several years ago, made experiments calculated to ascertain the possibilities of the band between about 3 metres and 9 centimetres, both in connection with television and local radio broadcasting. A 7-metre transmitter developed at Nauen has, after a six months' experimental service there, been installed at the Telefunken Radio-Photographic Research Laboratory.

This comprises a small aerial made up of two wire sections, each of 3·5 metres, which is hung up from a mast at a height of 50 metres. The transmitter covers the whole of Greater Berlin and the surrounding district, and has been used occasionally for broadcasting the Berlin programme.

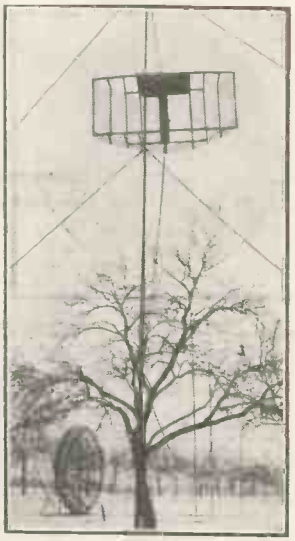
While Dr. Schroeter does not expect to be able to transmit from Europe to America on ultra-short waves, he has realised for a long time that the actual importance of these waves is *their restricted range*; and as this does not extend beyond the horizon, there would be no objection to a number of widely separated transmitters using the same wave without any risk of mutual interference. In fact, this would afford an easy means of providing multiple programmes.

The close co-operation of the Berlin Post Office and its Research Department, and the principal radio firms of the country, as well as men like Prof. Esau and scientific laboratories like the Heinrich-Hertz Institute, are mainly responsible for the headway made in Germany in this particular field of radio engineering.

Travelling Transmitters

Apart from the experimental broadcasting service above referred to it is thought that ultra-short waves will prove particularly suitable in connection with travelling radio transmitters used for reporting purposes. The greater freedom from interference and smaller consumption of energy are, of course, among the outstanding advantages of ultra-short waves.

Cables and other metal masses will, it is true, absorb much of their energy, thus reducing their range within large cities to, say, 10–12 kilometres. For this reason—and in order to avoid interference as far as possible—transmitters must be installed high above the ground, thus enabling the waves readily to reach any receivers.



This reflector was used by the German experimenters on a wave-length of 40 cm.

ETHER CONGESTION

ON THE CONTINENT

By A. G. LANDSEER.

LOOKING through the latest chart issued by the technical committee of the Union International de Radiodiffusion, I find that ether congestion is not what it was only a year ago. But turning on my set the other evening I found London and Mühlacker whistling away.

The new German-Swiss station, Beromünster, was badly interfered with by the neighbouring common wave, and London National came through a mixture of three stations!

Something is Wrong

Seemingly, then, something is wrong. Nine kc./sec. just aren't quite enough to keep two full-voiced giants apart. Give them at least 10 or 12 kc./separation.

"Certainly," said the U.I.R. "but where are we to get the space from?" And in view of all this the U.I.R. have prepared recommendations which they hope that the governments will accept at the next conference in 1932.

Why wait till 1932? Why cannot the Union impose its will on the governments?

In 1927 at Washington the world's governments sent representatives of their Ministries of Communications and Transport and here the ether was divided up among the different existing services. Air traffic services, marine services, police services, and broadcasting, all were allotted certain wave-lengths.

Experience has shown that what is known as the medium wave-band, and par excellence the wave-band above 1,000 metres, are admirably suited to broadcasting. The Union hopes to have these wave-bands widened.

But what is the exact status of the Union? Very often I find somebody demanding that some international body should be entrusted with powers to allocate wave-lengths and have means of coercion to force malefactors to stick to their wave-lengths—at least, as far as broadcasting is concerned.

From the foundation of the Union in 1925 to the Prague conference in 1929 the Union was a perfectly private affair, an association of broadcasting companies. At Prague in 1929 the Union was officially recognised by government representatives as a semi-official body with the right of official ADVISER in all things broadcasting in Europe. We must always remember that the Union as adviser cannot force a government to a decision.

Without treading upon any sensitive toes, it is obvious that the U.I.R. does not get the same treatment from all. Some countries either cannot or will not force their broadcasting authorities to stick to the wave-lengths allotted to them.

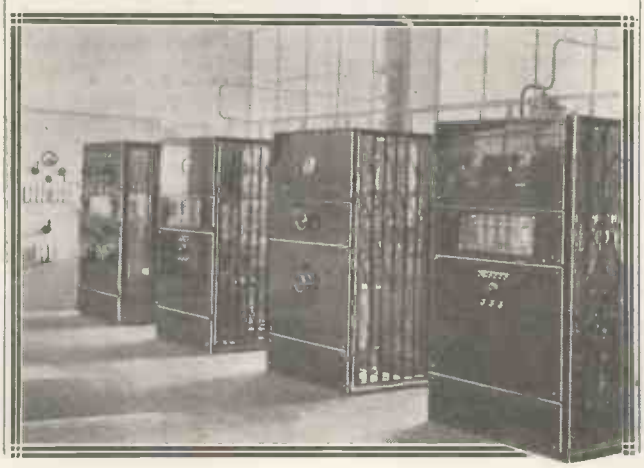
One of the outstanding examples is Turin, who has for a long time been working on 296·4 metres. Yet Turin's official wave-length is 274·2, which apparently does not suit his lordship!

The Delinquents

At the time of writing no fewer than thirteen of Europe's stations are reported astray in wave-length. These are Oslo and Hamar (Norway), Palermo and Turin (Italy), Kosice (Czécho-Slovakia), Lyons, Montpelier, Juan-les-Pins, and Fécamp (France), Radio Catalana (Spain), Varberg and Kalmar (Sweden), and Schaerbeck (Belgium).

Whatever the cause it is certainly deplorable that all these stations should be out-of-step!

Congestion in the ether will, let us hope, be alleviated somewhat next year at the conference in Spain, and till then we poor listeners will just have to make our receivers as selective as we can.



SOTTENS

—one of Europe's latest recruits to high-power broadcasting—uses the transmitter shown on the right.

HIGH POWER

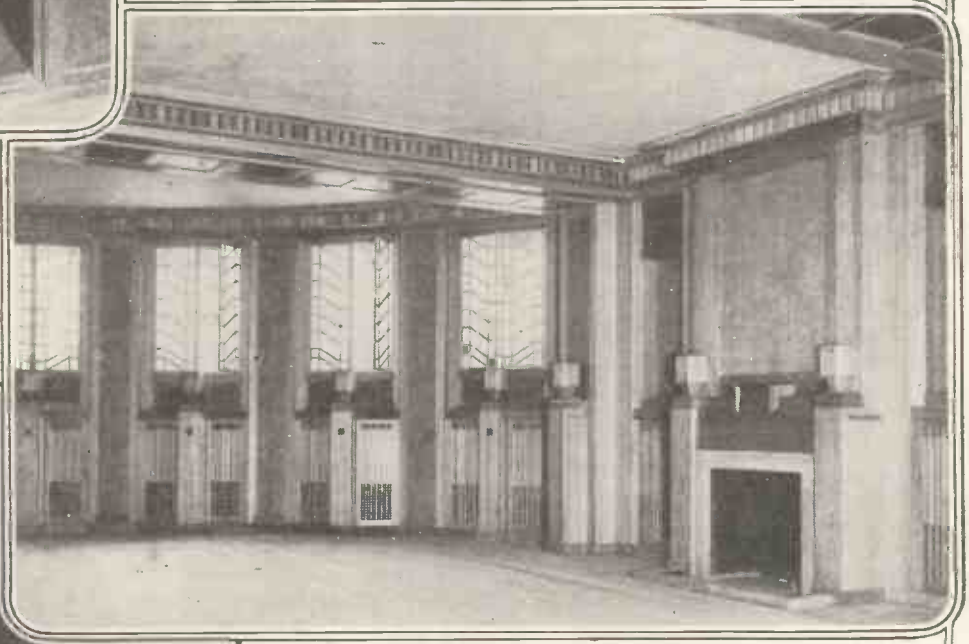
is particularly necessary in Switzerland and similar regions, owing to the poor radiation in mountainous country.

WHAT THEY'VE BEEN DOING LATELY

TRACKING CRIMINALS

You can here get just a glimpse into one of the secrets of Scotland Yard. It is the wireless cabin, from which the Flying Squad is controlled by radio directions.

Boy Scouts who recently took over and operated a high-power broadcasting station. This unique event took place in New York (W J Z).



HOUSING BRITISH BROADCASTING

This is the Council Chamber at the B.B.C.'s H.Q. in Portland Place, London, W., which will shortly supersede Savoy Hill.

SAVING DOG'S LIFE BY RADIO

This bull-terrier is "Laboratory Pup" of Schenectady, who contracted an "incurable" mange. But Dr. Whitney (left) treated him with radio-frequency massage, and now there's tail-wagging all day!

RADIO IN INDIA

Now that Empire broadcasting is again in the limelight, particular interest attaches to the "man-on-the-spot" views, expressed in this thoughtful letter to the Editor.

To the Editor of MODERN WIRELESS.

Sir,—Since I last wrote to you important decisions have been reached about an Empire broadcasting station. These were greeted with acclamation by all, and one had dreams of a twenty-four-hour service on wave-lengths suitable to the time of day.

Alas, they remain but dreams! No doubt files are passing from office to office, plans being drawn and "submitted for approval, please," but in the meantime we Indian exiles, whose other troubles have been figuring largely in the Press, are worse off as regards broadcasting than we have been for some years past. G 5 S W continues to pursue its unprogressive and, so far as India is concerned, almost useless policy of relaying the London programme with inadequate power on an unsuitable wave length.

News is Wanted

Philips Radio of Holland, who used to be our main stand-by when we wished to show off the capabilities of our set to a sceptical friend, have ceased transmissions on the 15-metre band wave-length, which used to be received so well in India, and has greatly curtailed its programmes on its 31-metre band wave-length.

Rome, on 25·4 metres, is well received, but at a late hour in the evening; and Java can still be received at great strength, often without any aerial, but transmits little music.

When Chelmsford has a special transmission on hand, such as the Grand National, or the Boat Race, it can generally be heard. I have a suspicion that the engineers responsible say one to the other: "Let's give these colonials a treat and hang the budget!" and "ginger up" the power a bit on such occasions.

Actually what we want is news, sent out at various times to suit our oriental habits. It should not be forgotten that on the North-West Frontier, in the winter, European hours and clothes are the rule, while in Madras the climate does not vary greatly from winter to summer, and

WHERE IT IS COOL!

Not an Indian scene, but an early morning snapshot of the Oslo masts.

the chief meals of the day are frequently "brunch" at about 11 a.m. and dinner at 9 p.m.

Therefore, to meet the needs of all, a twenty-four-hour service is necessary, with frequent repetitions of the news. When I say "all," I mean not only all in India, but also those farther East, and those farther West.

Articles have been appearing in the Indian Press recently outlining schemes of broadcasting to cope with the great distances and diversity of tongues found in the Indian Peninsular. All these deal with schemes for transmission, but in actual fact half the value of a Government scheme for transmission will be lost if a further scheme for reception in the villages is not provided.

Radio Badly Needed

There are thousands of villages and millions of people situated many miles from the railway and the post and telegraph offices. Such villages have postal deliveries once or twice in the week at the most.

Such newspapers as reach them are days, if not weeks, old, and probably very inaccurate. News travels mainly by means of travellers from one village to another. It would be scarcely possible to imagine a more receptive soil for wireless.

A beginning could be made with the big villages. In every District, and a District may be as large as Yorkshire, or larger, there will be, say, six important villages. In each instal a receiving set.

Teach the village schoolmaster how to switch it on. Have it overhauled and attended to by a travelling inspector appointed by the Government, and in return for a comparatively small outlay you will be able to ensure that correct information about the acts and intentions of the Government is being quickly disseminated throughout the outlying districts.

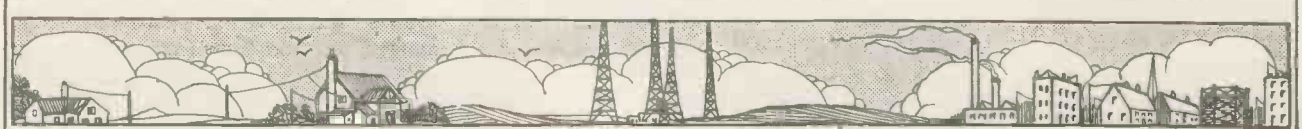
An Influence for Good

Every village has its Guest House, and in the evenings the men of the village gather outside it under a shady banyan tree and discuss the crops, politics, etc., just as is the custom of men all over the world. Put your set and loudspeaker there, and it will instantly become the centre of the circle.

The Indian peasant may be illiterate, but he is no fool in the important affairs of life.

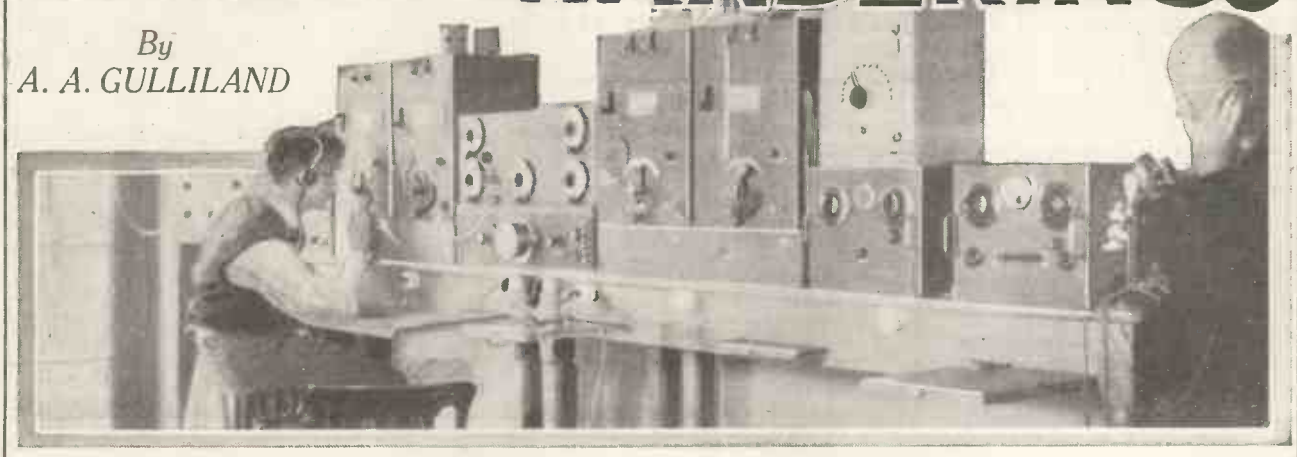
Place, therefore, at his right hand, up-to-date and accurate news, and, provided the Government is wise, you can be morally certain of a loyal and contented peasantry, able to counter the arguments of the agitator.

D. B. MACKENZIE.



WAVELENGTH WANDERINGS

By
A. A. GULLILAND



A comparatively short time ago the uncontrolled meanderings of broadcast stations all over the European ether led to absolute chaos where continental programmes were concerned. This had to be stopped, and so the International Radio Union was set up to police the ether, and the Prague Plan was conceived. How that plan has worked, and how the radio policemen control the traffic, is dealt with in detail by our contributor.

THE last time I met Mr. Braillard was about two years ago in the older and rather primitive U.I.R. (International Broadcasting Union) control station attached to his garage at the back of his home at Brussels. Raymond Braillard, by the way, is a great radio enthusiast, apart from his being a radio engineer with world-wide reputation. It is certainly due to his enthusiasm that he devotes so much time and energy to the policing of Europe's broadcasting wave-lengths, especially as he receives no financial return for it.

THE PRAGUE "POLICEMAN"

Mr. Raymond Braillard, President of the technical committee of the U.I.R., to whom much of the success of the Prague Plan must be credited.

When I looked up Mr. Braillard to see if there were any developments in the technical control of European wave-lengths, I found him in a pleasantly furnished office in a detached villa in the suburbs of Brussels. The house is entirely used by the U.I.R. for its wave-length control station, and is a great improvement on the former installation.

On the ground floor two rooms have been run into one, and are devoted to the complete control apparatus. But before describing this I should like to set down what Mr. Braillard told me in answer to my questions.

A Complete Success

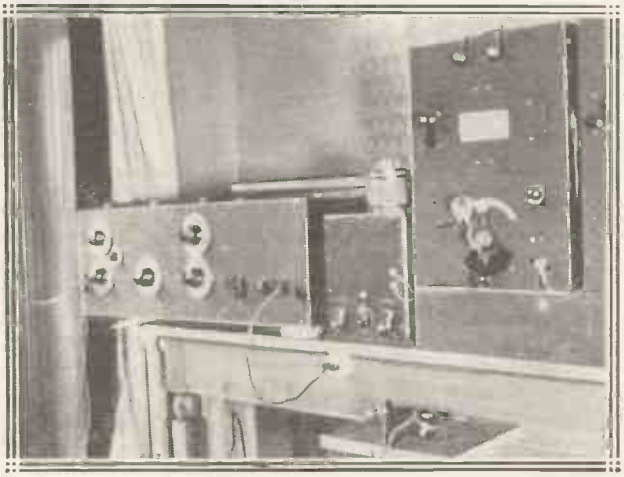
"Is the Prague Plan a success?" was the first.

Proudly he pointed to the latest wave-length control diagrams, and certainly these upheld him when he replied:

"Yes, certainly."

Nearly every station was in its allotted place, and there were but few which showed a wavy line of inconstancy to the allotted wave. It was hard work, he told me, and meant many hundreds of telegrams and telephone calls. But thanks to the co-operation and friendly spirit of all members of the Union, the Prague Plan is a success.

CHECKING THE CULPRITS



The standard receiver and some of the wave-meters used for "watching" the European stations.

Another Revision of Wave-lengths?

But, as a listener, I told him that I still heard stations interfering with each other.

"Well," he replied, "the number is not very great, and I will tell you the main causes of interference, even though the stations are dead on their allotted wave-length."

Three Main Considerations

There are three main points which have to be considered, Mr. Braillard told me. The first, of course, is a station not keeping to its wave either from insufficient technical equipment or from other reasons. Of course, it would be a simple matter to remedy insufficient technical equipment if the question of finance were not involved.

Here we discussed the problem of people wishing to broadcast actually broadcasting, but not having the means to do so properly. This seems something like the man who thinks he has every right to ride down Piccadilly on a farm-cart because he wants to ride, but hasn't the money to pay for a modern car.

This man is obstructing the traffic, and the same with some broadcasting stations who are on the air, but are unable, from financial reasons, to equip themselves properly.

Braillard's which has been further developed by Prof. Divoire of Brussels Polytechnic, and put into practice at the Union control centre.

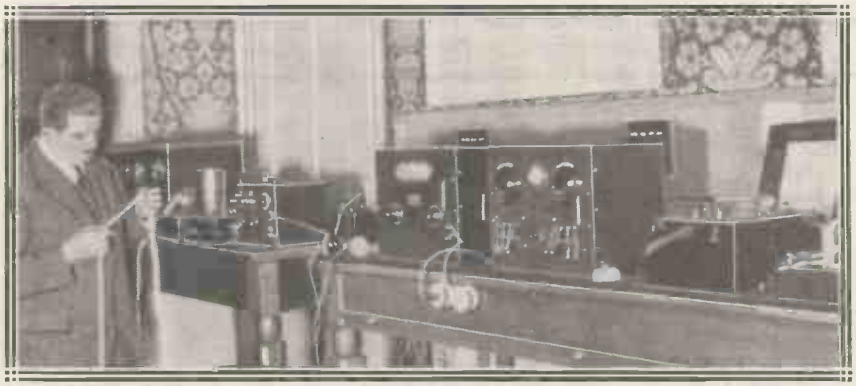
It is perhaps a little known fact that owing to the completely normal and undistorted modulation applied to a broadcasting station the frequency of the emission varies. This trouble is not easily overcome, and, in fact, it is only due to Braillard and Divoire's work that it has become measurable.

In two years the Madrid Conference will be held, and it is then hoped that the few snags that remain in the Prague Plan will be eliminated and that a final wave-length shuffle will take place. This should have a beneficial effect for all European listeners, and should greatly assist in keeping the ether free from heterodynes.

How It Is Done

Luckily, the variations are not very great, but always large enough to cause interference, owing to the very small separation of European wave-lengths. By means of an automatic recorder, of a time unit and of a double heterodyne, this frequency variation due to modulation of broadcasting stations is permanently recorded on a strip of paper at the Brussels control centre.

HOW FAR HAS THAT STATION WOBBLED?



Mr. Braillard examining the records of modulation-wobbling that takes place every day.

A second and, for the moment, very unimportant cause of interference is the harmonics of some stations. In the case of the badly designed high-power stations this trouble may increase, but can always readily be removed.

Frequency Modulation

Thirdly, there is the frequency modulation of some broadcasting stations. This is a pet idea of Mr.

After our interesting conversation, Mr. Braillard took me downstairs to the laboratory, where two engineers were at work mapping out the sins of the broadcasting stations ready for distribution to all members.

Recently a new receiver has been developed for control work. It has two H.F. (screened-grid) stages, one detector stage, and two L.F. stages.

A normal cage aerial is used, suspended from masts at the back of the house. Tests are at the moment being undertaken with a view to the use of directional reception by means of frame aerials.

Next to the receiver are the four standard heterodyne wave-meters which are necessary to cover accurately the whole wave-band from 200 to 2,000 metres. Special dials with magnifying glasses attached permit very accurate measurement. The standard frequency with which the received waves are heterodyned for measurement is supplied by a standard tuning-fork specially tested by Prof. Dye of the National Physical Laboratories.

Easily Remedied

As we left the headquarters of Europe's ether traffic police, as one well could call the Brussels control station, Mr. Braillard spoke of the great ease with which most wave-length troubles were remedied. For instance, suppose one station suddenly left its wave-length for some reason or other, with the result that Brussels was soon inundated by telegrams of complaint from the neighbouring stations.

Usually a few telegrams or 'phone calls would set the matter right. The very lack of elaborate red-tape organisation, and the friendly spirit of European broadcasters, very largely contributed to the success of the present wave-length plan.

In two years the Madrid Conference will take place. Mr. Braillard, like all who have to do with European broadcasting, has great hopes of a revision of the broadcast wave-length bands, so let us hope the broadcasters will get a larger slice of the ether than hitherto.

MORE STATIONS FOR "TITANS"

LARGE numbers of our readers who have become followers of "M.W." during the last year or eighteen months will perhaps not know very much of the "Titan" receivers, described by this journal and its contemporary, "Popular Wireless," some two years ago, and which met with stupendous success.

Here is an opportunity for all those readers having "Titan" coils to make an up-to-date Extenser receiver which uses those popular components to the very greatest advantage.

Sorting Out the Stations

But a very great many *will* remember those sets and will also have, if not complete "Titan" sets still in operation, many of the parts which went to make up the "Titan" receivers, and especially the "Titan" coil. Times have changed since the days when those receivers were designed, and the need for more selectivity, coupled with greater sensitivity, has increased, so that good as was the "Titan" two or three years ago, it is hardly adequate from the point of view of selectivity for modern reception, owing to the present chaotic state of the ether.

Contrary to what one might expect, because there are more stations to hear it is more difficult to get them. This may sound contradictory, but it is a fact, because sorting out the stations to-day in an endeavour to get clear, uninterrupted programmes is no simple job.

Clearing Away Interference

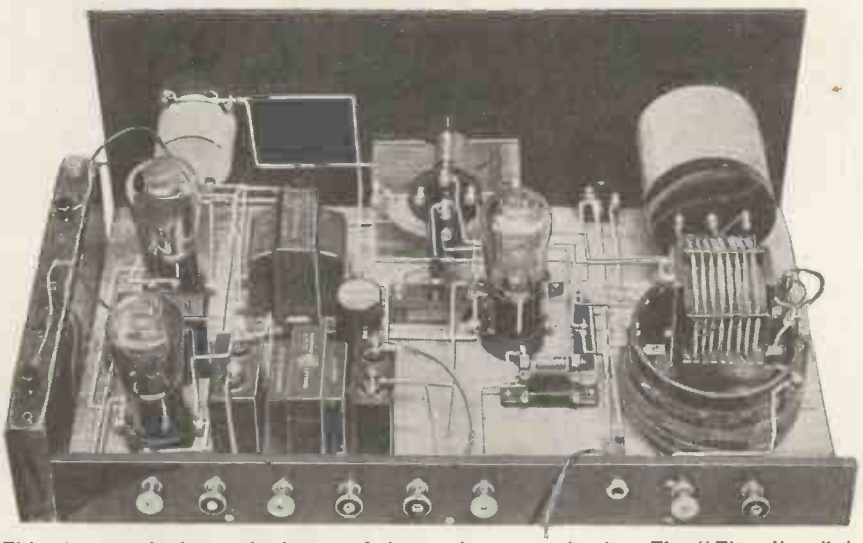
Owners of "Titan" receivers and "Titan" coils will be glad, therefore, of this simple design, which though perhaps not so super selective as many of the more recent of our sets, is nevertheless a big step towards obtaining a high degree of selectivity, and will enable those who wish to use the "Titan" coil to get an increased number of stations much clearer of interference than they have been in the past.

The selectivity of any wireless receiver depends almost completely on its tuning arrangements—that is, it depends upon its coil and its coil design, so that it cannot be expected that taking a coil of any particular type and characteristics one can get exactly what degree of selectivity one requires without any alteration whatever to the coil.

The "Star Turn" Selector

Consequently the limit of selectivity of the receiver which we are discussing now is due to the design of the "Titan" coil which, as we explained before, is a highly efficient coil designed to be used in those days of broadcasting when the need for knife-edge cutting off of stations did not exist. And by adding the "Star Turn Selector Coil," in the way shown here, we can very greatly enhance the selectivity of the "Titan" coil.

AN OLD FAVOURITE "HOTTED UP"



This photograph shows the layout of the receiver very clearly. The "Titan" coil is easily recognisable in the right-hand foreground, with the Extenser and Selector coil on the panel.

(We do not wish readers to get the opinion from this that the "Titan" coil is an inefficient piece of work. It is certainly not that, but at the same time we admit coil design has progressed since "Titan" times.) This receiver is sufficiently selective for most average purposes, and in addition to this selectivity it is extremely powerful. But it is not of the type which will separate, say, Mühlacker from the London Regional (which requires a 9-kilocycle separation). It is, however, adequately selective for most purposes, and therefore we have every confidence in placing the design before you.

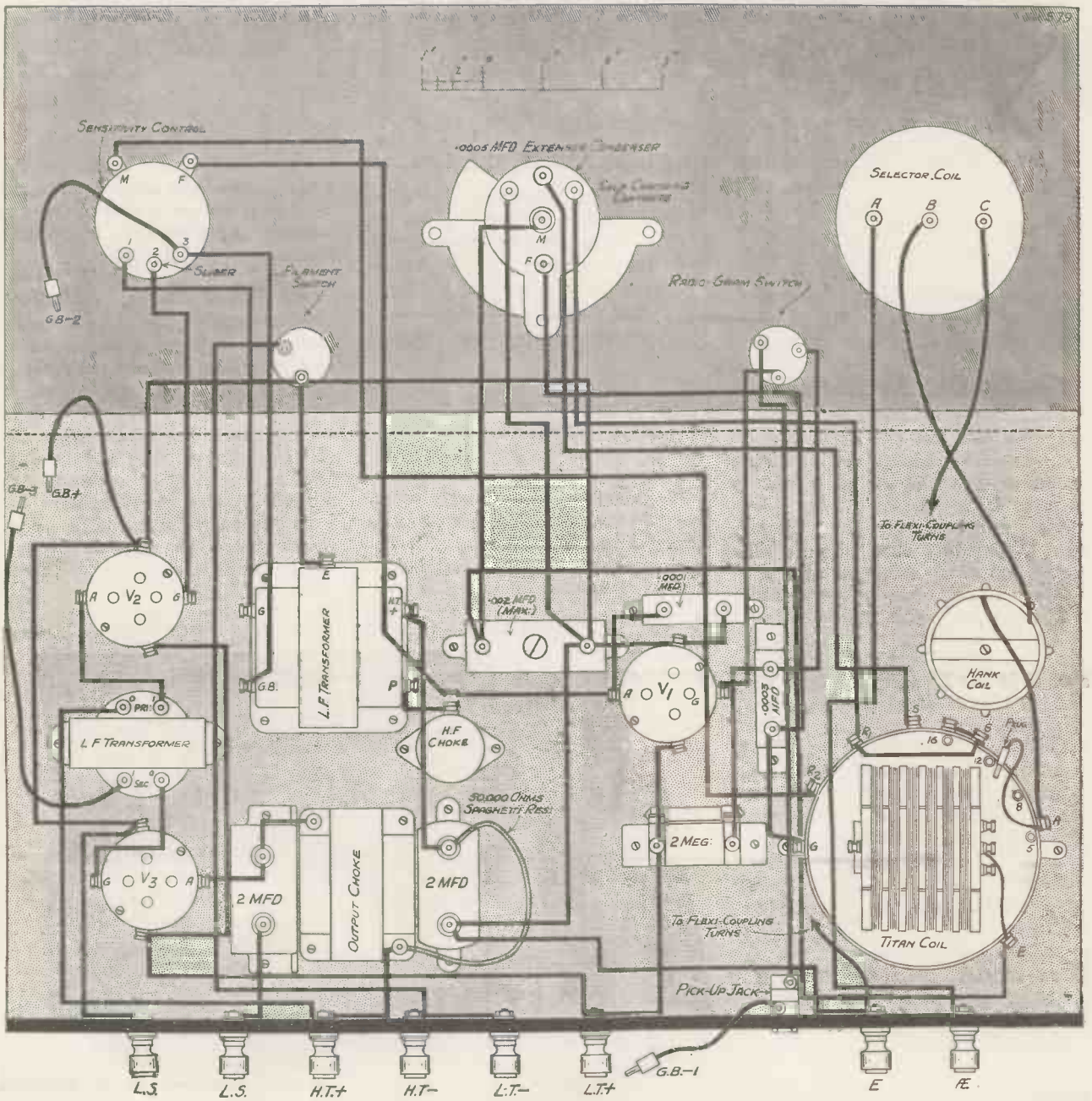
If you will look at the theoretical diagram you will see that the circuit is quite conventional as regards the L.F. end, using two transformer stages, with a detector whose grid circuit is tuned by the "Titan" coil and an Extenser.

About the Extenser

Now here a word must be said for the sake of those who already have "Titan" coils and variable condensers which they want to use again. The Extenser is not an *essential* part of the circuit; it is an extremely valuable part because it enables automatic wave-changing to be carried out without the need for wave-change switching, but it is not essential, and one can replace an Extenser by an ordinary condenser, together with a three-point wave-change switch if desired. And further on in the article we will give details of the wiring for such a change-over.

In addition to the "Titan" coil, however, we have the "Star Turn" Selector coil, coupled by what is

Wire It Up According To This Straightforward Diagram



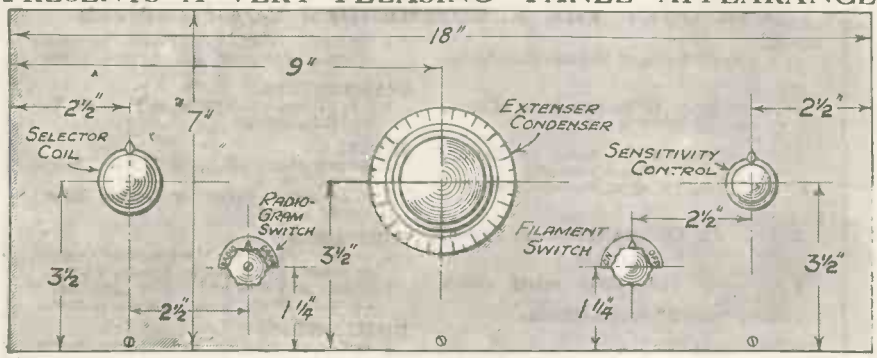
Here is the complete wiring diagram of the receiver. Don't hurry with the work of connecting up, but take your time and make a really good job of it. The hank coil is 60 turns of 24 D.S.C. wire on a coil quoit.

This Set Employs an Improved "Titan" Tuning System

known as "Flexi-coupling" to the "Titan" coil. This Flexi-coupling is an extremely simple method of obtaining a variable coupling between the "Star Turn" Selector coil, which tunes the aerial circuit, and the tuned grid circuit of the set.

It consists of merely winding round the large coil of the "Titan" one, two, three, or even four turns of ordinary single flex wire which at one end is connected to earth, and at the other end connected to stud C of the Selector coil.

PRESENTS A VERY PLEASING PANEL APPEARANCE



PANEL LAYOUT

The balanced panel layout makes the finished receiver very attractive. In the centre is the Extenser, and on the right the combined reaction and volume control, with the Selector on the left.

Really Flexible Coupling

The coupling between the Selector coil and the "Titan" coil is varied by altering the number of turns of this wire. Increasing the number makes the coupling tighter, giving less selectivity but more signal strength, and decreasing the coupling increases the selectivity, at a slight loss of signal strength, though the loss is so small as to be almost negligible.

We have then an infinitely variable method of varying the coupling, because not only can the number be altered, but the turns can be placed farther up the coil, away from the grid winding, or they can if desired be wound round the long-wave coil which sticks out at the top of the "Titan" coil, and is therefore some distance from the short-wave winding.

A Simple Adjustment

Most readers of MODERN WIRELESS are not newcomers to the "Star Turn" Selector coil, which enables fairly accurate tuning of the aerial to be carried out on the medium waves, thereby enhancing the selectivity of the set and at the same time increasing its sensitivity. As a matter of fact the use of a "Star Turn" Selector coil in a receiver gives a kind of band-pass effect so that not only are selectivity and sensitivity increased, but the form of tuning curve is improved and a better range of frequency response is obtained.

Thus there is everything in favour of using a "Star Turn" Selector coil in simple circuits, and nothing against it other than that one has another knob to turn; but as this is so extremely simple, the setting being quite approximate, and by no means critical, this extra knob cannot be said to be a disadvantage when tuning.

Volume Control Combination

As regards the layout of the set, there is really nothing to be said; it is fairly obvious from the diagrams and photographs that the layout is extremely simple and perfectly straightforward and well within the scope of any home constructor. The reaction condenser and volume control combination is an interesting component; reaction and volume are controlled by one knob and are arranged so that placing the knob at minimum (that is to the left) and increasing it to half its travel increases the volume from the *audio* point of view, because this varies the position of the slider on an ordinary 50,000-ohm potentiometer across the secondary of the first L.F. transformer.

Then half way round the travel one reaches the maximum of the potentiometer and begins to operate

SUGGESTED ACCESSORIES.

Loud Speakers. (B.T.-H., Blue Spot, Undy, Celestion, Amplion.)

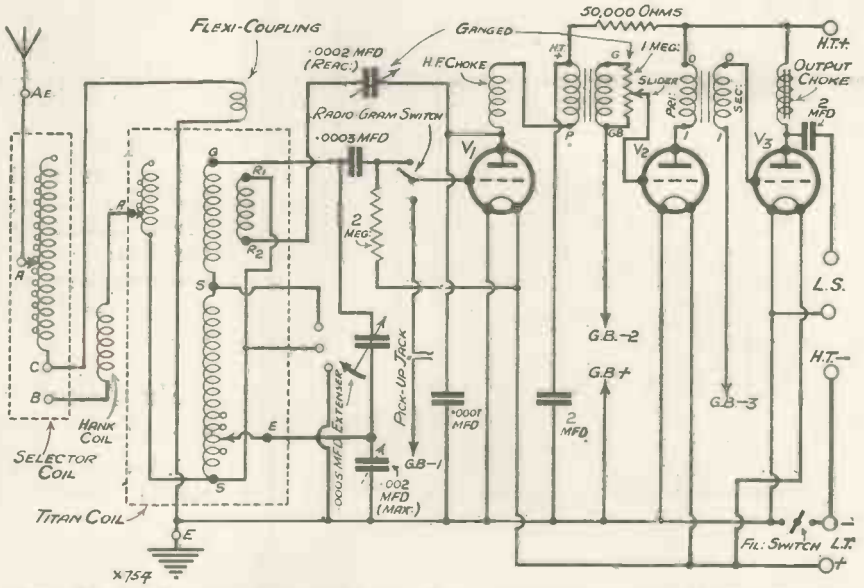
Valves. 1 H.L., 1 L.F., and 1 power or super-power (Mazda, Osram, Six-Sixty, Lissen, Fotos, Cossor, etc.) (2, 4, or 6 volts.)

Batteries. H.T., 100–150 volts double or super-capacity. G.B., 9–18 volts (to suit valves). (Drydex, Ever Ready, G.E.C., Pertrix, Lissen.)

Accumulators. (Exide, Ediswan, Lissen, G.E.C., Pertrix.) (2, 4, or 6 volts.)

Mains Units. (Regentone, Ekco, R.I., Tannoy, Atlas, Heayberd, Lotus.) State type of mains, voltage, and details of set when ordering.

THE CIRCUIT OF THE TRANSFORMED "TITAN"



Many fine features have been included in this re-designed receiver. There is an output filter, Selector coil, and special combined volume and reaction control.

In This Set You Can Employ Many of Your Old Parts

the reaction condenser. So one increases volume progressively, first from an audio point of view and then by means of reaction, so that a very smooth control is obtained.

The Preliminary Tests

In addition, as this set has an extremely powerful L.F. side, provision has been made for a pick-up by means of a jack on the terminal strip at the back of the set. A pick-up switch is situated on the front of the panel, and the jack enables an instantaneous change-over to "gramophone."

And now we can assume that the layout and the wiring has been carried out by the constructor, and he is ready to test the set. We will start with a couple of turns of flex round the Titan coil for the flexi-coupling, and this can be altered as desired later on. By turning the Selector knob round hard over to the right, contact is made with Stud B, which is connected direct to the tapping on the short-wave Titan coil, and you should first test the set with this.

So we will put the Selector round to B, and see that the Extenser dial is reading somewhere between 0 and 100 degrees. Then we shall know it is on the medium waves (if we have put the dial on properly), and we simply rotate the dial until we get signals. The tapping plug may be placed either in 8, 12, or 16, until we have found the position in which best selectivity is obtained.

Next we adjust the Selector coil and find we shall lose the local station entirely, but it will suddenly come back on about two or three studs, the centre of which will be giving maximum signal strength.

Here we shall find the tuning sharp, indicating the Selector coil has been tuned as well as the Titan coil.

For Long Waves

On listening-in to distant stations the same procedure has to be adopted.

On the long waves we have to adjust reaction somewhat, and that is done by means of the tapping clip, which is placed on one of three terminals at 20, 40, or 60 (you will probably find best results in the 40 tap), but on the position of this tap depends the reaction, and so one should alter the tapping until best reaction control is obtained. The ·002 condenser is a system of coupling on the long waves by which variable selectivity can be obtained. When the condenser is screwed down then the selectivity is at its maximum, and when it is unscrewed the selectivity is decreased.

Ordinary Condenser Connections

After this all that remains is to turn the tuning dial so that it registers for long waves, and then tune in the station you require.

And now in closing we must just go over the connections of the three-point switch which we said could be used in conjunction with an ordinary condenser instead of the Extenser.

The ordinary condenser will be placed in the same position as the Extenser and the moving and fixed vanes will be connected up in exactly the same way. Underneath this can be placed an ordinary three-point wave-change switch, and these are the connections which will have to be made to it. In the first place the switch will have to be of the type to which a flexible connection to the spindle can be made, making a fourth point. This wire would then be taken to the moving vanes of the condenser. The remaining three contacts will then be joined up in place of the three self-changer contacts on the Extenser itself.

USE ONLY THE RECOMMENDED COMPONENTS

PANEL
18 × 7 in. (Permcol, or Goltone, Peto-Scott).

CABINET
With baseboard 10 in. deep to fit (Camco, or Pickett, Osborn).

COILS
1 Selector coil (Ready Radio, or Wearite, R.I., Parex, Goltone, Peto-Scott).
1 "Titan" coil (Wearite, Goltone, Parex).

EXTENSER
1 ·0005-mfd. Extenser (Formo, or Cyldon, Wavemaster).

SWITCHES
1 single-pole double-throw rotary switch (Bulgin).
1 rotary "on-off" switch (Bulgin).

VALVE HOLDERS
3 (Burton, or Lotus, Telsen, Igranic, Bulgin).

CONDENSERS
1 ·0003-mfd. fixed condenser (Ready Radio, or Telsen, Ferranti, Igranic, Goltone).
1 ·0001-mfd. fixed condenser (Sovereign, or Ready Radio, Telsen, T.C.C., Dubilier).
2 2-mfd. fixed condenser (Dubilier and T.C.C., or Ferranti, Igranic, Peto-Scott).
1 ·002-mfd. max. compression condenser (Formo, or Goltone, R.I., Lewcos, Telsen).

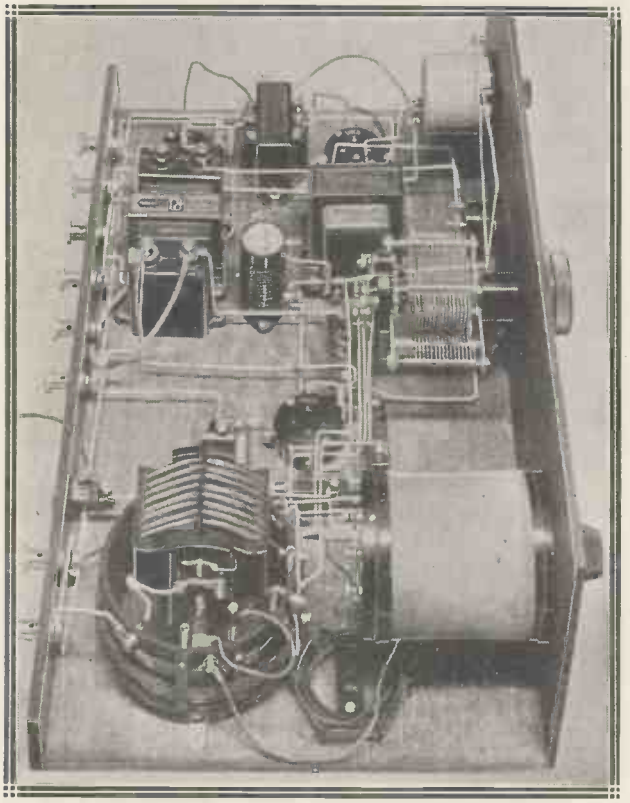
TRANSFORMERS.
2 L.F. (Telsen and Igranic, or Ferranti, Varley, R.I., Lotus).

CHOKES
1 output choke (R.I., or Igranic, Bulgin, Telsen, Lotus).
1 H.F. choke (Varley, or Lewcos, Telsen, Ready Radio)

RESISTANCES
1 50,000-ohm Spaghetti resistance (Magnum, or Telsen, Ready Radio, Bulgin, Varley).
1 2-meg. grid leak and holder (Dubilier, or Ferranti, Ready Radio, Telsen, Edlswan).

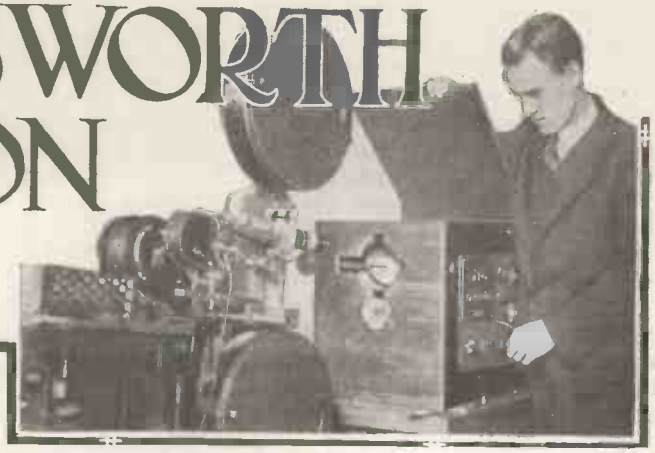
MISCELLANEOUS
1 combined reaction and volume control unit (Magnum). (·0002 and 1 meg.)
1 terminal strip, 18 × 2 in.
8 terminals (Eelex, or Igranic, Belling & Lee, Goltone, Clix).
1 pick-up jack and plug (Bulgin, or Lotus).
Glazite or Lacoline, 24 D.S.C. for hank coil, screws, flex, coil quoil, etc.
Battery plugs and spade connectors (Clix, or Eelex, Igranic, Belling & Lee)

ANOTHER VIEW OF THE RECEIVER



From this photograph you can see many of the added components. In the foreground there is the new Coil Quoit, with the "Titan" coil on the left and the Selector on the right.

The FARNSWORTH TELEVISION SYSTEM



Here are details received from America of a young engineer's scheme of television. In it he overcomes the limitations of mechanical scanning by magnetic control of the electron stream within a cathode-ray tube.

By A. DINSDALE, A.M.I.R.E.

REGULAR readers of MODERN WIRELESS will remember that the Editor has always maintained that no real progress towards the successful solution of television will ever be made by mechanical methods, and that some entirely new principle, preferably electronic, would have to be discovered.

THE NEW TUBE

Fig. 1. A form of cathode-ray tube which Farnsworth uses for transmitting purposes. He calls it an image dissector tube.

The only visible gleam of hope in this direction appeared to be the cathode ray, but for many years various workers have endeavoured unsuccessfully to secure results by this means. Cathode-ray tubes, as we knew them up to a year or two ago, suffered from many disadvantages which seemed to rule them out.

I, for one, did not think that success would ever be achieved via the cathode-ray route. But much water has passed under the bridge since then, and so many changes have been effected in cathode-ray tube design and operation that I have revised my opinion.

Recently I had the pleasure of meeting Philo T. Farnsworth, of San Francisco. He had come east to give expression to his views before the U.S. Federal Radio Commission, in Washington, concerning the assignment of frequency bands for experimental television purposes. From Washington he came to New York (where I met him), to attend to some business matters.

Exact Calculations

Although only twenty-four years of age, Farnsworth has been working on television for several years, and has made such important progress that his work merits serious consideration.

Unlike many inventors, who have an idea and straightway endeavour to carry it out by slap-dash hit-and-miss methods, Farnsworth is a brilliant mathematician.

All his ideas are worked out mathematically first, to the last possible detail, and then tried out in practice. It speaks well of his mathematical genius that his ideas, thus worked out, almost invariably function according to plan when put into practice.

Dissecting the Image

The form of cathode-ray tube used by Farnsworth for transmitting purposes is called by him an image dissector tube. It is shown in Fig. 2 diagrammatically, and also in one of the accompanying photographs.

Fig. 1 gives a cross-sectional view of the tube, which comprises a cathode C, coated with photo-sensitive material and mounted parallel and close to an anode screen A. At the opposite end of the tube there is a target electrode having all but a single small area shielded from the discharge.

The Electron Target

This target consists essentially of a small tubular type of photo-electric cell, the cathode of which acts as a target for the arriving electron, or cathode-ray stream, which is so focussed that it reaches the cathode through a tiny aperture in the encasing wall of the cell.

The high-vacuum type dissector tube, illustrated in Figs. 1 and 2, consists of a cylindrical glass tube, having at one end a flat window which

READY FOR RECEPTION

The complete receiver designed for working with the new system. The picture appears on the circular screen seen on the front of the set.

is polished before sealing in. At the other end is a stem upon which the elements of the tube are supported, and through which the leads pass.

The inner end of the stem carries a short glass pillar which terminates in a square button. This button supports a silvered mirror upon which is deposited a photo-sensitive film. A band clamp supported by the stem carries the anode structure.

This anode structure is made by winding a very fine tungsten wire around a thin, flat tungsten-nickel frame, and it is supported so that it is closely parallel to the cathode. In the latest types of tubes the electrostatic shield S, Fig. 1, consists of a platinum coating on the inner walls of the tube.

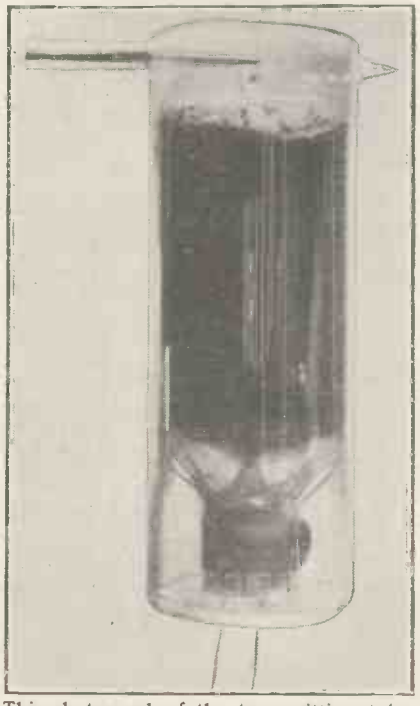
A Difficulty Overcome

One of the greatest difficulties in the way of the use of cathode-ray tubes for television purposes is that the cathode-ray stream has a tendency to "spread," thus making it impossible to focus the ray stream, and thus the image, sharply on the photo-electric cell.

Farnsworth has successfully overcome this difficulty by making use of a powerful concentrating or focussing magnetic field, provided by a coil wound over the dissector tube, as shown in Fig. 2. Outside of this coil there are mounted the two deflector coils which enable the cathode-ray stream to be moved to and fro, thus effecting scanning.

The currents through these two sets of coils are saw-toothed in shape (instead of sine wave A.C.), one having a frequency of 3,000 cycles and the other a frequency of 15 cycles. This provides a square image scanned in 200 lines, and 15 images are transmitted per second, and the frequency band which the amplifiers and transmission channel must handle is 300 kc. in width!

A FINE PHOTO



This photograph of the transmitting tube gives you a good idea of its appearance in real life. The leads come out underneath.

THE DESIGN SHOWN IN DETAIL

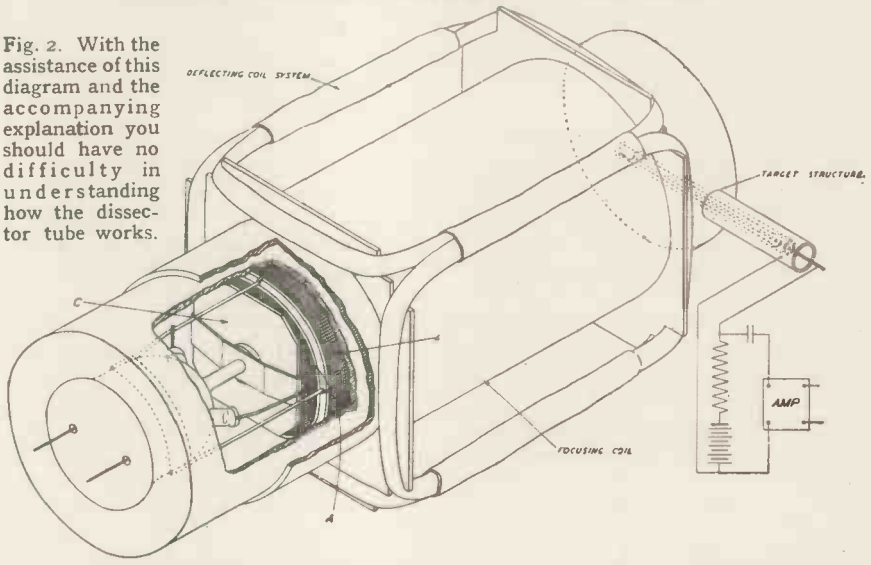


Fig. 2. With the assistance of this diagram and the accompanying explanation you should have no difficulty in understanding how the dissector tube works.

For receiving purposes, Farnsworth also makes use of a form of cathode-ray tube which he calls an oscillite. This is illustrated diagrammatically in Fig. 3, and also in one of the accompanying photographs.

The Receiving Tube

In appearance it is similar to standard cathode-ray tubes. It makes use of the same magnetic focussing principle as is used in the transmitting dissector tube, and scanning is effected by two sets of deflector coils mounted at right-angles to one another.

Farnsworth accomplishes synchronism by transmitting, between images, impulses from the 3,000 and 15 cycle saw-tooth-wave generators, and at the receiving end separate generators of currents of identical frequency and wave form are pulled into step by the incoming inter-image impulses.

This system is very simple and, according to Farnsworth, very effective. It does not require a separate channel for the synchronising impulses, nor are complicated filters necessary.

The more technically minded reader will no doubt be questioning the possibility of designing and constructing amplifiers capable of handling such enormously high frequencies as 300 kc. Farnsworth has successfully overcome this difficulty, however, by means of an amplifier of special design, which makes use of what he terms a system of admittance neutralisation.

Unfortunately, the patent situation does not admit of a detailed description of this amplifier being published at this time. Through the courtesy of Mr. Farnsworth I have had an opportunity of studying the design and the mathematical reasoning upon which it is based, and I am very much impressed with the ingenuity which has been displayed.

By a utilisation of the principles involved Farnsworth is able to obtain by means of this amplifier a response curve which is substantially flat all the way up to *one million cycles!*

Success on Four Metres

As regards the broadcasting of his 300-kc. television images, Farnsworth has achieved considerable success at ranges within visible distance of the transmitter, by using a 4-metre wireless link. Further successful results have also been obtained by wired wireless, where it has been found feasible to modulate a 1,000-kc. carrier frequency with a 300-kc. signal and transmit it over an ordinary telephone line.

The images transmitted in this way are practically as good as those obtained on a monitoring receiver used at the transmitting station. The voice currents can also be sent along the same wire, thus confining

Cathode-Ray Tubes for Television Receivers

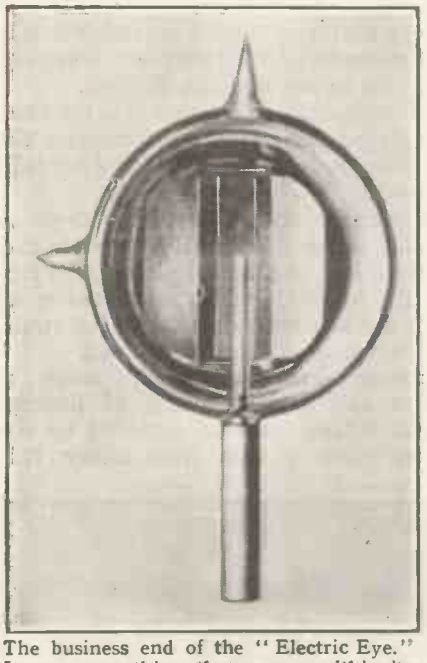
the entire "see and hear" service to a single wire channel.

Perhaps Farnsworth's most spectacular development, however, is what he terms his "image compressor." Having designed an amplifier capable of handling frequencies up to a million cycles, and proved that he could transmit 300-kc. signals by wire and by wireless, he set to and designed a method whereby his 300-kc. signals can be transmitted on a frequency band only about 7 kc. wide.

Remarkable System

Details of this method have not yet been made public, but Farnsworth explained the method briefly to me as entailing the suppression, before transmission, of certain parts of the wave-band, just as in the case of single-side-band carrier-eliminated transmission, the carrier and one side-band are eliminated before transmission. Farnsworth's method is not the same as that, but he used that simile as a way of describing his method.

IT SEES EVERYTHING



The business end of the "Electric Eye." It sees everything that comes within its range of vision.

The design was worked out mathematically first, and much to his surprise it worked at the first trial. The additional apparatus necessary, he says, cost only about £2, and the images secured by the image compressor method of transmission surpassed those obtained by his previous methods.

As regards results, I am told by reliable witnesses who have been to Farnsworth's San Francisco laboratory that they are much better than the 72-line images at present being

AT THE RECEIVER

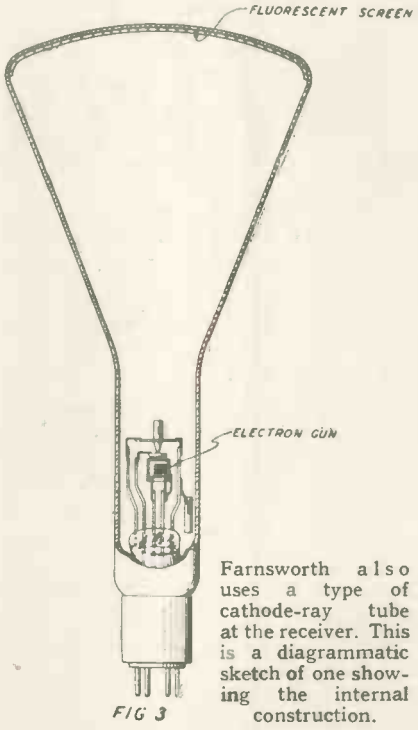


FIG 3

Farnsworth also uses a type of cathode-ray tube at the receiver. This is a diagrammatic sketch of one showing the internal construction.

reproduced by the Bell Telephone Laboratories. I have seen the Bell images, and would describe them as being at least twice as good as those being obtained by experimenters with a 30-hole disc.

As regards the commercial possibilities of Farnsworth's system, he tells me that he hopes to be able, by his image compressor method, to send both image and speech through a single broadcasting station, within the 10-kc. limitation imposed in the United States. Of the 10 kc. something like 7 kc. will be allocated to the image signal, while the remaining 3 kc. will carry the speech and music signals.

Not Too Expensive

So far as the marketing of the television receiver is concerned he hopes to do this before very long. An adaptor for connection to an existing wireless receiver could be sold, he says, for the equivalent of about £20.

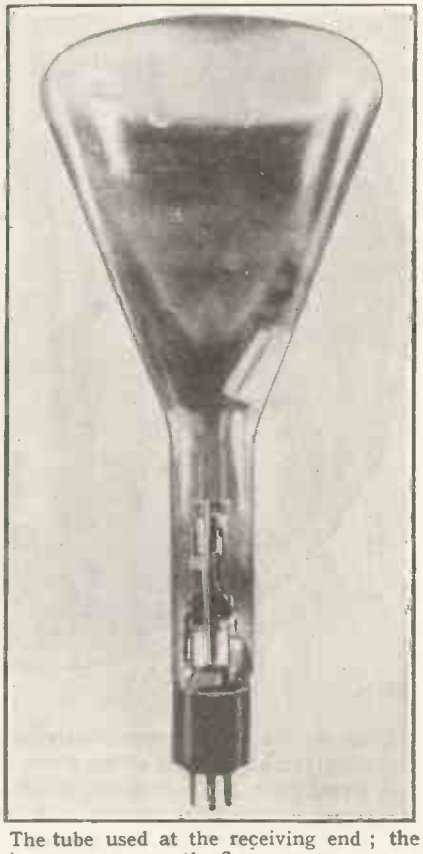
This adaptor will consist of an oscillite, a two-valve L.F. amplifier, and a three-valve special oscillator for generating the local synchronising impulses. A complete combination including wireless and television receiver, similar to that illustrated, would cost about £50. Such a receiver would give images, unmagnified, measuring 4 in. square.

Real Progress

When I inquired about the cost and maintenance of the oscillite, Farnsworth told me that the necessary high voltage would be 2,000 volts, which can be obtained from the A.C. mains by means of a mains unit designed to produce that voltage. The life of the oscillite is 1,000 hours, and the cost of replacement between £2 and £3. In time, of course, the life of the tube will be lengthened, and the cost of replacement reduced.

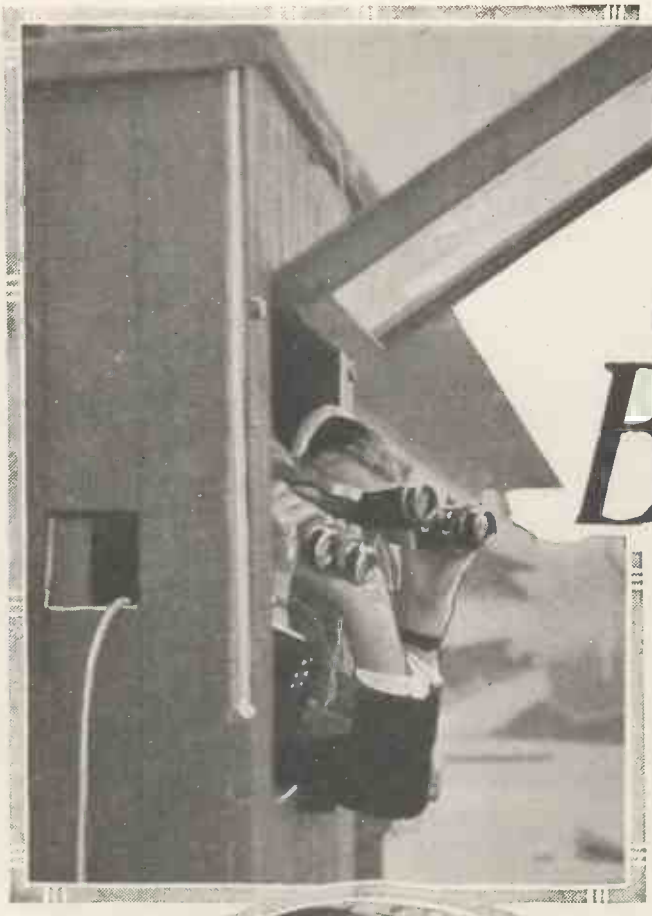
There is little doubt in my mind that Farnsworth has made more real progress in television than any other individual or organisation, and his future developments merit serious attention from everyone who is at all interested in the subject.

THE "OSCILLITE"



The tube used at the receiving end; the image appears on the fluorescent screen on the end. It is called an "Oscillite."

Those Sporting Broadcasts



IT was to be expected that running commentaries would find a ready popularity with the great body of listeners. Everyone had always wanted to experience the thrill of being on Epsom Downs on Derby Day; here was a chance to enjoy that thrill vicariously if it were impossible to be on the spot.

Those who had been present in the past welcomed the opportunity of reviving exciting memories, and even those who had never visited a racecourse in their lives, and normally did not bet, made the Derby an exception. They had staked their annual shilling, and listened, agog with excitement, to learn its fate.

Now Taken for Granted

The same applied to most of the other sporting events which the ubiquitous microphone made accessible to the listening thousands who, for various reasons, had never been able to be present in the flesh.

Even a commentary on an event like the Boat Race, the Grand National, or the race for the Schneider Trophy, could not help being immediately successful.

But the running commentary is no longer an infant. It has taken a firm hold on the affection of listeners; it has an accepted place in the programmes of the B.B.C., which apologises in an injured but dignified tone when some recalcitrant football club refuses to allow a broadcast.

The listener has, in fact, come to expect that any sporting event of national interest will automatically be attended by one of the descriptive wizards from Savoy Hill,

At the top the Derby commentators are looking from their observation post at the start of the classic race. In the circle are Col. Brand (standing), and Capt. Wakelam—two favourite commentators. And (right) the broadcasting of the world's fastest race—for the Schneider Trophy.

"They're Off! They're Off!"—

How often has the curbed excitement in the commentator's voice infected you with the real thrill of a great race? This article tells interestingly of the true task of the commentator, which is not merely to record what he sees, but to broadcast a word-picture that catches the glamour and the spirit of the great sporting event.

complete with microphone, engineers, and the necessary apparatus for bringing the scene before him as he rests at ease in his armchair.

The running commentary was, like a new-born infant, remarkable at first simply because it existed. But the first cause for astonishment has passed. The running commentary is now a healthy child, neither more or less remarkable than any of the other children which broadcasting brought into being.

Can Commentaries Be Improved?

To the rising generation it is not a wonder. It is simply a normal part of their existence. And the moment has surely arrived when it is permissible to ask if the art of the running commentary can ever be very much more than it is at present, and whether it is capable of exciting developments.

So I ask myself—am I satisfied with the present commentators, and, if not, what change in technique could they adopt which would give me greater pleasure?

The average commentator is, one must freely admit, very good indeed. Considering the many difficulties which he has to face, and the very competent manner in which he tackles them, it seems almost presumptuous to suggest that he could, in fact, be even better. But, like every other art, that of the wireless commentary must advance or retrogress. It cannot stand still.

What the Listener Wants

Let us leave the commentator for a moment and turn to the listener. What does he want from a running commentary? He wants an accurate account of the event delivered in a voice which is pleasant to listen to. These are prime necessities, and within these limits the B.B.C. has been very fortunate in its choice.

The upper picture clearly shows the B.B.C.'s O.B. van, which here is making an observation post to view the shooting at Bisley. Below—the Derby, with Steve Donoghue leading the field.

Is the Expert the Best Commentator?

Compare the pleasing, cultivated voice of the average commentator with the unpleasant, lugubrious and often unintelligible tones which accompany so many news pictures on the screen, and one is forced to the conclusion that on this score, at any rate, there is little room for improvement. Listeners are definitely given an accurate account of the facts, pleasantly delivered.

But the really important point, and one which some commentators are prone to overlook, is that however valuable the facts may be, something in addition to this can and should be transmitted to the senses of the listener. I refer to the "atmosphere" of the event which is being broadcast.

The Result is Not Everything

Admittedly, many thousands of people listen-in to accounts of sporting events primarily because they are interested in the result. But they listen to the whole account. They do not switch on only at the end when the result is likely to be announced.

They listen because they are hoping for and expecting something more—possibly they themselves do not know exactly what—than a bald recital of the facts.

"BOTH TEAMS ARE LINED UP . . ."

This is the scene in Ireland during the broadcasting of an International Rugby match. Note the simplicity of the boxed-in microphone, as compared with the elaborate arrangements made by the B.B.C. for this class of radio reporting. The great snag with such a simple method is that so much depends on the weather. One drop of rain on the "mike" would sound like St. Paul's Cathedral falling down! And then you never know what somebody in the crowd might say in the excitement of a missed goal!

In addition to those who want to know the winner of the Boat Race or the Derby there are thousands of listeners who do not particularly care who wins, but who listen to the commentary purely as an entertainment, which may be good or bad irrespective of who happens to win.

Passing on the Atmosphere

What these listeners really want is to share in the mood of those who are actually watching the drama on the Thames or on the Downs. They want to enter into the spirit and the atmosphere of what is happening—and the great commentator of the future is he who will enable them to do this.

So far, considerable emphasis has been laid on the fact that those who have given running commentaries have been experts in the game commented upon. But is it likely that the really great commentator will be an expert? I think not.

Just the Difference

The expert may be good up to a point. But he is likely to stress technical points which are not really of any very great interest to the main body of listeners, and at the same time, unless he is an artist as well as an expert, he will probably leave out just those telling, relevant, and seemingly small facts which, in the hands of an artist, could contribute everything towards conveying a real live impression, an "atmosphere," to the listening thousands.

Suppose a running commentary were broadcast on, say, a meeting between Charlie Chaplin and the Lord Mayor of London, at Waterloo Station. The expert on ceremonies of this nature might give a remarkably accurate description of the City dignitaries accompanying the Mayor, complete with names and short biographies. But the artist would tell of the expression on the face of one small boy among the crowd. That is the difference.

The trouble with the average running commentary on any game is, of course, that the commentator must have something like an expert knowledge, and the combination of artist and expert in one body would probably be hard to find.

How About Two People?

Possibly the solution is to have two commentators; an expert to present the bald facts of the progress of the game or the race, and, secondly, an expert commentator—not necessarily an expert player or racegoer—to give a creative interpretation of the scene.

Something of this sort has been attempted once or twice, but I do not think the ideal commentator has yet arisen. Nor is this very surprising, for it is an entirely new art.

The orator, the man giving an eye-witness account after the event, the newspaper reporter, the novelist—all these enjoy one priceless boon which is denied to the radio commentator.

They all have the chance of sorting out their impressions at their leisure, the opportunity of getting a correct perspective after the event. The ideal commentator, for whom fame and possibly fortune wait, will be the man who first learns how to do these awkward and unusual things while the event is happening.

As We Should Like It

Possibly the difficulty and novelty of his job have up till now persuaded the average commentator to go warily and to confine himself more or less to impersonal facts—a narrative rather than a commentary.

What I look for and expect from the great commentator who is bound to surprise and delight the world of listeners one of these days is the ability to give an account of the event which is at once accurate and a means of self expression for an artist in words.

In other words, he would be able to make a running commentary on, say, the Boat Race almost equally interesting to an Oxford don stranded on the Gold Coast and a middle-aged spinster from Oklahoma who associates Cambridge only with sausages.

Trouble Tracking

On this page the Chief of the "M.W." Query Dept. discusses, month by month, some of those common difficulties and troubles which can be so perplexing. This month he describes a simple method of testing and deals with the question of faulty connections.

THIS month I would like to give a few hints on tracing faults due to a break somewhere in the circuit. Sometimes a reader is unlucky in getting a component, such as a transformer or anode resistance, which is defective, and when he puts it in circuit he finds that although he has wired up the set correctly he is unable to get any signals, or if he does hear signals they are so weak that he knows immediately that the receiver is not giving its best results.

Continuity Tests

One of the difficulties is that you cannot see at a glance when a component is faulty. Take, for example, an L.F. transformer—the fact that one of the windings is broken down will not show itself from an external examination, and the only method which will enable the listener to determine where the fault exists is a continuity test.

Now, the average fan does not possess the expensive testing apparatus usually available in a laboratory or works service department. Therefore, his test work must be carried out with the simplest possible apparatus, such as a pair of telephones or loud speaker and a dry cell.

Much can be done with this somewhat crude apparatus, and the general scheme is as follows: A 1½-volt dry cell is obtained, and one of its terminals is joined to one of the telephone or loud-speaker tags.

A Simple Method

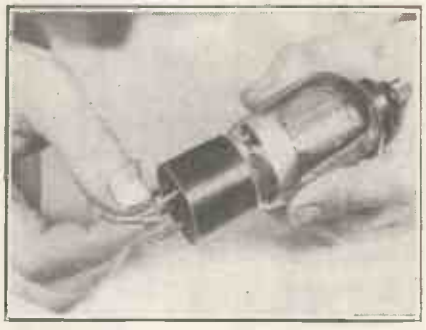
Two flexible leads should be connected, one to the remaining 'phone or speaker tag, and the other to the remaining terminal on the cell. These two flex leads can terminate either in a couple of improvised testing spikes or two wander plugs, so that they can be used to make contact with the various portions of the set.

If these two flex leads are touched lightly together, a strong double click will be heard in the telephones—that is, one click when the leads make contact with each other, and another when they are separated again.

Transformer Windings

To test an L.F. transformer it can either be removed from the set or the leads to its primary and secondary terminals can be disconnected. Then the flex leads can be touched on the primary and secondary terminals, a click in the telephones or loud speaker indicating continuity, and the absence of a click showing a break.

CLEAN YOUR CONTACTS



Many troubles are caused by dirty contacts. It is advisable to clean up all valve pins, valve-holder terminals, and coil connections with a piece of fine glass paper.

In the same way, anode resistances, coil windings, etc., can be tested out, it being remembered that when the component has a very high resistance the click will only be a faint one, unless the voltage of the dry cell is increased.

The 'phones and dry cell method may also be employed for testing for short-circuits. For instance, if one of the flex leads is connected to the socket of a coil holder and the other to a plug, nothing should be heard in the telephones, unless the insulation is faulty, in which case a click will be heard.

The coil, of course, must be removed from the coil holder before this test is carried out. Similar tests may be made with valve holders, both for testing for connection between each terminal and its socket, and for testing for short-circuits between the sockets.

Variable condensers may also be tested in this way, a short-circuit between the plates giving rise to the usual click, which should not be present if the condenser is O.K.

Remove all Leads

Whenever a fault develops in a receiver in which the symptoms point to a defective component it is advisable to apply the 'phones and dry cell test to as many components in the set as possible, it being remembered that one of the essential features is the removal of all leads from the component under test.

Another little problem that the enthusiast has to face is the possibility of dirty or dry joints. Dry joints frequently occur in sets that have been wired up by constructors who have not had much experience with soldering. The joint itself may, at first glance, appear to be a good one, but if the wire is pulled it will come away at the point where it has been soldered, thus proving that it has no mechanical strength whatever. Such joints as these are electrically poor, and will produce all sorts of puzzling symptoms in a set.

Dirty Connections

Another possibility is the corrosion or oxidation of the wire at the point where it has been screwed down beneath a terminal head or washer. Instead of the wire and washer or terminal being perfectly clean, there is a thin coating of oxide or, in some cases, dirt, which makes the joint hopelessly inefficient.

Even valve legs and the sockets of valve holders often get dirty, and these should be cleaned with a piece of very fine emery cloth at regular intervals.

The

Long-wavers and ordinary wave broadcasters are all obtainable merely by rotating the tuning dials. The Extensers automatically cover both bands.

A COUPLE of months ago we published a description of the "New D.C." Three, a three-valve receiver which used the new indirectly-heated D.C. valves, and which put the owners of D.C. mains on the same footing as the users of A.C. with regard to radio efficiency.

Now, having only three valves, the "New D.C." Three was peculiarly efficient, and enabled a surprising degree of sensitivity to be obtained; in fact, the volume that one could get out of the set was really remarkable. The use of a screened-grid valve, detector and pentode, of course, was responsible for this, and so this month we are describing another set using the same combination of valves, but of the A.C. variety, and in an unusually compact form.

Bulky Sets

The trouble with mains receivers—both D.C. and A.C. types—where the home constructor is concerned is that they are wont to be rather bulky. This apparently unreasonable weakness on the part of set designers for size is in reality quite well founded. Mains sets should never be tackled by an inexperienced man unless the design is such that there is plenty of scope and latitude for deviations from the original specification as regards construction.

It is very difficult for the home constructor who is not particularly experienced in set building to copy a set absolutely screw by screw, and so in the majority of our designs we deliberately go out for a certain amount of space, within, of course, reasonable limits, so that the home constructor can have as easy a job as possible in building the set.

An "Engineering" Job

A compact set looks very nice, but it is far more difficult to construct. There are, however, quite a number of constructors who are quite capable of building a set on what we may call truly engineering lines, and it is to these that the description of this A.C. Three is likely to appeal.

It is, to put it mildly, a compact job. Everything has been packed in as small a space as possible with the result that the whole set measures only 18 in. by 8 in. by 10 in. Into that space has been packed the complete radio side, consisting of Extenser wave-changing, screened-grid valve,

REMEMBER THESE MAKES . . . THEY ARE RELIABLE AND GOOD

PANEL
18 × 8 in. (Permcol, or Goltone, Peto-Scott, Lissen).

CABINET
Panel space 18× 8 in. baseboard 10 in. deep (Camco, or Pickett).

VARIABLE CONDENSERS
2 ·0005-mfd. Extensers (Cyldon, or Wavemaster, Formo).
1 ·0001-mfd. differential reaction (Ready Radio, Cyldon, Telsen, Lotus, Igranic, Polar, J.B., Dubilier, Lissen, Parex, Formo).

COMPRESSION-TYPE CONDENSER
1 ·001-mfd. max. (Formo, or Polar, Sovereign, Telsen, Lissen, Lewcos, R.I., Goltone).

SWITCHES
1 "on-off" toggle switch (Bulgin, or Igranic).
1 2-pole change-over toggle switch (Bulgin, or Igranic).

RESISTANCES
1 50,000-ohm potentiometer (Regentone, or Sovereign, Igranic).
2 25,000-ohm "Spaghetti" (Lewcos, or Ready Radio, Telsen, Bulgin, Magnum, Peto-Scott, Varley).
1 15,000-ohm "Spaghetti" (Lewcos, or Sovereign, etc.).
2 10,000-ohm "Spaghetti" (Bulgin, or Lissen, etc.)
1 1,000-ohm "Spaghetti" (Tunewell, or Graham Farish, etc.).
1 600-ohm "Spaghetti" (Varley, etc.).
1 300-ohm "Spaghetti" (Telsen, etc.).
1 200- or 400-ohm baseboard-type potentiometer (Lissen, or Igranic, Gecophone, Wearite).
1 2-meg. grid-leak and holder (Graham Farish, or Lissen, Dubilier, Telsen, Ferranti, Ediswan, Igranic).
1 100,000-ohm with terminals (Graham Farish, Watmel, etc.)

VALVE HOLDERS
1 Horizontal 5-pin type (W.B., or Parex, Bulgin).
2 Ordinary 5-pin (Clix, or Telsen, Wearite, Lotus, Lissen).

FIXED CONDENSERS
1 ·0003-mfd. (Ready Radio, or T.C.C., Telsen, Dubilier, Ediswan, Ferranti, Helsby, Igranic).
1 ·0001-mfd. (T.C.C., etc.).
1 ·001-mfd. (T.C.C., etc.).
1 ·01-mfd. (Igranic, etc.).
2 1-mfd. (Formo, and Franklin, etc.).
7 2-mfd. (T.C.C., Ferranti, Formo, Helsby, Dubilier, etc).
3 4-mfd. (Formo, etc).

CHOKES
2 H.F. (Varley, and Lewcos, or Telsen, Peto-Scott, R.I., Ready Radio, Wearite, Magnum).
2 Smoothing (Ferranti, and Wearite, or R.I., Varley, Igranic, Atlas, Bulgin, Lotus).
1 Output (Igranic, or R.I., Telsen, Varley, Ferranti, Wearite, Magnum, Lotus).

TRANSFORMERS
1 L.F. (Lotus, or R.I., Telsen, Igranic, Varley, Ferranti, Lissen, Lewcos).
1 Mains All-Power (Heayberd W.31).

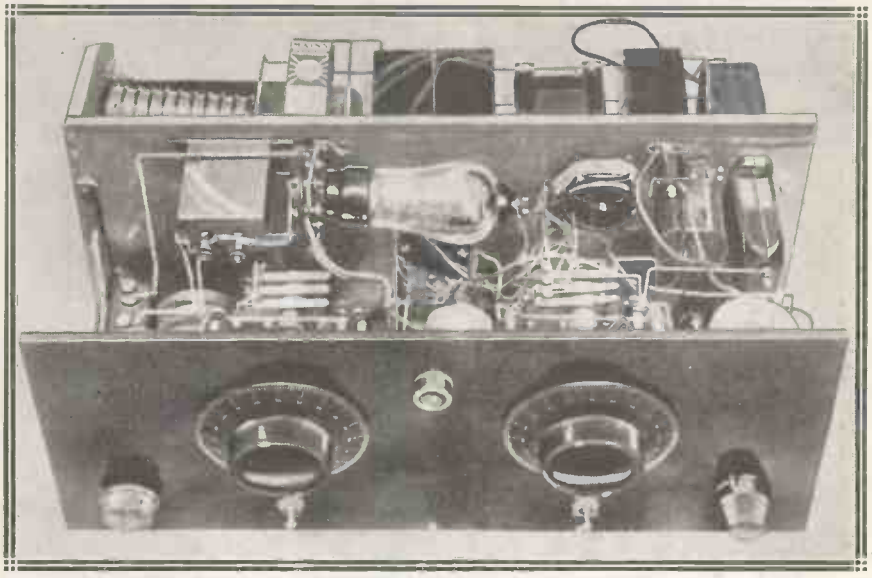
COILS
2 Coil quoits (Peto-Scott, or Wearite, Ready Radio, Redfern).
1 P.J.2 (Ready Radio, or R.I., Wearite, Goltone, Peto-Scott, Formo, Ferranti, Lewcos).
1 P.J.3 (Ready Radio, etc.).

MISCELLANEOUS
1 Metal rectifier, H.T.8 (Westinghouse).
1 Plywood partition, 18 × 7⅞ × ⅜ in.
1 Panel light (Bulgin).
Copper foil for baseboard and partition.
1 sheet 10 × 18 in., 1 sheet 7 × 18 in.
3 Terminal blocks (Junit, or Eelex).
6 Terminals (Belling & Lee, or Eelex, Igranic, Goltone, Clix).
4 Crocodile clips (Goltone).
2 Panel brackets (Camco, or Magnum).
Wire (Glazite, or Lacoline).
Flex, screws, etc.
1 Copper screen 7½ × 5½ in. (Parex, or Peto-Scott, Ready Radio, Magnum, Wearite).
1 Mains plug and socket (Bulgin, etc.).
4 ozs. of No. 30 D.S.C. wire for coil quoit. (See text.)

"M.W." "Extenser-Power"

An A.C. All-Mains Three-Valver embodying all that is latest and best in radio receiver development.

Designed and described by the "M.W." Research Department.

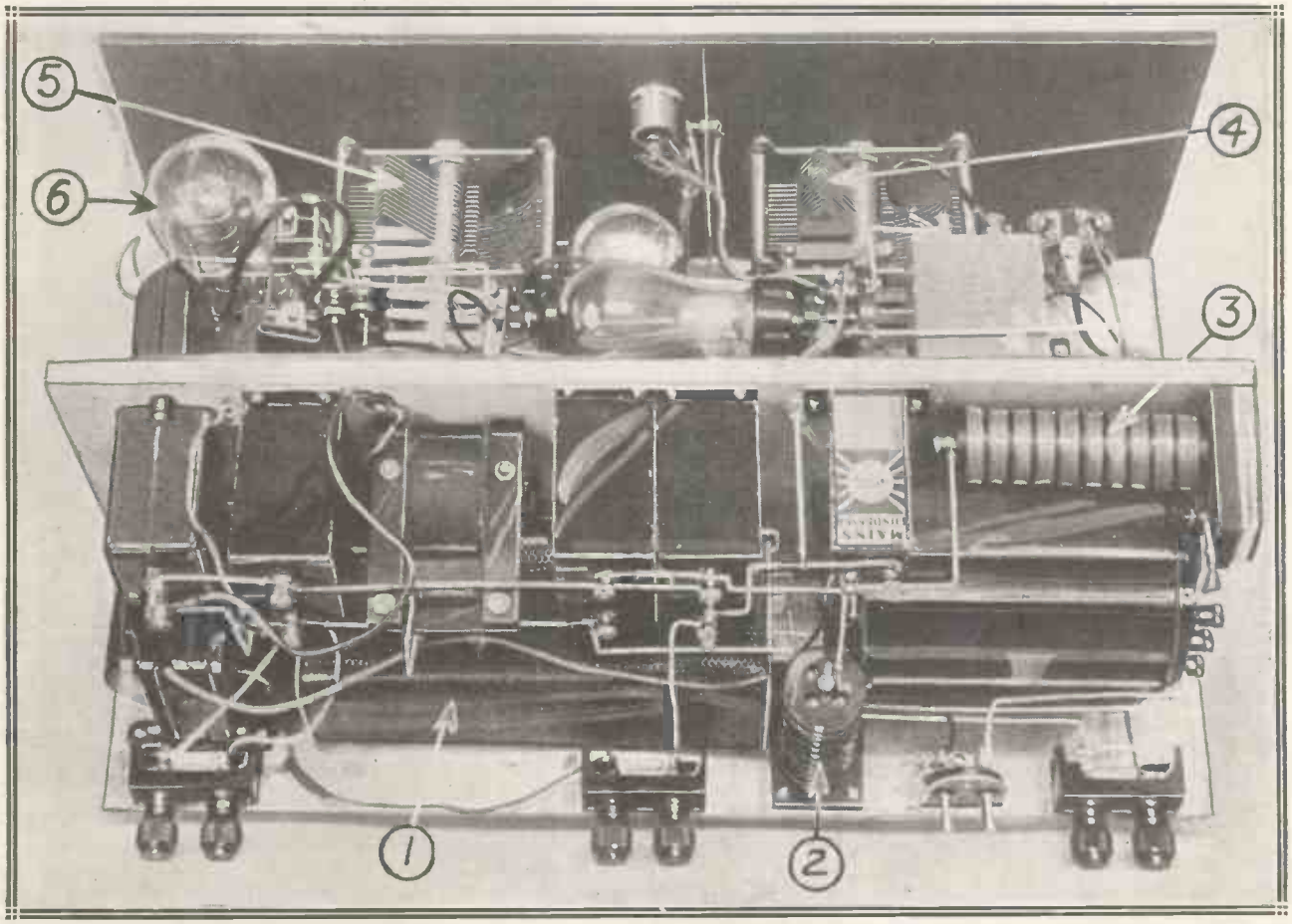


There are no batteries whatever, and the running costs are practically negligible—not more than 2d. or 3d. a week, even if you use the set for several hours each day.

detector and pentode, and a complete mains unit comprising a dry rectifier system giving full-wave rectification and really adequate smoothing. We stress this latter point because so many mains sets are brought out with only just sufficient smoothing to enable them to work reasonably well, the hum which is present being drowned while music is on.

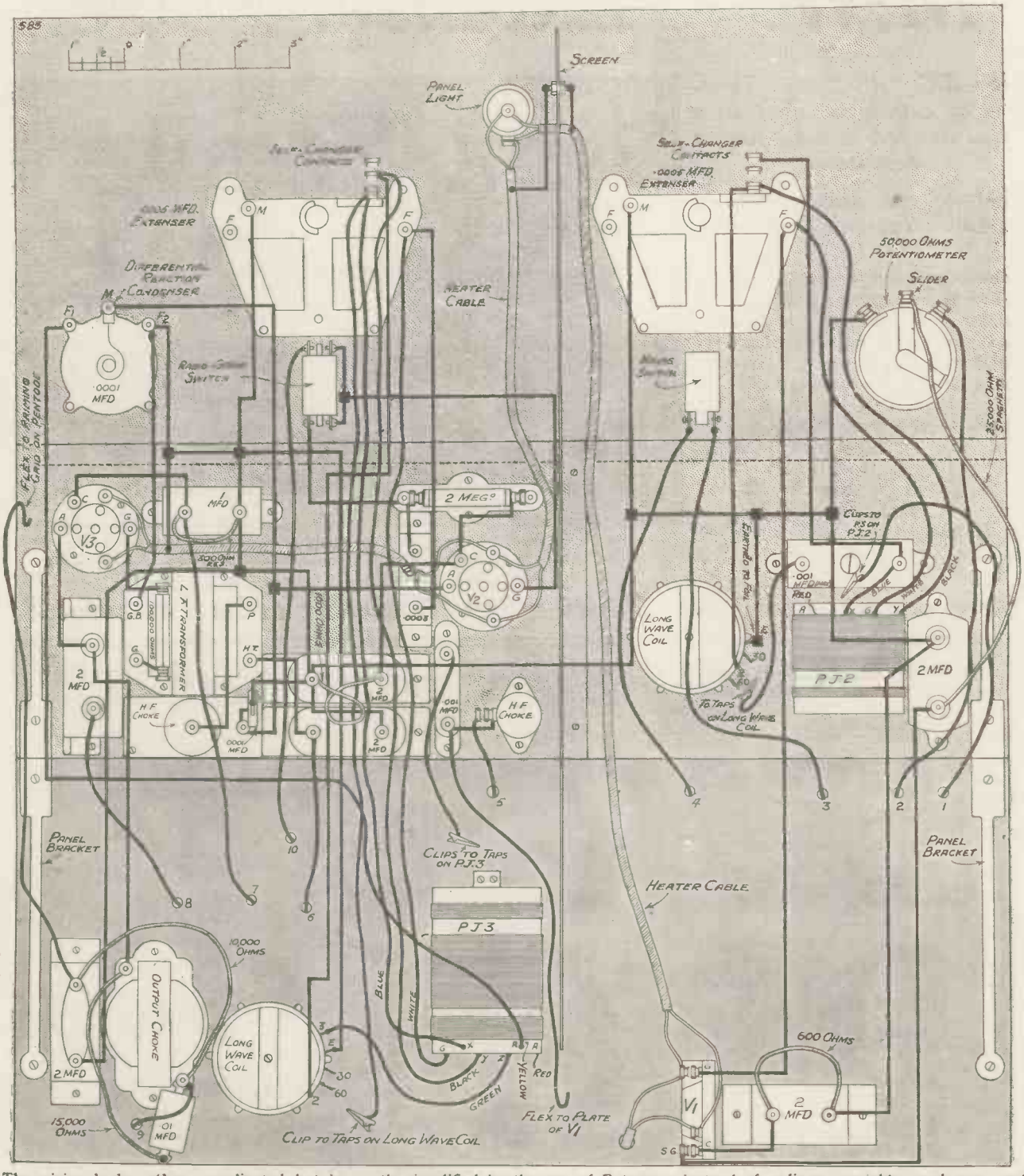
We in this set have aimed for no hum at all, we think you will find that unless you put your head right in the speaker you will not get the slightest

Programmes have Real Punch when Received on this Powerful Set



The power pack is arranged at the back of the set and the mains components do not mingle with the "radio" parts. There are (1) a metal rectifier; (2) and (3) optional H.F. chokes for suppressing very severe mains irregularities (see text); (4) and (5) Extenser tuning, and (6) a mains pentode output valve for big volume.

This Part of the Job Needs Care



The wiring looks rather complicated, but is greatly simplified by the use of Extensers instead of ordinary variable condensers and wave-change switches. As with all mains sets, it should be done very carefully, and the various connections checked several times against the above diagram. Particularly does this apply to the power section, the wiring for which is shown in a diagram on a later page

trace of ground noise while the set is on radio or gramophone.

It might be mentioned here that the A.C. we normally test our sets on is rather noisy, and so you will notice in this design special anti-H.F. devices have been incorporated.

Two H.F. chokes and a condenser, as shown, were required before absolute silence of background was obtained. It is probable that you may not need these elaborations, or perhaps one choke will be enough—or you may need one in each mains lead.

These are points we are afraid you will have to ferret out for yourself. Sometimes a ·0003-mfd. condenser from each side of mains to earth is sufficient. At others two ·01 or ·1 condensers joined in series across the mains with their centre connection earthed are better.

In our particular instance we had

You Can Use a Pick-Up With This Receiver

to adopt the somewhat unorthodox method shown, but we advise you to try the set without any such " stunts " and only to employ them if you are troubled with hum.

Just join up each side of the mains (one side through the switch, of course) to the primary of the mains transformer and see how you get on. If this is unsatisfactory try the condensers, and, finally, if these are useless try a choke, with a ·01 to earth on the side of the choke remote from mains.

"Dirty" Mains

Remember that if you use a larger condenser it will draw current from your mains and that a 1 mfd. will pass something like 20 watts.

Whatever your mains we do not think you will need any more elaborate H.F. stopping than we have incorporated in the original set.

Further smoothing is carefully carried out on the low-frequency side, and this together with efficient de-

RECOMMENDED ACCESSORIES.

Loud Speakers. (B.T.-H., Blue Spot, Celestion, Amplion, Undy.)

Valves. 1 A.C. S.G., 1 A.C. H.L. (Mazda, or other suitable makes such as Six-Sixty, Cossor, Osram, Eta). 1 A.C./Pen (Mazda).

coupling enables perfectly silent operation to be obtained.

The circuit, as you will see from the theoretical diagram, is quite straightforward, and consists of two tuned circuits using P.J.2 and P.J.3 coils and the long-wave coil quoits, the wave-changing being carried out by the Extensers. First there is a screened-grid stage in which an A.C.-S.G. valve is employed; this is followed by the usual detector, and finally the A.C. Pen. is used in the last stage to amplify up rectified impulses passed on from the detector. The A.C. Pen is a very fine valve, and is capable of giving surprising signal strength with only a small input.

Using a Pick-up

The pick-up switch enables gramophone records to be electrically reproduced by inserting in the grid circuit of the detector valve an ordinary electric pick-up. Automatic biasing is carried out throughout the set, and in the case of the detector on radio leaky-grid rectification is employed, and when the pick-up switch is placed in the gramophone position an automatic biasing resistance comes into play, and we get that valve accurately biased for pick-up operation.

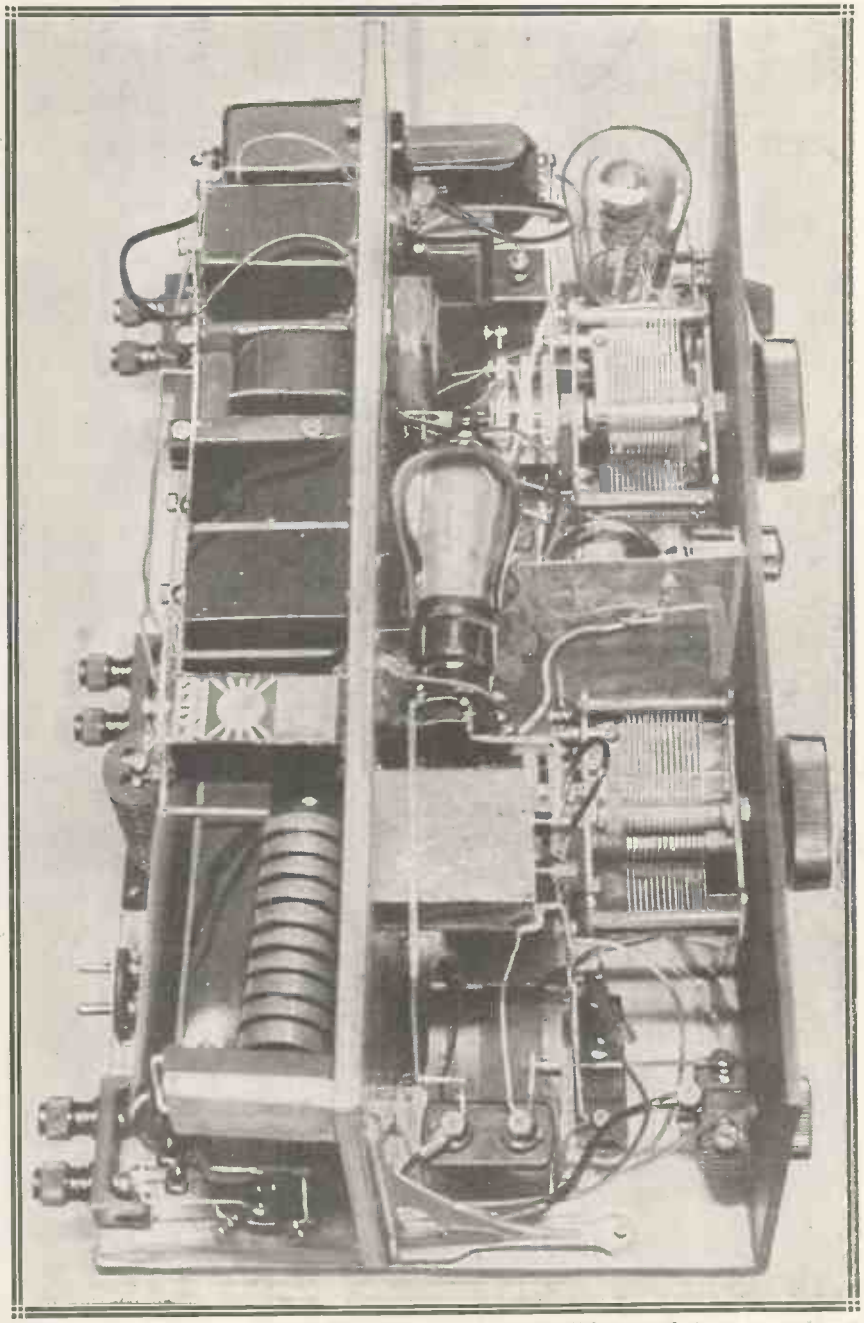
The dry rectifier employed in this receiver is the new H.T.8 Westinghouse rectifier. This is capable of an output sufficient to provide 250 volts 60 milliamps. after smoothing in the effective way adopted for this set.

This output enables ample scope in the voltage and milliamp. power of the set to be obtained, so that all three valves can work at their highest efficiency.

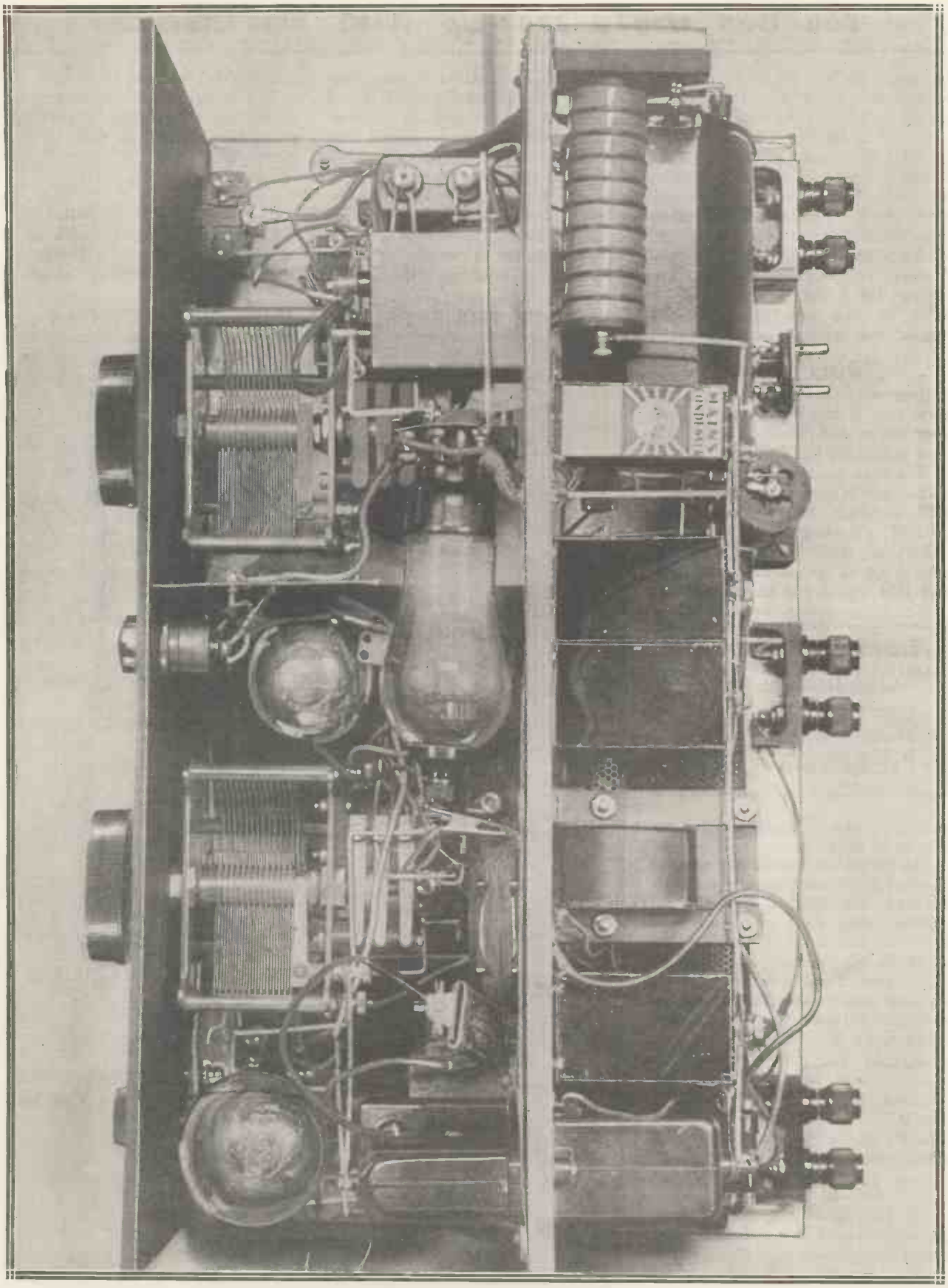
Varying the Volume

Volume control on the radio side is carried out by means of a 50,000-ohm potentiometer controlling screening

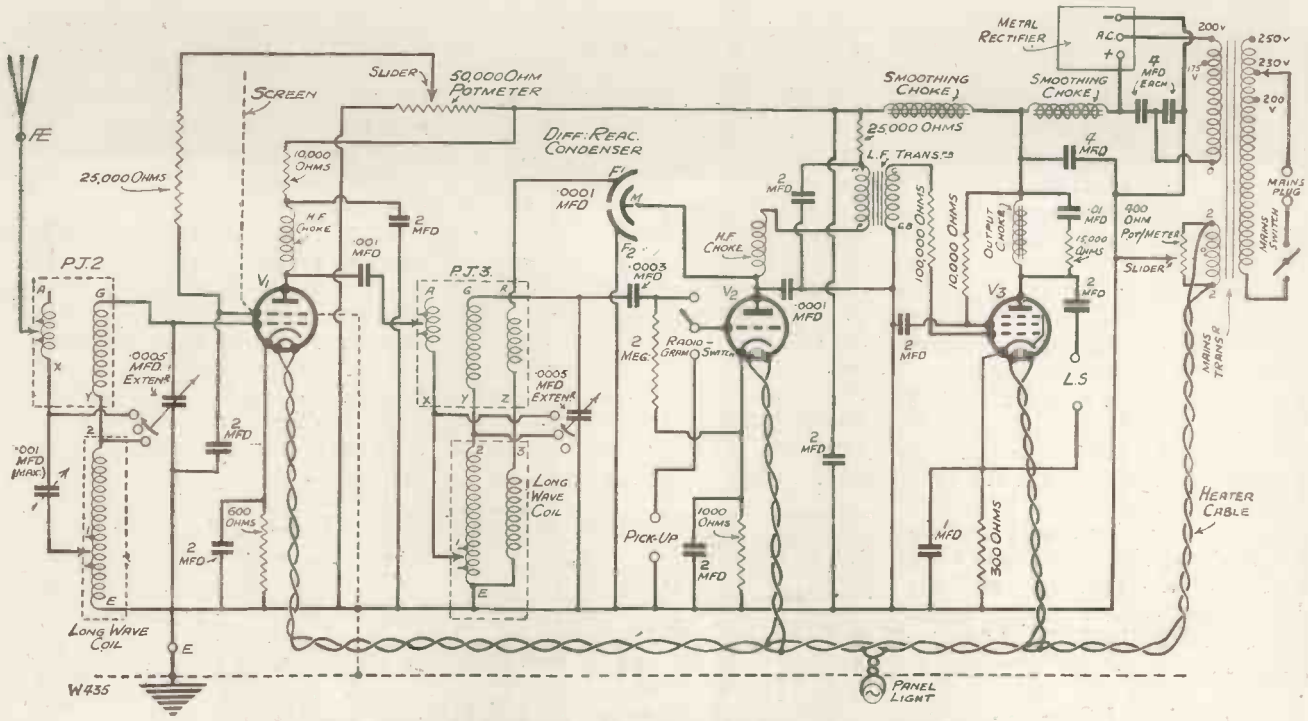
NOTE THE SET'S BEAUTIFUL COMPACTNESS



No space is wasted anywhere, and the " Extenser-Power " is one of the most compact sets of its kind we have ever designed for home assembly.



The Compact "Power-Pack" Makes it a Self-contained Set



A Circuit That Speaks for Itself

"M.W." readers who are able to read theoretical diagrams will readily appreciate the technical attractions of the "Extenser-Power." A mains S.G H.F. valve and a mains Pentode are used to their very greatest advantage.

grid of the S.G. valve. On the gramophone side it is suggested that an ordinary potentiometer type L.F. volume control be employed across the pick-up and mounted on the turntable board.

This is as a rule a far more useful position for a pick-up volume control than on the panel of the set, and that is the reason why no L.F. volume control is employed in the construction of the receiver.

Before we go into the actual making of the receiver we will deal with the tuning coils. These are of quite standard type and can be obtained ready made if desired. But the home constructor who wants to make them himself should follow carefully the simple directions given on another page.

Preparing the Panel

The first thing to do in the actual construction of the set is to mark out and drill the panel in accordance with the panel diagram. Then it can be mounted on the baseboard, which latter is covered with copper foil. The next thing to do is to fix the panel components and those baseboard components which are placed between the panel and the upright partition (details of which we will go into a little later on).

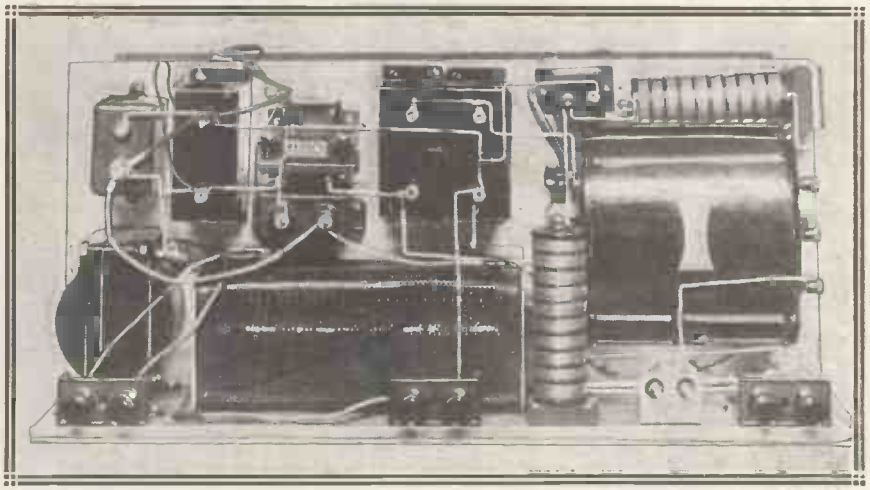
These components consist of the valve holders and H.F. choke, fixed condensers, L.F. transformer, etc., and you will see that on the first wiring diagram we have given the back-of-panel wiring in that first section. After these few parts have been placed in position, the main partition is mounted along the centre of the baseboard. It is covered with copper foil on the wire or panel side, and consists of ordinary plywood of the same material as the baseboard, measuring 18 in. by 7 in.

It is mounted in position by a couple of panel brackets as shown in the wiring diagrams and photographs. On the side facing the panel are mounted the P.J.3 coil and its associated coil quoit, also the output filter choke and the condenser used for de-coupling the priming grid of the pentode. Towards the aerial side of the set there is the valve holder for the S.G. valve, with the screen, de-coupling condenser and resistance.

Wiring the Receiver

You can now wire the receiver. This

A SMOOTH AND SILENT POWER SUPPLY



Here you see that department of the "Extenser-Power" which rectifies and smooths the mains current. Reliability and freedom from hum have both been attained by careful choice of components and values.

is carried out in accordance with the wiring diagram we have just discussed. Eight holes are drilled along the foot of the partition to take wires to such places as the mains on-off switch, the volume control, and the S.G. valve. Then there are the aerial and H.T. leads to the various parts of the set. These holes are numbered so that they can be followed easily from the wiring diagram. You can then easily see what happens to the wires when they come through the other side of the partition.

At the top of the partition are two more holes, one for the heater leads of the screened-grid valve and the other one for bringing the H.T. lead to the output choke.

The heater wiring should be done first, as this can be tucked away along the foot of the baseboard and the side of the vertical copper screen which separates the H.F. and detector portions of the set.

Sectional Screens

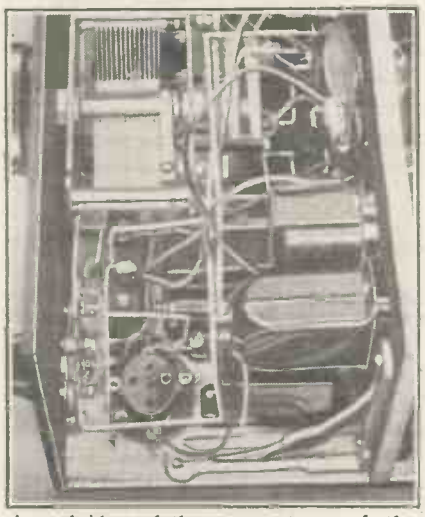
This screen measures 7 in. by 5 in., and is cut away for the screened-grid valve (see photos). It is mounted firmly between the partition and the panel. Having secured the components on the partition and fixed the screen, the next thing to do is to bond the screen and the foil together by a spot of solder at various points where they meet. Then wire up the heaters as far as possible by means of twin, braided, copper-covered flex, supplied by the London Electric Wire Co.

This heater wiring is later connected to the output of the mains transformer through the hole near the S.G. valve on the top of the partition. But the complete heater wiring inside the set can be carried out at this stage of the proceedings.

Beware of "Earths"

After this has been done and a couple of wires taken to the pilot lamp at the back of the panel, the braiding should be soldered at various points to the copper screening and the foil. Care should be taken that no point in the heater wiring is earthed; the valve holders must not touch the copper foil at any point where connection is made to them.

EXTENSER TUNING



A good idea of the compactness of the finished receiver can be gained from the above photograph. Thanks to the Extensers there are no wave-change switches, which reduced the amount of wiring considerably.

To make sure of this, it is not a bad plan to mount the valve holders on a piece of cardboard, so that contact between either anode or filament and the foil shall not take place, and there is no need to earth or connect the cathode to any of the heater wiring.

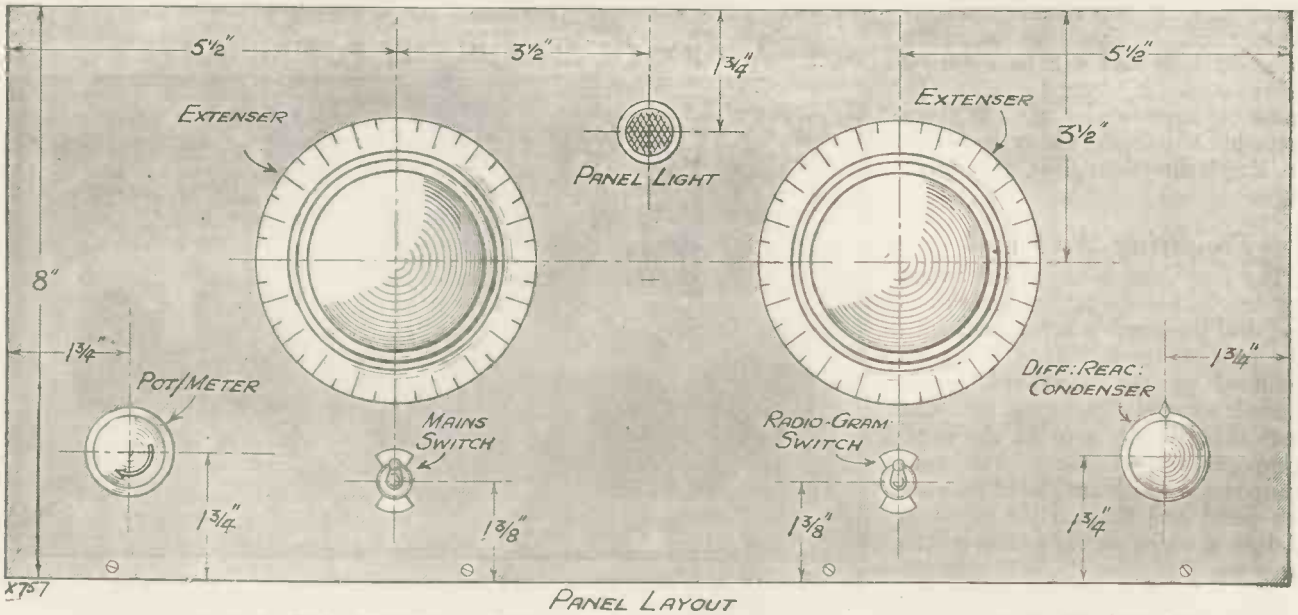
The flex on the switch controlling the mains input and going through the two holes in the front is the ordinary rubber-covered type, being passed through two separate holes as shown; and in taking these leads through the partition it is a good idea to leave a fair length of wire on the other side for connection to the various mains components.

Label all Leads

And here is a point which is well worth noting. When you have completed the radio side, label all the wires which come through the partition carefully, and then, if possible, connect up the set with an H.T. battery or a mains eliminator, if you have one, and an L.T. accumulator, and test it out as a battery set, making sure it works before proceeding any farther. If you have no accumulator, you can test with the H.T. battery and the L.T. wiring of the set connected up to the mains transformer, the mains being only used for supplying the L.T. power to the set.

Similarly, a little later on it would be advantageous for an accumulator to be used for the low-tension supply, and the H.T. section of the set to be taken from the mains. In this way

No Wave-change Switches are Required . . . or Desired!



PANEL LAYOUT

You roam through all the available programmes, both ordinary and long-wave, as you rotate the Extenser dials.

The Pilot Lamp Shows the Set is "On"

each portion of the set is known to be working satisfactorily before the final testing of the set is carried out.

We will assume then that the radio portion has been checked over and a preliminary test has been made. The next thing to do is to mount the remainder of the parts on the back part of the baseboard and the outer side of the partition.

The mains transformer, rectifier, smoothing chokes, smoothing condensers, and various de-coupling resistances are all fixed on this side, as will be seen from the second wiring diagram, which continues the layout. Should you require them, the mains H.F. chokes can be mounted one above the transformer and one below, the top one being secured on a piece of wood which is screwed to the partition.

In wiring up the remainder of the circuit, in accordance with the second diagram, it is not a bad plan to keep the theoretical circuit in view, checking up the two as you go on, though the H.F. chokes and condenser have been omitted in the latter.

Check Your Wiring

Every care must be taken that no mistakes are made, because if they are made then a tremendous amount of demolition may have to be undertaken in order to rectify the fault.

For instance, if anything goes wrong in the detector circuit round about the H.F. choke (which is in the anode circuit of the screened-grid valve), the P.J.3 coil may have to be removed completely, and its wiring disconnected in order to get at the H.F. choke. This is because the P.J.3 coil is mounted above the choke on the inside of the partition.

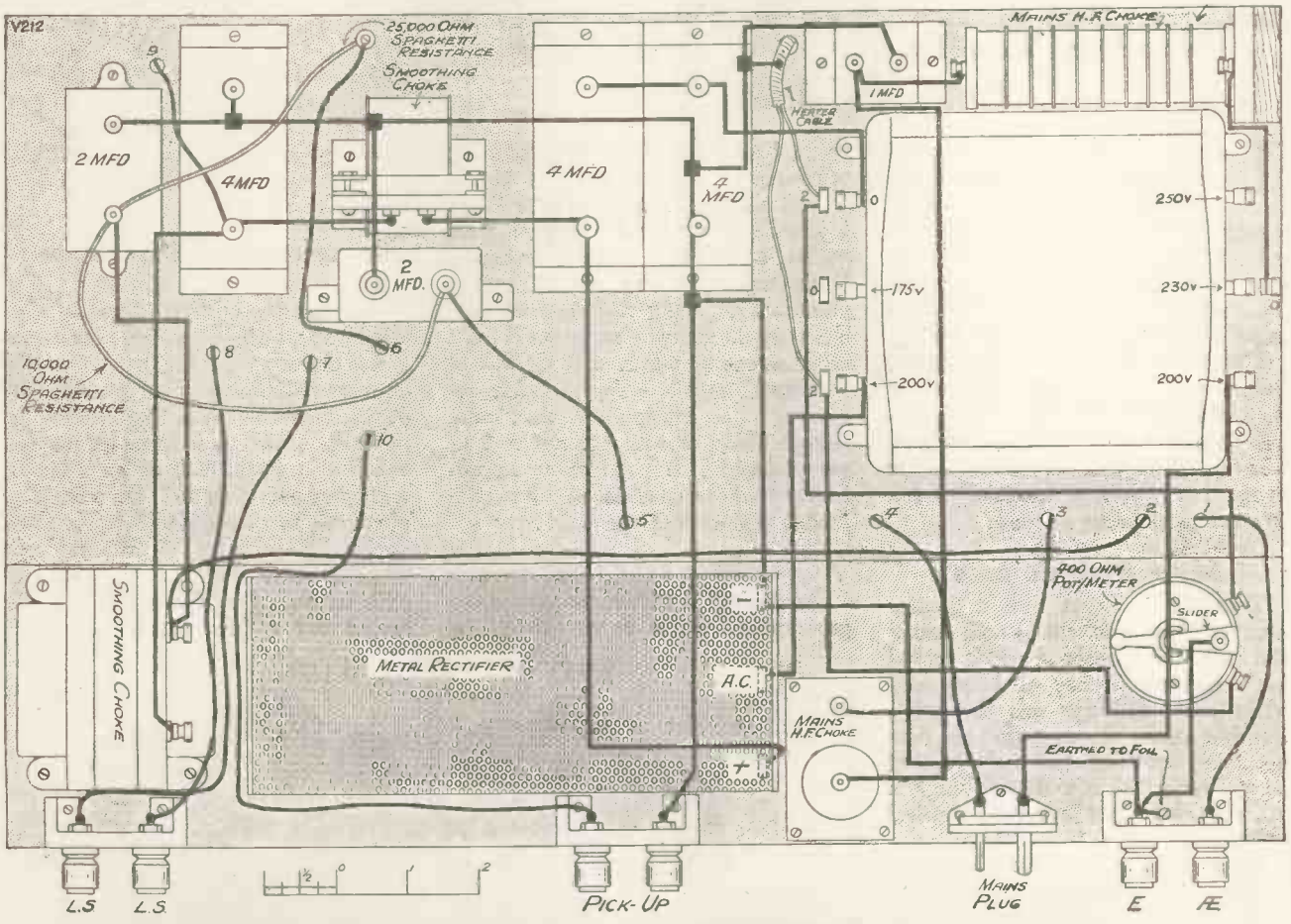
So be very careful in the construction that no mistakes are made. This is a set which is designed essentially for the man who has had a fair amount of experience in constructional work, and it is not advisable for the tyro in set building to undertake it. In building a set of this description a knowledge and understanding of theoretical diagrams, as well as the wiring diagram, of course, is a great help.

We will assume, however, that the set *has* been successfully constructed and that the various tests as indicated, have been carried out and that we are ready to switch on the mains and use the receiver.

The pick-up can be connected, if desired, across the two terminals in the centre of the baseboard at the back. The two terminals belonging to the block on the right-hand side at the back of the receiver are for aerial and earth, next to them is the plug and socket for the mains, and right

(Continued on page 284.)

Connections for the Power Supply Components



Use this diagram in conjunction with the other wiring diagram which appears on an earlier page.

Records are Down at Last — Wonderful Recording — Why are Gramophones Badly Tracked? — That Spindle Fallacy.

By "TONE ARM."

THIS month is a very important one for the gramophone and radio-gram user, for it marks a stage in this branch of science that is bound to have far-reaching effects. I refer, of course, to the price reductions of gramophone records which came into force on September 1st.

The most useful price reduction, naturally, is that which concerns the three-shilling record, which in future will be placed on the market at half-a-crown. This is a very much better figure, both from a financial and a psychological point of view.

More Records Sold

There is no doubt that a greater number of records will be sold under the new price, records which would have had no chance of being sold when three shillings was the price, simply because the average man does not mind spending half-a-crown, but he will not break into five shillings in order to have six minutes' musical enjoyment.

It is a reduction which has been awaited for a very long time, and one which the gramophone industry can well afford. In fact, I do not think that they will lose a farthing over the reduction, but will, on the contrary, put up the sale of their records so that there will probably be a substantial gain.

Wonderful Recording

And nobody, I feel sure, will grudge them any extra success which they may achieve, because there is no doubt that the gramophone record is pretty good value for money. I will not say it could not be made better value, because, good as the recording of to-day is, it could be still better.

And, talking about good recordings, I should like to place before your notice again the Polydor records. Unfortunately, these are of foreign manufacture, being made in Germany, but they do throw a remarkable light on what can be achieved in the way of "canned" music. The Polydor recordings are remarkably fine, and, though these records are not sold at every dealer's, if you get an opportunity to hear one, do so. You will find it is time well spent.

Bad Tracking

By the way, I wish somebody in the gramophone world or on the manufacturing side would tell me why it is that so many gramophones are sent out with the sound-boxes out of track; that is, out of track from the pick-up user's point of view. There may be some obscure reason why the needle should not run quite tangential in the groove, though I for one cannot see it; but the fact remains that the other day I was looking at a gramophone of high price and worldwide reputation, and was surprised to see that the sound-box seemed to have been placed so that it could start fairly well in track but would work out almost immediately the record started to play.

It looked almost as if the tone-arm had been mounted haphazard and a goose-neck type of tone-arm had been employed, too, so that offsetting ought not to have been a difficult matter, for a slight deviation of shape from the ordinary goose-neck will give you quite a valuable amount of offsetting to put the sound-box fairly well in track all the way over the record.

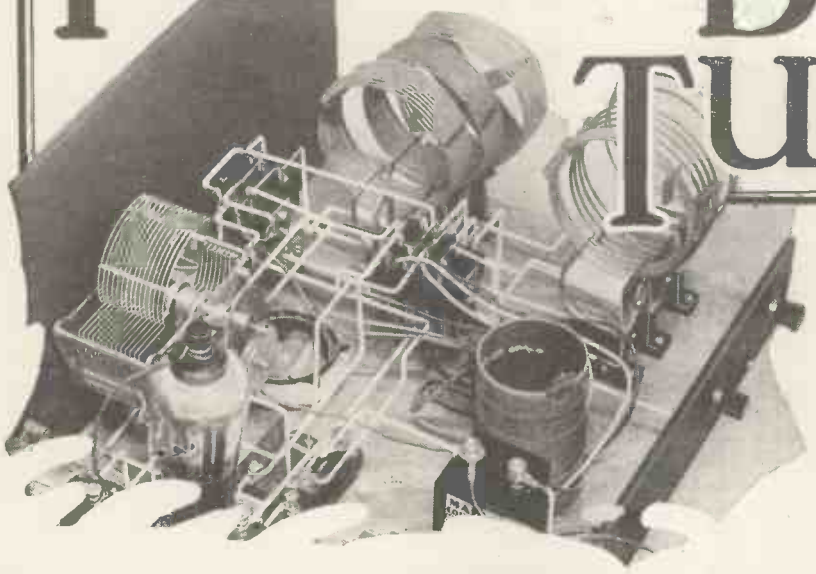
An Erroneous Impression

And, talking about tracking, it is remarkable the number of people who still have the idea that if the tone-arm is so placed that the needle in its circular path passes over the spindle of the turntable then the machine is in track. Nothing is more erroneous, and if you would care to work it out with your own pick-up (I am referring, of course, to off-set pick-ups now, not the straight variety) you will find that when in track there is a very peculiar path in regard to the centre spindle traced out by the needle.

WHY WON'T IT WORK?

Dealers visiting the H.M.V. Training School receive instruction on the re-wiring of H.M.V. instruments, and on other matters of maintenance.

FOUR-BAND TUNING



Part of one of the experimental four-band sets built by the "M.W." Research and Construction Department.

The "M.W." Research Department is undertaking a series of particularly fascinating experiments in receiver design, and should these prove successful it will be possible next month to introduce "M.W." readers to a radio receiver constituting a notable development, and one in which the Extenser is given extremely onerous duties. But whether or not success attends our endeavours, we feel sure readers will enjoy reading about the scheme.

ONE of the most interesting experiments in radio set design ever conceived is at present being carried out in the "M.W." Research and Construction Department. At the moment of writing it is quite impossible to say whether or not we shall meet with entire success. But, whatever the result, we are sure readers will welcome a brief description of the apparatus in question.

It is an attempt to compact the whole of the world's broadcasting into the one set in such a way that the outfit retains simplicity of both construction and operation.

Such an ambitious scheme would have been an impossibility without the Extenser, and it can truly be said that this component has more than halved the problem.

Short Waves, Too!

The Extenser enables us to dispense with wave-change switching and coil changing. Receivers using Extensers and able to tune to the whole of the medium- and long-wave broadcasting stations by means of a single dial or drum rotation are now almost a commonplace, and the ordinary variable condenser method of tuning seems to be destined to an early extinction.

Some time ago it occurred to us that it might be possible to extend the applications of the Extenser to short waves and so enable short-wave sets to be designed that could tune over two bands of wave-lengths.

Subsequent to a period of research it was found that the idea was not only feasible but entirely practical. However, it is only the "fan" who is interested in receivers able to handle nothing but short waves.

Real "Distance" Results

But every listener would welcome the addition of short waves to his present two bands, for there are some excellent and reliable programmes on the higher frequencies, programmes from America, Australia and other distant places that are quite out of reach in the usual way.

Therefore, we set to work to combine the double short and the double ordinary Extenser tunings in the one inexpensive instrument.

The idea was that there should be just the one switch control for changing the outfit from ordinary to short waves; with this switch in the one position the Extenser would give you all the broadcasting from 200 to 2,000 metres or so, and when you clicked the switch over all the useful short waves would be tunable on your Extenser.

The Transformation

Such a switch cannot be regarded as a wave-change switch—it is a transformation control!

But what a set! Practically every wave-length that is used for broadcasting available on a receiver having only one tuning control and one transformation switch!

It might be thought that the Extenser almost automatically solves all the problems concerned in the design of such a set. But while, as we have said, we admit it has taken us over half-way towards their solution, there remain a number of very nasty "snags."

It would not be difficult to turn out such a design based on compromises, say one that was not quite as good on the short waves as a special short-waver, or as good on ordinary broadcasting as a conventional "hook-up." But that is not the sort of thing that would satisfy us.

A Final Snag?

We want one hundred per cent efficiency all round.

There are dozens of minor difficulties, but it is possible to say that we have overcome most of these.

We feel very confident that complete success will be achieved, although there may be some "snag" of which we have no knowledge lurking around one of the last corners we have to turn.

However, if everything turns out as we hope it will, full details of the world's first two-way, four-band tuning set will appear in "M.W." next month, and its description should create extraordinary interest.

By the Technical Editor — On the

Varley H.F. Inter-Valve Coil

As a companion to their Constant Square Peak Band-Pass Coil, Messrs Varley have produced an inter-valve coil unit of a completely screened character. And this screening is not electrically connected to the coil itself, so that it can be earthed in the usual way.

This renders the construction of a set incorporating an H.F. stage a fairly simple business. And further simplification is afforded by the specially arranged wave-change switch which can quite easily be ganged with the switch on the Square Peak coil.

This inter-valve coil is not a band-pass, but is suitable either for tuned-grid or tuned-anode coupling of a more or less conventional nature. But its inductance has been carefully determined so that perfect ganging with the C.S.P. is assured.

It is an efficient coil, and especially in co-operation with a C.S.P. (Constant Square Peak) gives very effective results. There is no reason at all why it should not be used in conjunction with another form of aerial tuner and, in view of its qualities, we expect many constructors will want to do this until such time that they can include a C.S.P. and the gang condenser that this demands.

And as with all Varley apparatus the component is well made and cleanly finished. At the retail price of 8s. 6d. it should rival the great success we believe the C.S.P. is even now deservedly enjoying.

SUITABLE FOR GANGING

The wave-change switch is arranged so that it will easily gang with the one on the Varley Constant Peak Band-Pass Unit.

Six-Sixty Valve Screen

The Six-Sixty Radio Co., Ltd., has introduced a valve screen to sell at 1s. 3d. It is of simple but effective design, and can quickly be fitted in practically any existing set.

There are many receivers which would undoubtedly benefit by the addition of one or two of these Six-Sixty screens, particularly those which are of "hi-mag." character and tend to operate close to the "spill-over" point.

And constructors contemplating the addition of an S.G. stage to an existing outfit should be able to employ one or two with advantage. Its main application is in screening an S.G. valve, but it frequently happens that the detector can also be given such screening with good effect.

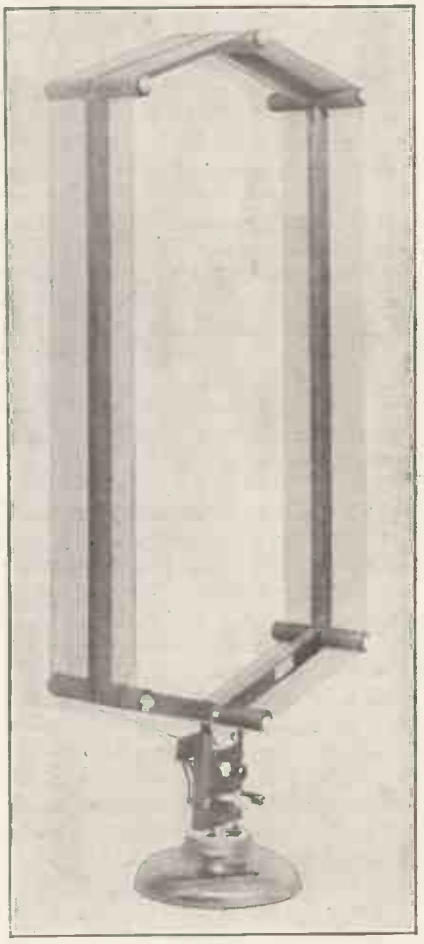
Wearite "Popular" Frame Aerial

Super-het enthusiasts should take particular note of the Wearite Frame Aerial, a product of Messrs. Wright and Weaire. It has a wave-change switch embodied in it, and is, from every point of view, a very sound proposition.

It is more robustly constructed than many others, and its appearance is definitely high-class. There is a solid base and the frame swivels easily and surely on this.

We have used the Wearite Frame with several different super-hets, and in each case it has given full satisfaction. The wave-ranges are just right, and the "pick-up" is equal

A FINE FRAME



The Wearite "Popular" Dual-Range Frame costs 32s. 6d., in either polished oak or mahogany (as desired), and is wound with 9/40 standard green silk covered wire on ebonite spacers.

Test Bench

Varley, Six-Sixty, Wearite, Clix, R.I. and Formo Components form the subjects of our impartial reviews this month.

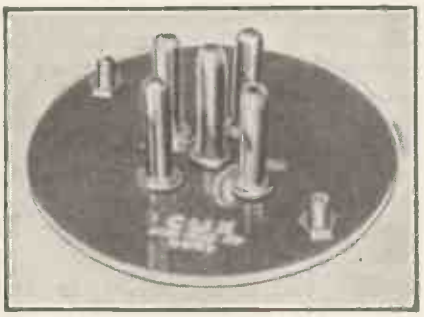
A volume control due to R.I.

to anything we have had come our way even including special experimental constructions.

A Clix Valve Holder

The valve holder which we illustrate is a Clix Panel-Mounting Valve Holder employing sockets of a helically-slotted resilient type. Messrs. Lectro Linx, Ltd. have been supplying this valve holder in large quantities to various of the leading British manufacturers of sets, but they are also retailing them at 5d. and 6d. each, the four- and five-pin types respectively, complete with nuts and bolts.

PANEL VALVE HOLDER



The underneath view of the Clix Panel-Mounting Valve Holder.

This latest Clix product is a fine little component and its electrical losses are abnormally low, mainly owing to the very small amount of first-class solid dielectric used. Valves fit into it snugly, good contact with all the pins being made despite the smoothly easy fit.

The R.I. "Unigrad"

This is the latest product of Messrs. R.I., and is a volume control for use with radio-gramophones and wireless sets.

It is rather smaller than the average volume control, and has the typical R.I. sleekness and smoothness of lines and finish.

The action is entirely velvety, there is not the slightest looseness or harshness discernible at any point, and in this respect it is better than any other similar component we have yet had to hand.

Electrically, too, it is quite sound, and the variation of volume from minimum to maximum is given without either those jumpy effects or cut-offs that are characteristic of the poorly designed control.

The "Formo" Extenser

This year's radio show at Olympia will be well worth visiting, so it seems to us at least, if only to take the opportunity of examining and handling some of the Extensers that will be on view.

The introduction of the Extenser was itself a signal event, but of almost equal interest has been the high standard of manufacturing ability evinced in its commercialisation.

If nothing but the Extensers that are now on the market had been made this year, the resources of the British radio industry would still have been given quite adequate expression in the world's markets, if not in bulk of trade, at any rate in the proof of the quality it can achieve.

It so happens, luckily for the Extenser, that the firms capable of making the best apparatus are the very ones that are getting off the mark first with Extensers. It is not often that enterprise and skill go so closely hand-in-hand!

Very shortly it seems that the word "Extenser" will be synonymous with quality in manufacturing in its own particular line! Anyway, so far there are no signs of an Extenser appearing that can be rated as

(*Continued on page* 285.)

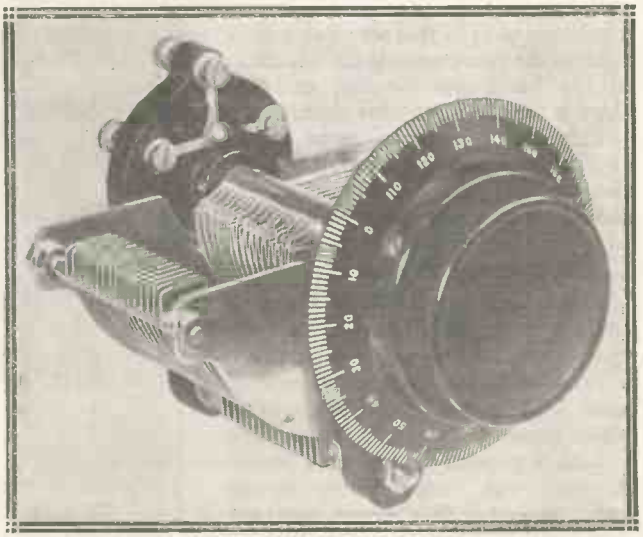
WILL READERS, MANUFACTURERS, AND TRADERS PLEASE NOTE?

We are prepared to receive samples of radio apparatus of any description from anybody for the purpose of preparing test reports for this page. Nevertheless, the Technical Editor reserves to himself the right to select only those items of most general interest when space limitations prevent all the submitted material from being dealt with.

Also it should be noted that we cannot accept responsibility for the return of goods forwarded to us for this free service inasmuch as it is frequently essential for components, accessories, etc., to be completely dissected in the course of our examinations.

Finally, it is pointed out for the benefit of our more technical readers that the reports are based on tests carried out with the most modern gear under strictly impartial laboratory conditions.

AN EXTENSER WE CAN RECOMMEND



The Formo Extenser is an excellently-made component, and we can fully recommend its use in "M.W." receivers.

SELECTING THE STATIONS

Some final hints and useful tips on tuning the "Lock-Tune" Four, the wonderful DX receiver, full constructional details and diagrams of which were given in last month's "M.W."

THE "Lock-Tune" Four is a receiver that has a peculiar fascination in its operation. This is partly due to the fact that no reaction control is employed, giving a striking proof of its sensitivity, and partly because the band-pass circuits provide such an unusual degree of selectivity, and at the same time are perfectly ganged, enabling one-knob tuning control to be employed. Station selection is simple.

Easily Adjusted

The tuning is really excellent from all points of view. Not only is it easy to handle, but it is extremely easy to readjust. And we want to say a few words about its preliminary setting, and the subsequent operation in this short article.

There are three little wheels on the side of the Polar triple tub condenser used in this set; two wheels nearest the panel control the trimming of the band-pass circuits, and the third is for the intervalve circuit.

This latter is fairly flatly tuned, so that not much trimming will be needed, but the band-pass section should be carefully ganged up.

Balancing the Ganging

This is how we did it, and how we suggest you should carry out the same operation.

First we tuned in a medium-wave local. Then we rotated the first wheel (nearest the panel) by pushing it with a wooden skewer or a pencil. A point was found where signals were loudest. The wheel was left at this setting and our attention transferred to the middle one, and we moved that about until we found maximum loudness again.

Then we found that the local station tuning was pretty sharp, the tuning point being pretty clearly defined over a matter of a degree or two. Next we tuned in a distant station, namely, the Northern Regional, and we reset the trimmers. Actually, they were pretty well right, but a slight adjustment brought up signal strength, and when we had trimmed up for the maximum signal strength on the first two condensers we proceeded to the third trimming wheel at the back of the condenser unit.

This was rotated until maximum signal strength was obtained, but hardly any trimming had to be done on this circuit. Once the trimming has been carried out there is no further adjustment to be done and the trimming holds for both bands.

When the condenser trimming has been completed the set is ready for ordinary listening, and all you have to do is to rotate the tuning condenser until you get the station you want. As we remarked before, no reaction is employed in this receiver, and you will therefore probably find it rather strange to be handling a set of this kind with only one tuning control and nothing whatever to be altered except that tuning control, whether you want a powerful local station or a distant programme from the other side of Europe.

No Instability

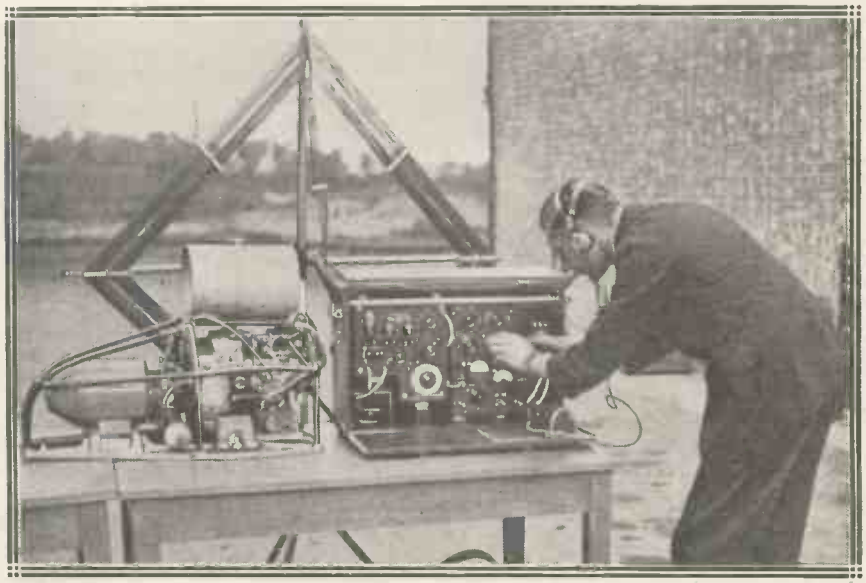
No boosting up of signals is necessary; in fact, the only thing that is required is a "boosting down," if we may use the term, on some of the more powerful stations to prevent detector and L.F. valve overloading.

The S.G. potentiometer is not, as is the case in some sets, for *stabilising* the receiver, for it does not reduce the screened-grid voltage in order to keep the H.F. side from oscillating. The potentiometer is solely for volume control, and with it hard over to the right (the maximum screened-grid voltage on the S.G. valve) you get your maximum volume, with perfect stability.

The valves to employ in this receiver are of quite the normal types.

(*Continued on page* 287.)

THOSE IMPORTANT "FINISHING TOUCHES"



This is the final test of a French Army radio set, supplied to the order of the French Government by Radio Instruments, Ltd.

A RADIO RECKONER

By W. A. BARCLAY M.A.

A further complete instalment of a valuable time-saver which takes all the sting out of tedious calculations and quickly enables you to solve radio problems without putting pencil to paper.

IN the last two instalments of this series we described the nature of inductance and capacity, and showed how approximate values of these might readily be found in most cases.

We now turn to consider the actual behaviour of inductance and capacity in a wireless receiver. We have seen that, in practice, inductance is obtained by winding many turns of wire in the form of a "coil," while capacity is provided by the well-known condensers of either fixed or variable type.

The first important thing to notice about the behaviour of an inductance is that it has absolutely no effect whatever upon direct current. By this is meant that if we pass D.C. through any inductance coil, the only opposition it will meet with is that due to the ohmic *resistance* of the coil.

Resistance to A.C.

Next we have to observe that it is impossible to pass a direct current through a condenser. The reason is that, as we saw last month, the circuit through a condenser is not completed, since the two sets of plates are insulated from each other.

But when the current is alternating the case becomes quite different. When A.C. passes through a coil its inductance sets up an opposing influence to the current which is known by the name of "reactance," and this reactance exists, of course, in addition to the ordinary resistance of the coil.

Reactance is, indeed, a special kind of resistance which only appears when A.C. is concerned. It is convenient to measure reactance in ohms, but it must always be carefully remembered that an ohm of resistance is quite a different thing from an ohm of reactance.

Effect of Condenser

Again, as we saw last month, a condenser will allow A.C. to pass, although blocking the way for direct current. When A.C. passes through a condenser it is found that it encounters a similar opposition or reactance, and this, too, may be measured in ohms.

It will be remembered from our study of Ohm's law in the case of direct currents that if E volts were applied across a resistance of R ohms, a current equal to $\frac{E}{R}$ amperes would flow through the resistance. Conversely, if a current of I ampere is passing through a resistance of R ohms, a potential difference of IR volts exists across the terminals of the resistance.

Let us now consider the application of Ohm's law to the case of alternating currents. As was pointed out in a previous article, we require to know two things about an alternating current in order to specify it completely.

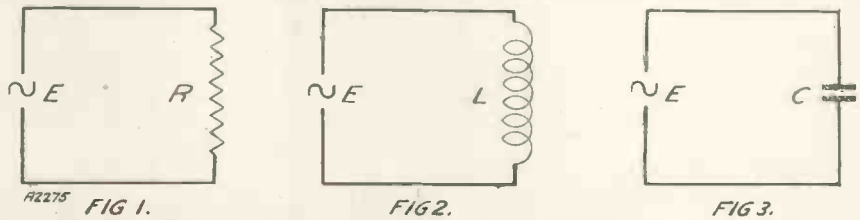
These are (a) its amplitude, or greatest variation from the zero value, and (b) its frequency, or the number of complete alternations it makes in one second. If we pass such a current through an ordinary resistance wire it will be obvious by Ohm's law that the potential difference or voltage across the terminals of the resistance will fluctuate in precisely the same manner as the current variations.

Varying Voltages

If we now make the symbol I stand for the amplitude or periodical maximum value of the current pulses, and let R as before denote the resistance in ohms, then the maximum value or amplitude of the voltage across the resistance will be given simply by IR volts.

Note, too, that each successive

THREE FACTORS WHICH OPPOSE THE FLOW OF A.C.



A2275 FIG 1. FIG 2. FIG 3.

The first of the diagrams shown above offers the same opposition to A.C. as it does to D.C. This is because it contains only pure resistance. The other two arrangements, however, are quite different in their behaviour, as the writer explains in this article.

current maximum is accompanied by a voltage maximum, so that the frequency of the alternating voltage across R is the same as that of the current. We thus see that voltages as well as currents may be alternating and can be specified by means of their amplitudes and frequencies.

Where A.C. Differs

We might, for instance, consider the circuit of Fig. 1, where an alternating voltage of amplitude E volts and frequency f cycles per second is applied across a resistance of R ohms. The alternating current in the resistance would then have an amplitude of $\frac{E}{R}$ amperes, the frequency, of course, being the same.

Suppose, however, we substituted an inductance coil for the resistance in Fig. 1. For the sake of simplicity, we shall suppose our coil to be of the best "low-loss" type—in fact, we shall suppose it to possess no resistance at all, but only inductance, the value of which we shall call L microhenries.

If we apply to such a coil the same alternating voltage of amplitude E and frequency f as in Fig. 2, what will now be the magnitude of the resulting current?

The answer is found by an analogous procedure to that just described in the case of Fig. 1, but using the concept *reactance* instead of resistance. Thus if the value of the reactance of the given coil at this frequency were X reactive ohms, we may say that the amplitude of the resulting alternating current in the coil will be $\frac{E}{X}$ amperes.

It is very instructive to note the different effect which the same coil has on D.C. and on A.C. In the former case, if a fixed steady voltage were applied to the coil the resulting current would be very large indeed, owing to the absence of resistance.

With A.C., on the other hand, the applied alternating voltage meets with the opposing effect of the reactance, and this chokes back and limits the current. For this reason such inductance coils are sometimes referred to as "chokes."

THE A.C. RESISTANCE OF CHOKES EASILY FOUND

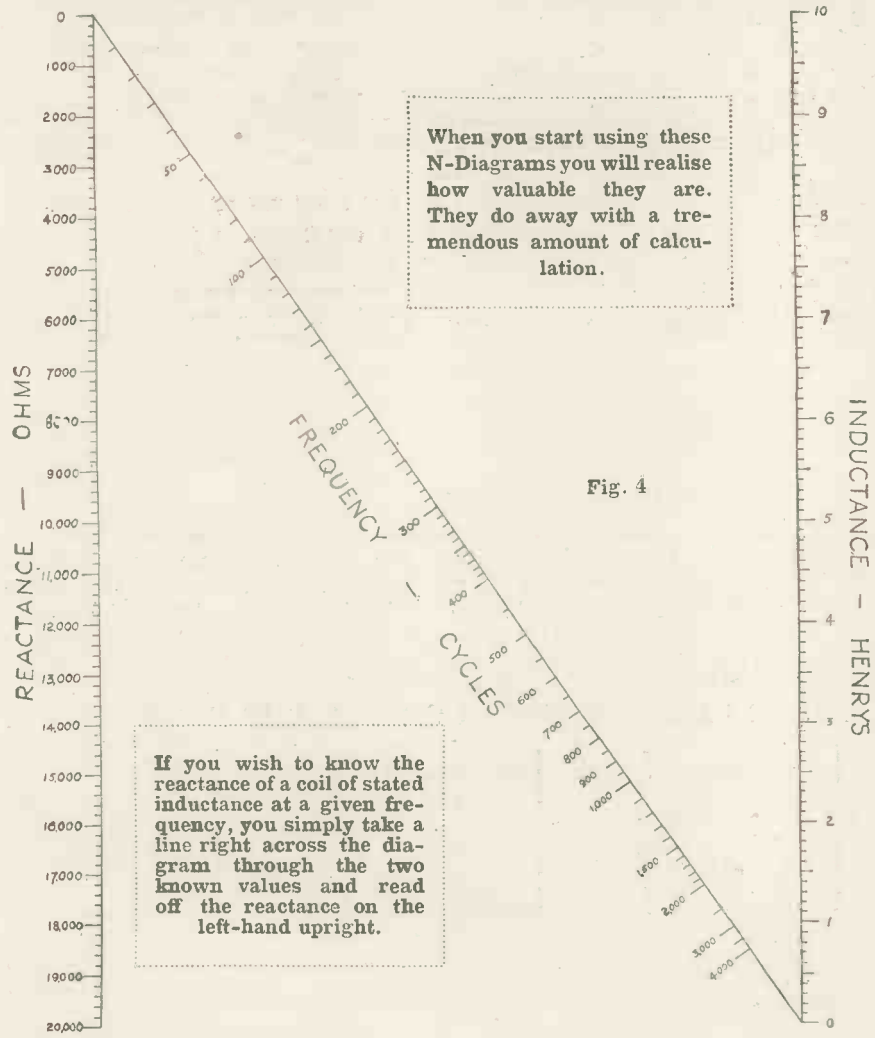


Fig. 4

Reactance of Coils

Similarly, in Fig. 3, if the same alternating voltage E at frequency f be applied to the condenser C, a certain alternating current will be found to flow, the amount of which depends on the reactance of the condenser at the given frequency. If, again, this reactance is denoted by X ohms, the amplitude of the current will be $\frac{E}{X}$ amperes.

It is thus very important to have a means of finding the values of the reactances which may be set up by various coils and condensers. It was mentioned above that reactance is a phenomenon associated only with alternating currents. Not only does it vary with the magnitude of the inductance or capacity in question, but it depends also upon the frequency of the alternations.

Reactance is, therefore, something very different from resistance, as the same coil or condenser may offer any number of different reactances according to the different frequencies used. We shall see later on how valuable this property is in "sorting out" the different frequencies which are met with in a radio receiver.

Saving Calculation

The usual formula from which we may find the reactance in ohms of a coil whose inductance is L henries at a frequency of f cycles is:

$$X = 2\pi fL \quad . \quad . \quad . \quad (1);$$

where X is the required amount of reactive ohms, and π is the constant number 3·1416. To save the trouble of working out numerical values from this formula, the N-Diagram of Fig. 4 will be found very convenient.

In this diagram values of inductance up to 10 henries will be found on the right-hand scale, while the values of frequency appear on the diagonal line. Placing a ruler across the given values of these two, the corresponding amount of reactance is read off on the left-hand scale. All calculation is thus done away with.

Values Quickly Found

For example, it is easily seen that at 600 cycles per second an inductance of 3 henries will have a reactance of 11,400 ohms. Should the given value of inductance lie outside the range of values provided on the scale of Fig. 4, a little consideration of the formula

These N-Diagrams give "Reactance in Ohms" in Record Time

(1) will show us what to do in order still to make use of the diagram.

Suppose, for instance, that it were required to find the reactance of 30 henries at 600 cycles. It is obvious that the reactance will now be ten times the former amount. So that all we need do is to find the reactance for 3 henries by the chart, and multiply by 10, the answer being, of course, 114,000 ohms.

Another Formula

The corresponding formula for the reactance of a condenser is slightly more complicated. If we express C, the capacity of the condenser in microfarads, the frequency as before being in cycles, we have:

$$X = \frac{1{,}000{,}000}{2\pi fc} \quad . \quad . \quad . \quad (2);$$

where X is in ohms.

There is no doubt that this is a very troublesome formula to use, even for those who are "good at sums"! The N-diagram of Fig. 5 should, therefore, be a great help, for questions as to the reactance of a condenser are always cropping up.

In Fig. 5 the arrangement of the scales is a little different from that used in the previous chart, but as they are clearly marked this should not cause any difficulty. Here values of capacity appear on the right-hand scale, while those of frequency are on the left.

Any straight line placed across the given values of these two will meet the diagonal line at the required amount of capacity reactance. For example, the reactance of a condenser of 0·4μF. at 165 cycles per second is easily found to be 2,400 ohms.

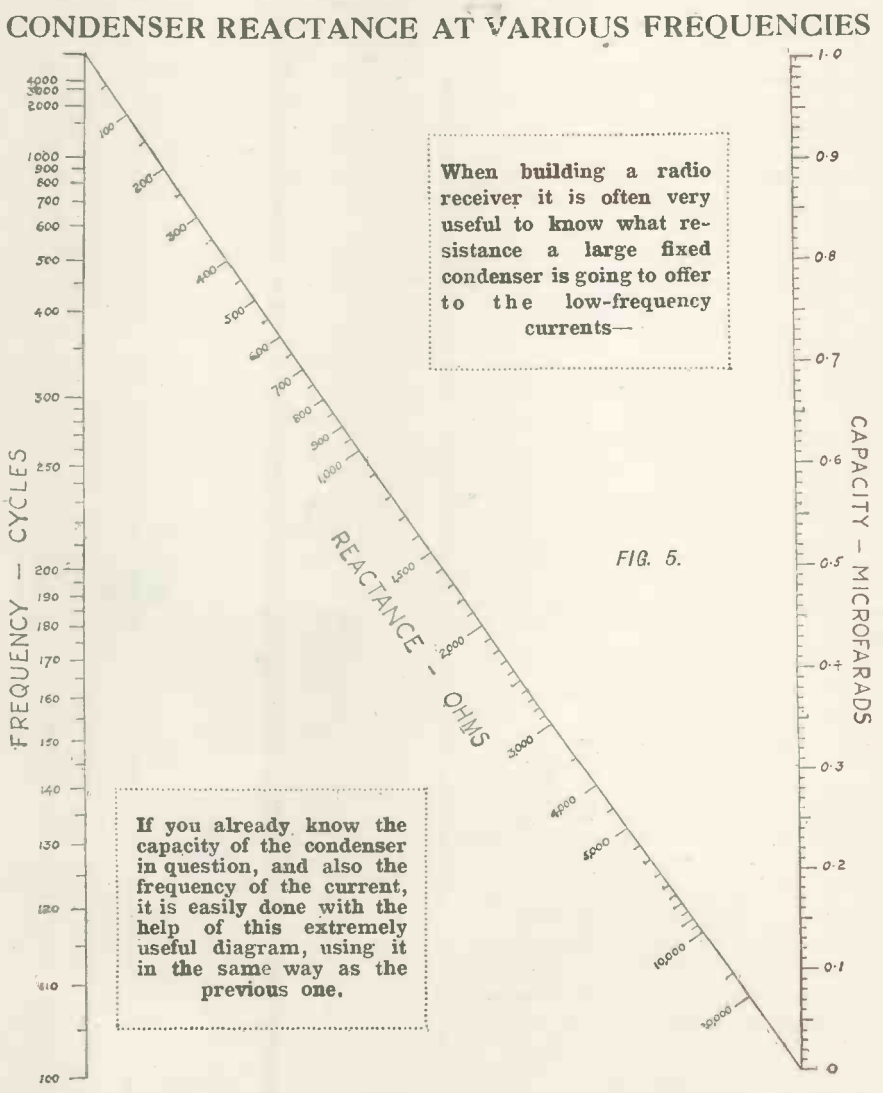
Their Practical Use

It may here be interesting to refer briefly to some other uses of these diagrams. In common with all "alignment charts" they have the property that *any straight line placed in any position across them meets the three scales in corresponding values.*

Hence it comes about that we may just as easily use Fig. 4 to find, say, the inductance when the reactance and frequency are given, or, again, we may employ Fig. 5 to find the frequency at which a certain condenser has a given reactance. Such problems, which would otherwise require considerable "juggling" with the formulæ (1) and (2), are thus solved at sight by means of the charts.

Let us suppose it is required to ascertain the size of a choke coil which will provide an alternating voltage of 160 volts across its terminals when passing an alternating current of 100 milliamps. amplitude at 50 cycles frequency. Now, 100 milliamps. is equal to 0·1 ampere, and, as we have seen, when X is the choke reactance, $X = \frac{E}{I}$. Here, therefore, the reactance of the choke is evidently $\frac{160}{0{\cdot}1}$, or 1,600 reactive ohms.

Now turn to Fig. 4. By joining 1,600 ohms to 50 cycles the inductance is found to be just over 5 henries, which is thus the size of choke required.



OPERATING THE "NEW D.C." THREE

Some further notes concerning one of the interesting receivers described in "M.W." last month.

LAST month we gave full constructional details of a three-valver using the new D.C. indirectly-heated valves. Called the "New D.C." Three, this set is an all-mains job, and is capable of providing excellent quality reception, and has sufficient power to bring in a large number of Continental as well as British programmes.

Coil Construction

Owing to lack of space, however, we were unable last month to discuss the actual operation of the set. Details of construction were gone into fairly closely, and here we should like to point out a printer's error which occurred on page 184 concerning the P.J. coil details.

It was stated that the P.J.2 coil had *three* windings of 30-gauge D.S.C. wire, and this was followed by providing details of only two windings. This probably put most readers wise to the fact that there had been an error, for, of course, the real state of affairs is that there are only two windings. It is the P.J.3 which has the third (reaction) winding.

And now let us spend a little time considering the actual operation of the "New D.C." Three. It is not a difficult matter, but there are one or two points that would be all the clearer for a little explanation. So we will take up the thread of our story from where we left off last month.

"Starting Up"

Having completed the construction of the set and placed the valves into position, the aerial and earth leads and loud speaker put on, nothing remains but to switch on the mains and watch the meter on the panel. If nothing happens, provided you have no disconnection anywhere, then you probably have the mains on the wrong way round, and you must reverse the plug from the wall socket or electric-light end (you cannot make the reversal on the set).

On reversing the plug you will find that the needle will switch over. If it should go past half an amp. more than, say, one degree on the marking of the little meter, then in all probability you have connected your resistance on the back of the set wrongly, and not in accordance with the voltage of the mains. The mains plug, of course, need not be withdrawn for this operation provided you switch off the set and the mains switch.

HOME RECORDING

An American super-het radio-gram which includes the necessary devices for making your own gramophone records.

If on switching on the needle goes just above the ·5-amp. mark, there is nothing to worry about, for when the valve is heated up the current will drop a little bit, and you will find that you have exactly half an amp. flowing. The milliammeter will not show anything for some time—until the valves warm up properly—when it will gradually come up to between 25 and 30 milliamps.

"Extenser" Tuning

Tuning is carried out in the usual way by means of the Extensers. These Extensers, as you are probably fully aware, enable wave-changing to be carried out automatically, the dial rotating through 360 degrees; the one-half of the rotation tuning in the medium waves, and the other half the long waves.

Should, however, you wish to use ordinary condensers, wave-change switches will have to be inserted in convenient positions—say, beneath the condensers, although this will upset the balance of the panel rather considerably. The connections to these wave-change switches would be quite simple. In the case of the aerial circuit, you merely take the connection which goes to the moving vanes of the Extenser (see the wiring diagram) to the moving vanes of the new condenser, *and* to one side of a three-point switch, and take the two points used on the Extenser switching to the remaining two points on the switch.

In the case of the detector valve circuit you will need a three-point switch which has a centre plunger available for the fourth connection, unless you are prepared to make a slight alteration in the wiring. We will give you the connections for both types.

Alternative Methods

In the first case we use the plunger of the switch as one connection, and take the leads connected to the moving vanes of the Extenser to the moving vanes of the new condenser and to the centre plunger. Now all remains is to take the three points on the Extenser to the three points on the wave-change switch.

In the case where a *three*-point switch is used (the plunger not being available to make the fourth connection by means of a piece of flex attached to it), you take the moving vanes to one contact, and also a lead joining the aerial winding of the medium-wave coil and the winding of the coil quoit to another contact (that is, the lead from the aerial winding which is coloured blue, and

(*Continued on page* 286.)

Some Radio Soliloquies in the Suburbs

WHEN we moved into this house I found that the garden appertaining thereto had, apparently, been the victim of a person with a craze for the "old English" garden, which meant that the thing was mostly hollyhocks, sunflowers, London pride, Michaelmas daisies, and dandelions. The bottom quarter was entirely afforested with huge plants which flowered like daisies the size of sixpenny pieces.

Great was the slaughter; I buried them in two trenches and planted a few real flowers. Then the daisy things resurrected themselves and grew a foot taller!

Self Recuperation

Years passed, and each one saw a finer growth of those immortal pests, which yearly I slew. I then had some seven tons of Kentish ragstone dumped, but with art, upon the resurrection ground, and on this I planted a charming rock garden. Brave diehards of those daisy things have crept upwards through some of the interstices, but the bulk of the colony have been forced to move horizontally, and now, I hear, they are trying to push over next-door's toolshed!

I was so much in love with my rock garden, a place of winding "crazy" paths, creeping saxifrages and sempervivum in a dozen varieties, that I built me a little summer-house, from whence I could contemplate the weathered rock and mossy shelves overhung with flowers, even though heaven opened its sluices. To this abode of spiders I carried my notebook, intent on my monthly dissertation, which should smell of open air.

Next-door's cat was soundly sleeping on the cushioned seat, an honour which I acknowledged by helping it swiftly back into its rightful demesne. They always land on their feet! Which is remarkable, considering that my returned cats always turn over in mid-air two or three times; I have a googly throw which is much admired

A BAD "BREAK THROUGH"!

"Trying to push over next-door's toolshed!"

by the man on the other, or non-cat, side.

Bending my mind to my task, not rendered any easier by reason of the fact that non-cat next-door's wife had brought the loud speaker on to her balcony so that I could hear how much finer his is than mine—or, is his than mine—I mean, how much finer than mine is his. (Don't like that at all! The woman and her L.S. cramp my style!)

A Radio Feud

Ever since I halved the length of my aerial, clean against his views, and got results denied to him, he has been trying to out-dope me in the matter of home-made speakers.

However, bending my mind to my task, I became conscious of a discord between the seat of reason and the seat of—er—in short, *the seat*. Preparatory to a garden-party we had hurriedly made a long cushion for the summer-house seat out of some old cretonne curtains stuffed mainly with my old shirts. During the operation the reel of thread disappeared. I swore that it was in the cushion, and told a story about the sponge being sewn up in the appendicitis case. But I was laughed at. And now—this discord, from below upwards. The reel!

The Original "Pips"

I had to go indoors in order to chortle over and otherwise discomfit the Enemy. *I told them so.* Enemy then swore affidavit that said reel had been found on floor on same day as alleged disappearance of same.

"Same is in cushion aforesaid," I retorted.

"Get me my scissors," quoth the Enemy, "*and we'll see.*"

Seldom have I, inured to constant warfare, come such a wallop! The discord, when eventually extracted, proved to be a bobbin of wire which I had not seen since Armistice Day. We used to heat the "pips" of the early types of valves by means of these bobbins; the bobbins were slipped over the pips and the wire was warmed with an accumulator. When the accumulator ran down, the signals ran down!

Up to the "carpet" stepped my

Pertinences Pertaining to Wives, Wires and Wireless Sets

young son. Yes, doubtless the bobbin was mine; doubtless it was found in the cushion. But he was not to be held responsible for the contents of cushions. Heaven forbid! Was he an upholsterer? Heaven forbid!

WELL "BIASSED"

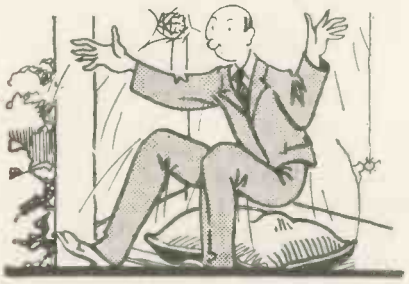
"I have a googly throw which is much admired by the man on the other, or non-cat, side."

"Not in these!" He had been present at the stuffing of the cushion—but only, mark you, as an *observer*, not in an executive capacity.

Had he seen or been in temporary possession of said bobbin? He was not prepared to admit that he legally recognised that particular bobbin. Cross-examined, he said that he had found *a* bobbin—lying around, loosish like—and might have temporarily become possessed of same, but he gave this evidence with all legal reserves and under pressure, without prejudice, completely *ultra vires* and *pro bono justicia*.

The Court then adjourned at the instance of Rosalind, the "lady help," who desired to register her deposi-

VERY POINTED!



"I became conscious of a discord between the seat of reason and the—er—seat."

tions concerning her perennial quarrel with the universe about the pantry. "'Flies,' you ses. 'Plagues uv Egip,' I ses, and what with beef rose a 'apenny——" etc. Led away by kind hands, but refusing to be comforted. Ay de mi! One of the old school! They don't have it nowadays, any more! But—back to the summer-house, for this is beginning to smell of the kitchen!

The Aerial Sherlock

I can see a perspective of aerials from here; each one a thumb-nail monograph of its owner. There's Strachan's, for instance. I infer that he is a tall man with a limp (my dear Watson!); that he owes money to the painter and decorator; that he is enthusiastic and determined and prefers crystal reception; and that his family do not care for radio.

He owes money to his painter? Elementary! Look at his name—braw Scots! And consider that he couldn't borrow a ladder from old Paintpots because of that unpaid bill. Yes, his aerial is not half as high as that tree would permit. In fact, he stood precariously on a couple of chairs to fix it, and because he is tall he got it high enough to dodge his rose pergola, and then fell off. Hence the limp!

Then I observe that the lead-in, instead of diving into the sitting-room, soars up to the little room beside the second-floor bedroom. That means that he is the sole radio lover in the house, and that he intends to have it even if he has to have it solitary, poor bloke! He prefers crystal reception because his name is Strachan and his aerial is a twin-wire, oh, so many tens of feet long! Am I right?

An Artistic Enthusiast

Then there is Carlott's aerial. He must be artistic, fairly affluent, a nature lover, not a technical radio man, but a "listener" pure and simple; a weak character, easily swayed by every wind of doctrine; nervous, prudent. 'Cos why?

That Carlott is artistic is evident from the facts (*a*) he painted his insulators blue and green, and (*b*) he is so trustful in matters of science. His aerial is designed according to every rule ever published by the technical Press; it is at right angles to the power lines and sags according to Fleming's formula! Affluent he must be, because five men took three hours to erect the aerial; the insulators are most complicated, and have revolving fans to keep off the flies and other conductors.

He must be a nature lover or he would not have had those pro-pigeon corks strung on the wires. His aerial is far too formal to be owned by a radio man; that he is weak and swayable is proved by his miserable response to every popular cry—bare wire, then covered wire, corks, no corks; long insulators, short insulators; two wires, then one wire! He is nervous because he has a two-guinea lightning protector—and prudent because he got a P.O. inspector to measure his aerial.

A "Short-Waver"

Just beyond Carlott's I can see Groom's wire, a bit of a puzzler. From his habits I gathered that he had a short-wave complex, a deduction which was corroborated to a large extent by our maid's evidence. (She knows a boy who is keeping company with Groom's maid!) Seldom in bed before midnight; seldom in bed after 4 a.m.! Much given to algebraical talk at breakfast, mainly

GOOD "BAND-PASSING!"

"But, dear, couldn't Sir Henry Woods or that sweet Mr. Walpole Davis have it stopped?"

about "too ex ay dee or three something else." Yet what is he doing with an aerial that long?

Rosalind says that Alf says that Gladys says that Mrs. Groom says—by gum! what a lot of gossip!—that Mr. Groom says the band is too crowded.

Some Idea!

Mrs. Groom gets really worried about that unfortunate band. When he tells her, moreover, that he refers to an "amateur" band her indignation rises and she asks: "But, dear, couldn't Sir Henry Woods or that sweet Mr. Walpole Davis have it stopped?"

Now, talking of radio, I have observed that the frequency of—but I'm sorry! All the time and space have been used up, so I shan't have to write my article after all!

QUESTIONS ANSWERED

Anode Resistances

A. D. (Sutton).—"I am interested in resistance capacity coupling, my idea being to build a receiver to give the best possible reproduction: I understand that there are certain snags, such as loss of high notes, etc., if precautions are not taken to choose the correct values. Can you enlighten me please?"

The value of the anode resistances should be kept as low as possible consistent with adequate amplification. Anode resistances not exceeding 150,000 ohms are desirable in the case of two-stage amplifiers.

If a little amplification can be sacrificed it is beneficial to choose values such as 100,000 ohms for the first stage and 50,000 ohms for the following stage. You must bear in mind the fact that the overall magnification will be relatively small and from this standpoint it will not compare with a good transformer-coupled L.F. side. With anode resistances of low value nothing is gained by using high-impedance valves.

The coupling condensers should have values not less than ·01 mfd. or greater than ·1 mfd., and the grid resistances may have a value of 0·5-1 megohm.

H.F. Choke Coupling

B. A. (Banstead).—"I am interested in the various systems of H.F. amplification and I am puzzled to know whether a choke-coupled stage is really worth while. What are the merits of this form of H.F. magnification?"

The chief advantage of choke coupling is simplicity. Since the stage is untuned a tuning condenser is unnecessary and in consequence only one tuning dial (viz., the aerial condenser) is needed. A tuned H.F. stage, of course, requires an additional tuning condenser. It is quite true that the magnification obtainable from a choke-coupled stage is not comparable with the amplification which a tuned H.F. stage gives, but many listeners are quite prepared to forgo a certain amount of "punch" in order to get simplicity in construction and stability of operation. These remarks do not apply to a "parallel-feed" H.F. stage having a tuned grid circuit.

High or Low Ratio?

L. M. (Coventry).—"Why is it that in most of the sets published in MODERN WIRELESS the L.F. transformers specified are usually of the low-ratio type? Wouldn't it be possible to obtain greater amplification by using high-ratio instruments?"

The reasons are twofold. First, a low-ratio instrument normally employs a primary winding of higher inductance than the high-ratio type. Thus the response curve is superior, particularly on the low notes. There are certain difficulties in manufacturing high ratio transformers having very high primary inductance values, one of which is the possibility of high-note loss due to the distributed capacity of the secondary. Secondly, a two-stage L.F. amplifier having *two* high-ratio transformers is prone to become unstable unless particular care is taken to de-couple each valve and to make sure that the H.T. supply is above suspicion. Moreover, with such enormous amplification available the L.F. valves would be easily overloaded. So for most purposes it is advisable to use low-ratio instruments. When it is desired to get the greatest possible magnification from a single stage then it is permissible to incorporate a high-ratio instrument and a Pentode output.

Valve Overloading

G. M. L. (Sydenham).—"I have recently installed a three-valve set and a cone loud speaker. The results are highly satisfactory except on very loud passages, when I often detect "dithering" sounds. I find that this distortion spoils certain items such as the top notes of a soprano. Do you think the speaker is faulty?"

No, G. M. L., it is very unlikely that the cone speaker is the cause of the trouble, unless there is something loose in the unit or a bad mechanical joint between the apex of the cone and the "driving rod" of the cone unit. Most probably your output valve is being overloaded on the loud passages. You can remedy this by (1) Decreasing the volume; (2) substituting a more suitable valve for your present one, e.g. if you are using a valve of the small power type try a super-power valve in its place; (3) increasing the H.T. voltage and also the grid bias on your output valve. You must be careful here not to use more H.T. than the makers recommend. The use of a milliam meter to show distortion would be helpful in the anode circuit of the last valve.

By H. REES.

This article tells you how to modify an "on and off" switch to prevent valve burn-outs through accidental H.T. shorts, and includes other items of interest for practical amateurs.

By means of the very simple device indicated in Fig. 1 (a) an ordinary "push-pull" filament switch can be made an effective safeguard against valve disasters due to accidental doses of H.T.

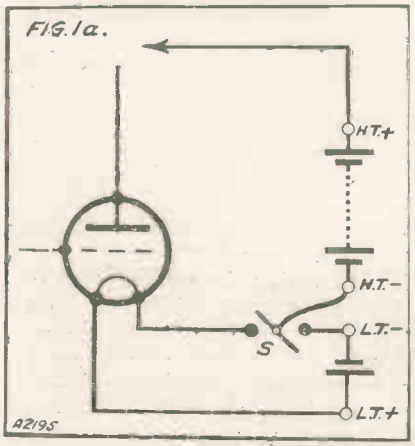
This consists in adding a third connection to the switch by soldering a piece of flex to the dolly and coupling H.T. to this, instead of using the usual loop between H.T.— and L.T.—.

Safety First!

This third connection is familiar to readers who have used these switches for wave-changing in connection with some "M.W." circuits, and it will be seen that its purpose here is to disconnect entirely H.T.— when the switch is off.

It might appear at first that the ordinary connection in Fig. 1 (b) accomplishes this, since there is no apparent circuit to H.T.— when S is off. A little consideration will show that the low-tension accumulator forms an excellent low-resistance loop back to the H.T. battery, so that a switch connected in the conventional manner is actually no protection whatever against H.T. shorts, and, in fact, often leads to a sense of false security.

SAVE YOUR VALVES!



It is well worth the little time required to make this L.T. switch change, as it may save you a valve renewal.

Cold Comfort!

Coming back to Fig. 1 (a), it is now obvious that there is no possibility of an H.T. short via the filament circuit when S is off. With S "on," however, there is a possibility of a dead short in the event of the connections being tampered with, *but not through the valve filaments.*

The explanation of this seeming paradox is that the accumulator forms an extremely low resistance path across the filaments, so that all the short-circuit current is practically diverted from the latter. Remember, therefore, when using an ordinary switch, that it is impossible to blow valves when the switch is "on," although you might have a dead H.T. short.

Better still, modify your switch connections to Fig. 1 (a); the change is extremely simple and well worth the small trouble.

Dirty Contacts

When a current of one ampere flows through a resistance of one ohm, there will be a *loss* of one volt in sending the current through the resistance. If the current were 0·5 ampere, the volt loss in the same resistance would be 0·5 volt, and so on.

Now, this latter current approximates to the filament current of an ordinary three-valver, and since the resistance of a dirty or corroded terminal may easily amount to more than one ohm, it is evident what we are driving at. A drop of $\frac{1}{2}$ a volt or so between the accumulator and set can lead to a host of troubles.

The moral of keeping clean terminals is, therefore, pretty obvious, and when reception becomes debilitated and reaction floppy and squakey, don't forget the ohmic effects of a little dirt.

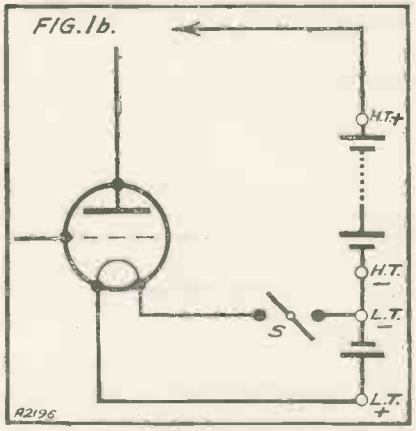
Anode Resistances

When deciding upon the value of an anode wire-wound resistance for a given purpose there are two points to bear in mind: (1) the actual value of the resistance; and (2) the maximum current it will have to carry.

Manufacturers frequently state the rating in milliamps., and where this is so the matter is perfectly straightforward. Quite as frequently, however, the rating is given in watts, and for the sake of interested readers it is proposed to show how to deduce from this the maximum current.

Now, watts are equal to the product of volts and amperes, i.e. watts = volts × amperes. The volts in this case will be the volts dropped in the resistance. For example, suppose it is desired to work a detector stage at 50 volts from a 120-volt H.T. tapping.

THE USUAL WAY

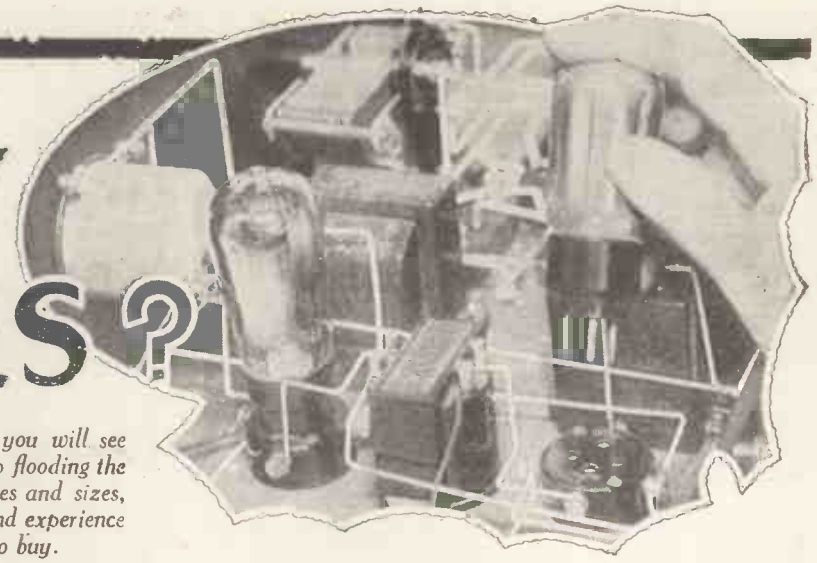


This is the method of switching off generally adopted. It has the disadvantage that an accidental short may damage a valve.

The volts to be dropped are obviously 70, and if the current is 2 milliamps. (or ·002 ampere) the value of the resistance must be 35,000 ohms.

If a resistance of this value were rated by the manufacturers at, say, 5 watts, its maximum current-carrying capacity with 70 volts across it can easily be found by transposing the terms of the above equation. Thus amps. = watts/volts or milliamps. = (watts/volts) × 1,000. In our case this would be (5/70) × 1,000 = 71 milliamps. Since the actual current is only 2 milliamps., the working current would only be about $\frac{1}{35}$th of its maximum permissible value.

TOO MANY VALVES?



Look at any general wireless catalogue and you will see valves listed by the score. Manufacturers keep flooding the market with their wares in all sorts of shapes and sizes, until listeners are apt to get rather bewildered and experience the greatest difficulty in deciding what to buy.

WE are on the eve of another radio exhibition and everybody is wondering what is awaiting us for the next season. Shall we see some startling new developments or will progress just be steady and orthodox? I am afraid that in this article I cannot give you an answer to this question except in the case of the valves, in which I must say the answer is "orthodox."

On Orthodox Lines

Quite a lot of new development in the way of valves has taken place, and not only are we promised better valves, but several new types have made their appearance. Foremost, of course, are the special new D.C. valves we have already mentioned in these pages, and which I understand will be altered in characteristics to a certain extent, and will have at least in one case a heater consumption of ·1 amp instead of the much higher figure. This, of course, is all to the good.

Several new H.F. valves have come out, and the Osram S.21 and S.22 are a couple of screened-grid valves of prominence. These two valves differ in characteristics and application and have been produced for two different classes of receiver.

A Pair of S.G.'s

The S.22 has a high value of mutual conductance and is useful for single-stage H.F. sets, while the S.21 is designed for multi-stage H.F. amplifiers. The mutual conductances are 1·75 and 1·1 respectively, both valves having an impedance of 200,000 ohms, the S.22 having an amplification factor of 350 and the S.21 220. Filament current in the S.22 is ·2 amp. and in the S.21 ·1 amp.

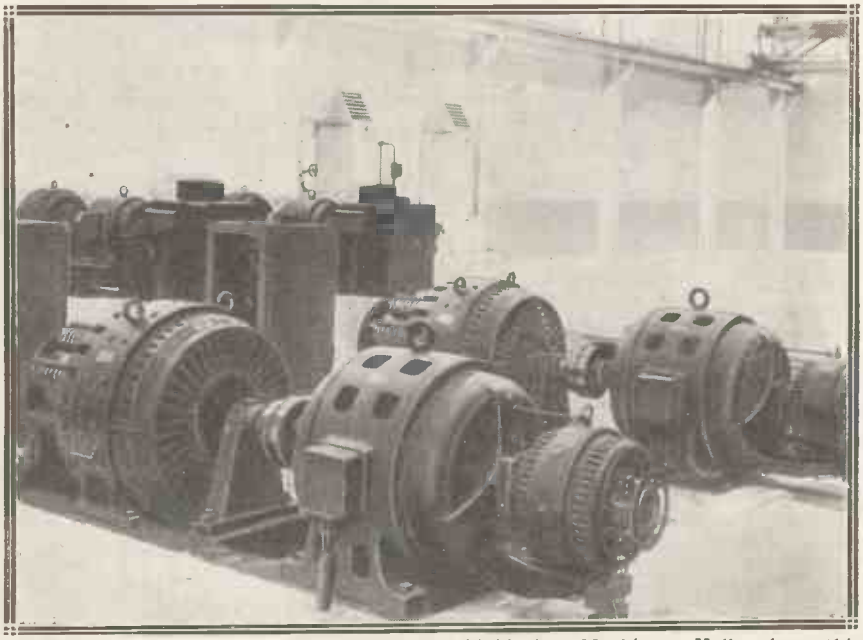
Apart from these there is a large range of valves coming along which will fit in between the various valves we have on the market. For instance, if we have got an H.L. valve having an impedance of 20,000 ohms, and the next valve in a certain range is an L valve having an impedance of 10,000 or 12,000 ohms, then a valve will be brought out having an impedance of about 16,000 ohms. If this is logically continued we shall have almost twice the number of valves we have at the moment, and the point immediately suggests itself—do we really want all these valves?

From the point of view of the expert it is very nice to be able to choose a valve which will *exactly* fit in any particular stage in any particular set, but from the point of view of the ordinary listener he is going to have a glorious time trying to decide which valve will suit him best.

Buying Replacements

In the case of the bought set he will naturally repeat the valves already in the set when he wants new ones, in the case of the home constructor he will go very largely by what is recommended in the article describing the set he has built. I say *very largely* because unfortunately constructors (and I suppose they cannot be blamed really!) will still wander away from the specification of the set they are building.

A TYPICALLY TEUTONIC TRANSMITTER



"Efficiency" is evidently the motto in the Mühlacker Machinery Hall, where this photograph was taken. It is here that all the power is generated for the tremendous transmitting valves used at this station.

Why Not Standard Markings for All Makes of Valves?

In the case of valves it must be very hard both financially and psychologically to have to, say, scrap a perfectly good H.L.210 detector because somebody describing a certain set has said you must use an H.2, which may be a better valve for that particular set.

Naturally, the man with a perfectly good H.L. 210 would use *that* valve, and he would get quite good results, but there are cases where to get the absolute utmost out of a receiver it is essential to use the valves recommended. In any case, it is advisable to use those valves mentioned by the designer of the set, for otherwise it can be very confusing for a man to have to choose between a 16,000-ohm valve, say, and a 20,000-ohm valve; or between a 10,000-ohm and 8,000-ohm valve if he has got a set having a couple of L.F. stages and he realises that a "good L.F. valve" must be used.

More Co-operation Needed

Having plenty of valves on the market enables one to choose what one requires, but the main crux of the matter lies in the fact that the valve manufacturers have not yet come to any particular system of naming their valves. The designation of valves on the British market is absolutely appalling, and this is where the main confusion is going to exist. For accurate indication only one firm on the market has yet placed, in my opinion, anything like a satisfactory system. That is the Eta valve.

Here the *figures*—though the lettering is sometimes a little bit puzzling—at any rate show the impedance and amplification factor. Those are the two things one wants to know about a valve. But take some of the other makes. Take, for instance, a certain type of mains valve.

Very Confusing

There is the 354V., the figures of which certainly denote a 4-volt filament, and 35 as amplification factor. The impedance apparently, according to the maker, does not matter. Against that valve there is another of different make called the A.C.-H.L. There is nothing to tell you that this valve is very similar in characteristics to the 354V.

LOS ANGELES LEADS THE WAY

The California Television Society recently conducted tests in Los Angeles with a new device which enables much clearer pictures to be transmitted. The invention is seen above undergoing a trial.

Then we have the M.H.L.4, which, though not of exactly the same characteristics, can be used instead of either of those already mentioned; and, continuing, we have another, the 41 M.H.L.4, which is another valve that can be used in place of either of the first three.

The characteristics of these four valves are not exactly the same admittedly, but to the normal listener they do the same job. They are H.L. valves; they will act as detector or L.F., and they should have the same designations. For instance, why not call the 354V. and the A.C.-H.L. the H.L.11-35? That would advertise the fact that it is an H.L. valve, its impedance is 11,000 ohms, and the amplification factor 35, so that everybody would know exactly where they were. As it is, they appear to be completely different valves, and though they are manufactured by completely different makers they are absolutely interchangeable.

Among the battery valves we are in just as bad a pickle. A little time ago we had R.C. valves, then we had H.L. valves, which had somewhere round 20,000 ohms impedance. Then H. type valves came along with impedances round about those of the old R.C. valves, and now the H. valve impedance, such as the H.2, seems to have come down somewhat, till really it is almost on a par with the H.L. As a matter of fact, this valve *should* be designated H.L. in my opinion.

Badly Classified

It is an excellent H.F. valve, it is a good L.F. valve, and it is also an excellent detector. But even if the H.2 valves were properly classified I suppose another valve manufacturer would come along, bring out a similar valve, and *he* would call it the A.B.210A., or something like that.

The present state of affairs forces one to the conclusion that although to have more valves is a good thing from the expert's point of view, it is going to be very puzzling to the ordinary person, and unless the valve manufacturers can come to some agreement over the designations of their valves it would be far better to stay as we were rather than to produce a whole lot more which have confounding and confusing nomenclature.

I like the idea of the R.C., H., H.D., H.L., L., P., S.P. quite well, and this, coupled with some figure which will give impedance and amplification factor, should be about the surest means of specifying valves that can be devised, and I should like to put it as I have put it before to the valve manufacturers, very strongly indeed, that it is high time some such arrangement was come to.

A Good Scheme

It only requires a couple of manufacturers to start the idea, and it would soon catch on. The public ought to know what they are buying; they should not have to go blindly for one make simply because they have always used that particular valve and it is the only valve of which they know the name.

There is a new season coming along, and it would be a fine thing if the B.V.M.A. would get down to it and once and for all end the chaos which has existed in the valve world ever since broadcasting began.

MAKE A GOOD JOB

of these two new sets by building with a

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2 Wavemaster ·0005-mfd. Extenser condensers	1 11 0
1 ReadiRad ·00015-mfd. differential reaction condenser	5 0
1 Sovereign ·001-mfd. pre-set condenser	1 6
1 ReadiRad ·0003-mfd. fixed condenser	10
1 T.C.C. ·0001-mfd. fixed condenser, type "M"	1 0
1 T.C.C. ·001-mfd. fixed condenser	1 10
1 T.C.C. ·01-mfd. fixed condenser, type "M"	2 3
1 T.C.C. 1-mfd. fixed condenser	2 10
8 T.C.C. 2-mfd. fixed condensers	1 10 8
3 T.C.C. 4-mfd. fixed condensers	1 5 6
1 Colvern 50,000-ohm variable potentiometer	5 6
2 ReadiRad 25,000-ohm Spaghetti resistances	3 0
1 ReadiRad 15,000-ohm Spaghetti resistance	1 3
2 ReadiRad 10,000-ohm Spaghetti resistances	2 0
1 1,000-ohm Spaghetti type resistance	9
1 600-ohm Spaghetti type resistance	9
1 300-ohm Spaghetti type resistance	9
1 ReadiRad 400-ohm baseboard mounting potentiometer	2 9
1 ReadiRad 2-megohm grid leak and holder	1 4
1 Graham-Farish 100,000-ohm resistance	1 6
2 ReadiRad quoit coils, wound to specification	5 0
1 ReadiRad PJ.2 coil	3 0
1 ReadiRad PJ.3 coil	3 6
1 W.B. Horizontal 5-pin type valve holder	1 3
2 Clix 5-pin valve holders	2 0
2 H.F. chokes, Lewcos and ReadiRad "Hilo"	12 3
2 R.I. Hypercore smoothing chokes	1 15 0
1 R.I. general purpose output choke	12 6
1 R.I. Hypermite L.F. transformer	12 6
1 Heayberd mains all-power transformer, type W.31	1 5 0
1 Bulgin 2-pole toggle switch, type S.80	1 9
1 Bulgin 4-pole toggle switch, type S.81	2 0
1 Westinghouse metal rectifier, type HT.8	1 1 0
1 Plywood partition, 18" × 7½"	1 0
1 Bulgin panel, light type D.9	2 6
1 Aluminium screen, 7½" × 5½", and foil to specification	3 6
3 Junit terminal blocks	2 0
6 Belling-Lee "B" type terminals	3 0
2 Crocodile clips	3
1 Pair ReadiRad panel brackets	10
1 Bulgin mains plug and socket, type P.12	3 9
2 Packets Jiffilinx for wiring	5 0
3 Valves to specification: A.C. S.G., A.C. H.L., A.C./Pen.	3 2 6
Flex, twin-braided copper-covered flex, screws, plug adaptor, etc.	1 5
	£18 15 6

KIT "A," £14:8:0, or 12 monthly instalments of £1:6:6.

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1 R.I. oscillator coil	12 6
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1 Telsen 5-pin valve holder	8
1 R.I. Hypermite transformer	12 6
1 T.C.C. ·001-mfd. fixed condenser	1 10
1 Telsen ·001-mfd. fixed condenser	6
1 Telsen ·002-mfd fixed condenser	6
1 T.C.C. ·0002-mfd. fixed condenser, type "M"	1 0
1 T.C.C. ·1-mfd. fixed condenser	1 10
1 T.C.C. ·01-mfd. fixed condenser	3 0
1 T.C.C. ·0005-mfd. fixed condenser	1 6
4 T.C.C. 1-mfd. fixed condensers	11 4
2 T.C.C. 2-mfd. fixed condensers	7 8
1 600-ohm Spaghetti type resistance	9
2 ReadiRad 600-ohm resistances and holders	5 0
1 50,000-ohm Spaghetti type resistance	1 6
2 25,000-ohm Spaghetti resistances	3 0
1 100,000-ohm Spaghetti resistance	1 6
1 Colvern 50,000-ohm potentiometer	5 6
1 ReadiRad 400-ohm baseboard mounting potentiometer	2 9
1 Loewe 2-megohm grid leak, with fixing wires	1 6
1 ReadiRad "Hilo" H.F. choke	4 6
1 R.I. general purpose output choke	12 6
1 ReadiRad 3-point on-off switch	1 6
1 ReadiRad on-off switch	10
1 Terminal strip, .18" × 2" × 3/16", drilled to specification	1 6
10 Belling-Lee type "R" terminals	2 6
2 Grid bias plugs	4
2 S.G. cells	2 0
1 ReadiRad dual-range frame aerial	1 0 0
1 Packet of Jiffilinx for wiring	2 6
5 Valves to specification: 2 S.G., 1 H.L., 1 L.F., 1 Pentode	3 17 0
Flex, screws, and 1 coil Glazite	1 0
	£14 2 6

KIT "A" (less valves and cabinet), £8:15:6, or 12 monthly instalments of 16/3.

KIT "B" (with valves, less cabinet), £12:12:6, or 12 monthly instalments of £1:3:6.

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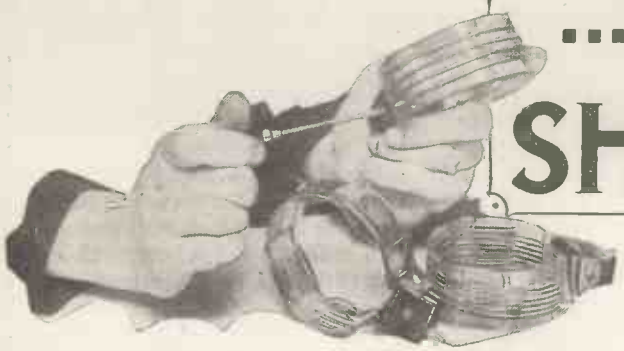
EASY PAYMENT ORDER. Please despatch my Easy Payment Order for the goods specified, for which I enclose first deposit of £_____ *Kit required*.....



... ON THE ... SHORT WAVES

By W.L.S.

Some practical pointers regarding the assembly of special short-wave receivers.

I NEARLY decided to call this article "Laying Out a Short-Waver," but it sounded rather like a description of violence being done to myself or to a kindred spirit! That, however, is the subject of my notes this month, and I should not like to think that its importance was being under-estimated.

It *is* the actual layout that makes or mars a short-wave receiver. Perhaps, at first sight, it is not easy to understand why this should be so. After all, every broadcast receiver seems to work, whether you have the coils at one end of the set or the other. Why should a short-wave set be so very critical? This is a question that I am frequently asked, and, in the belief that it is puzzling to many, I am now for the first time answering it in public.

Only a Few Turns

The first and most obvious of all the reasons is this. To tune to the short wave-lengths we require what appears to be a ridiculously small coil. Its inductance is but a tiny fraction of that of a coil suitable, say, for 300 metres. This being so, a given amount of "outside inductance" will have a huge effect upon the tuning compared with its effect upon the longer wave-lengths.

Think now of what "outside inductance" consists. A straight piece of wire, to commence with, has quite a measurable inductance, even if its length is but a matter of inches. To take the extreme case, in a set designed to tune to about 1 metre, the wire joining the coil to the tuning condenser might easily have half the inductance of the coil itself! And it is all included in the tuned circuit.

Useless Wire

Even in a badly designed set for 20 or 30 metres we can often trace leads between coil and condenser that run to eight or nine inches in length.

Here, then, is the first and foremost point, dictated not by science, but by common sense. Put your coil as near as possible to the condenser that is to tune it. Now, however, science steps in and says: "Yes, but not *too* near, or you will get your large metal condenser right in the field of the coil." And science is quite right.

A Point to Watch

If your coil has a large field its efficiency will be reduced quite noticeably by introducing large masses of scrap metal into it! Luckily, however, the fashion for short-wave coils is to keep the diameter fairly small, and this problem does not become too serious. Generally speaking, if you keep the edge of the coil about an inch away from the condenser you will not run into trouble.

Apart from the question of sheer position, do take the leads from the coil directly to the condenser, and not by way of valve holders, switches, terminals, and the like. Remember, first of all, that you have got to make a tuned circuit. Make it, and then join on your valve grid and filament, and any of the other trimmings afterwards!

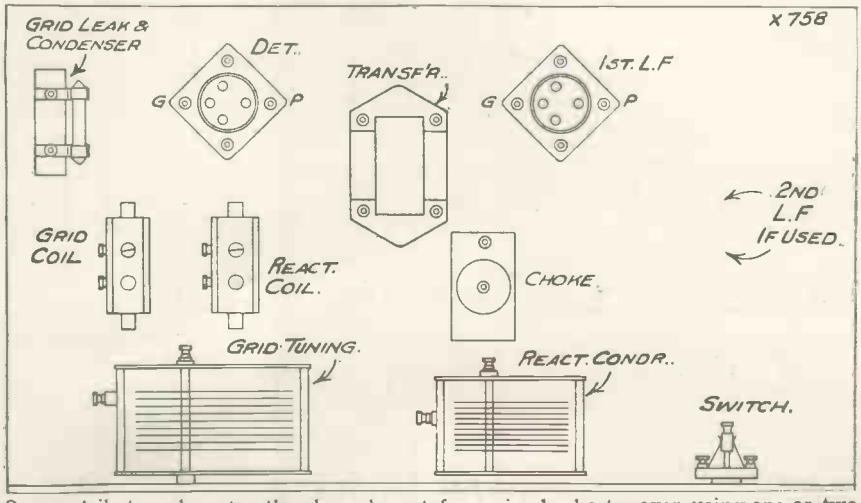
I mention this in detail because I have seen so many sets in which the lead from the bottom of the coil is taken, for instance, to the filament terminal of the valve holder, while the corresponding side of the variable condenser, instead of going straight to the coil, has to worm its way round metal panels, and half the circumference of the set before it finds its mate. How such a set ever works at all puzzles me greatly.

Aim at Short Leads

On these lines I have sketched a suggested layout for a set consisting of a detector and either one or two L.F. stages. You will note, referring to Fig. 1, that the grid condenser and leak are just where they should be—between the grid terminal of the valve holder and the grid coil. The latter is close to its condenser; the reaction coil is reasonably near to the reaction condenser, and this latter, in turn, is up against the H.F. choke and the L.F. transformer. Finally, the transformer itself is just right for coupling to the next valve.

If you have a set of this type, built to no matter what design, and it does not satisfy you, just convert it to a layout on these lines, and I shall be very surprised if your results are

PLACING THE PARTS FOR BETTER RESULTS



Our contributor advocates the above layout for a simple short-waver using one or two L.F. amplifying valves.

Make Your Own Coils for Plugging into Valve Holders

not far better than before. Unless, of course, the previous layout was better than mine, which is quite possible!

For sets using a screened-grid stage prior to the detector a different type of layout is advisable. Personally, I believe in tuning such a stage, and in this case the use of a two-gang condenser with a drum drive gives a very neat arrangement. As will be seen from the diagram, Fig. 2, the S.G. and detector portion of the set is arranged along the front panel, while the L.F. amplifier doubles back along the rear of the set.

S.G. Screening

It is usual to provide a screen between these two sections, but not absolutely necessary. In this case reaction can be controlled either by a small variable condenser at the right-hand end of the front panel, or by a resistance in the same position, wired in series with the H.T. supply to the detector. In either case the layout is quite neat and does not necessitate long wires.

Naturally it is always desirable in these days to house a short-wave set in a metal box, and this has been assumed, definitely, in the second case. If this is not done, however, with the first receiver, quite a sound scheme is to use a false panel some three inches in front of the panel carrying the condensers, and to extend the spindles by means of ebonite tubes.

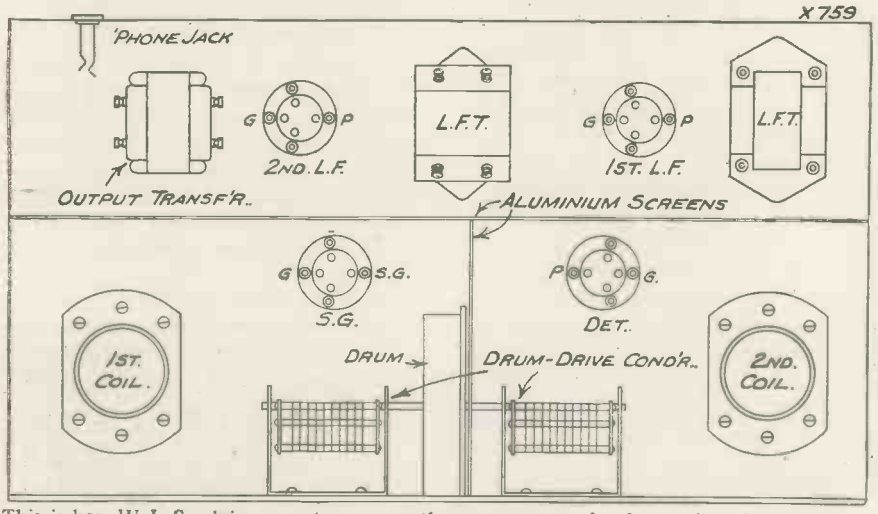
Into the ends of these tubes are screwed metal shafts the same size as the condenser spindles, and the dials are mounted on these shafts.

Coil Construction

This can be relied upon to give freedom from hand-capacity troubles, but seems rather a complicated proceeding when the metal-box method is almost infallible.

Now for a few words on the coils themselves. Probably the majority of enthusiastic short-wave listeners prefer to make their own. In this case I am strongly in favour of small-diameter vertical coils, plugging into ordinary valve holders. A good scheme, by the way, is to obtain some American type valve holders and bases, so that if, in a fit of aberration, you try to plug the valves into the coil holders you will not do any damage!

SUGGESTED LAYOUT FOR AN S.G. SET



This is how W. L. S. advises you to arrange the components of a four-valve short-waver, using an S.G. H.F. valve.

The familiar octagonal ribbed tubing is suitable, the usual diameter being between 1½ and 2 inches. This type of coil can be placed quite close to the edge of the metal box or to other metal parts without causing the trouble previously mentioned. Naturally, from its shape, one can see that its field is confined to quite a small space.

Coming down to generalities in connection with laying out a set, I always believe in "playing shops" with the loose components and the baseboard for quite a long time before coming to a decision. When one considers that layout may mean such a lot in the future performance of the set; that it is perfectly free—and is the only part of the set that is!—and that the usual amount of common-sense is all that is required, it seems such a pity not to make the best of it. If only one would take the trouble *every time* to evolve the best possible arrangement there would be no more of these horrible contraptions looking like Clapham Junction, with "rails" running criss-cross in all directions.

Your Own Reward

There are times when I feel like offering a prize for the short-wave set with the smallest amount of wire expended on it. But I reflect that the designer already has his reward, in the shape of the superior results that cannot fail to be his.

Now, having written these sage words, I am proceeding to wreck my own set with the idea of seeing how much wire I can free for other purposes.

AN "INTER-AXIAL" TIP

Try the modification suggested by this enthusiastic "M.W." reader.

Sir,—I constructed the "M.W." "Inter-Axial" Senior Cone speaker as soon as it appeared in your February issue, and can thoroughly endorse all you claim for it, and is well worth anyone's while to construct it.

Some of your readers may appreciate one small hint, it is this: The 66R Blue Spot unit is heavy and, if mounted as you describe, will in time sag, with the result that the cone will touch the chassis at the top, causing a "burr," which has been my experience.

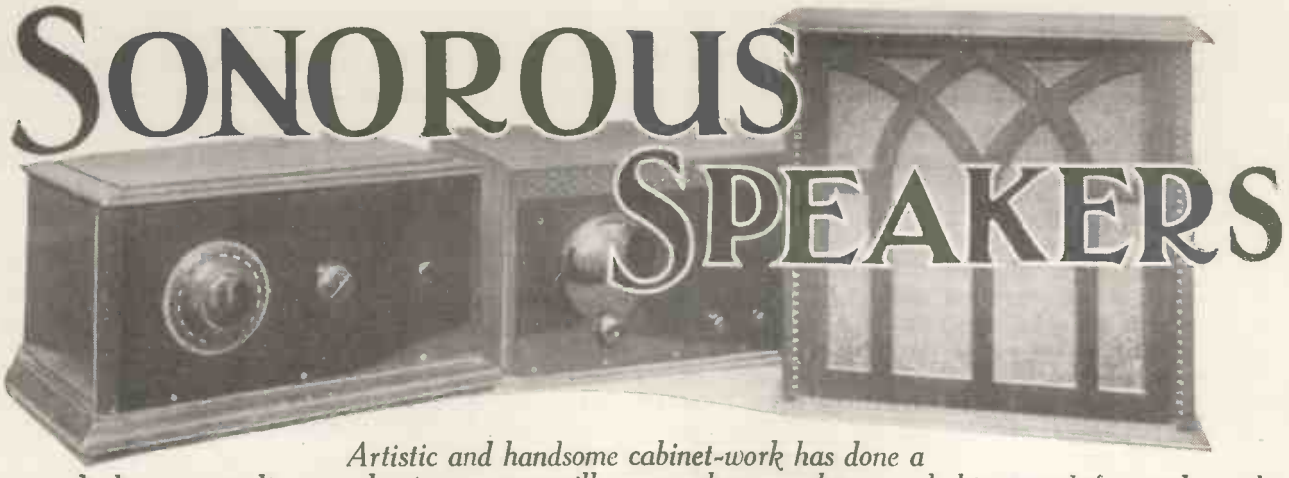
I suggest, to obviate this, an auxiliary support under the lower horizontal unit support.

Yours truly,

E. PRIOR.

Ealing, W.5.

SONOROUS SPEAKERS



Artistic and handsome cabinet-work has done a great deal to ruin radio reproduction, as you will agree when you have read this straightforward article.

By FREDERICK LEWIS.

BOOM, boom, boom, boom! The noise ceased, and a deep bass voice somewhat breathily announced: "You have been lizdening do Jack Bayne an' His Boyz blaying My Ganary haz Zirgles Under Hiz Eyez."

I was listening to a friend's receiver which he had just built and of

A POPULAR CONE TYPE

A cone loud speaker having good characteristics.

which he was terribly proud. "Wonderful bass, isn't it?" he inquired. "You have got plenty of it," I admitted. "Yes, I think it's great," he rejoined.

And there I let the matter rest. What's the use of arguing? He had been searching for this bass for months.

A Real "Floor Shaker"

He had started off with an ordinary small moving-coil speaker, then got a larger one, then put it in a tremendous box, stuck it in a corner of the room, and altered the set until he had got two huge output valves in push-pull. Finally he invited me to comment on the result.

I had to agree with him when he said that the bass shook the floor. It certainly did. But what a travesty of musical reproduction! And yet there was nothing the matter with the set.

The circuit was perfectly standard, and would have given very fine balance indeed if he allowed it to. But unfortunately he had a moving-coil speaker which was probably the most boomy of all on the market, and not content with that he had boxed it well in, shoved it up in a corner of the room, standing on the floor, with the result I have indicated.

The question of loud speakers will always be a difficult one, and will always necessarily be a matter for one's own personal taste. Some like a lot of bass, some prefer more treble, and some, only a few it appears, require the perfect balance.

The Bass "Bogey"!

Probably the hunt for bass has led more people up the garden than anything else in radio. Owing to the ordinary physical limits of the average living-room, somewhat false means of getting bass reproduction from loud speakers has had to be devised.

For instance, we have found out that if we put a moving-coil speaker into a box having sides with an area of only about 2-ft. by 2-ft., we get quite a good bass response, better (apparently) than if we had an ordinary 2-ft. square baffle. But this bass is due mainly to resonance, and is not pure bass at all. And it is this resonant bass which causes quite a lot of misconception about the real results that can be obtained from radio, and is liable to give people a completely false impression as to the powers of their sets.

Many cone loud speakers, especially those in cabinets, are very resonant down the bass end of the response curve, and the consequence is that speech and definition of radio reproduction suffers very badly indeed.

Try It Yourself

A good free-edge cone with a baffle, well placed in a room, is capable of giving remarkably pure reproduction and good balance; and I should like to emphasise this matter of balance, because I feel that it is one of the most important things in radio and gramophone reproduction.

DON'T BOX IT!

A straight baffle with a moving coil reproducer is highly desirable.

People will say: "Oh, my loud speaker will not go down very low." It is a pity, but if it also does not

The Larger the Baffle the Better the Bass

go up very high, then the "balance" can still be quite good and the result be quite pleasing.

If your speaker goes up very "high" and does not go very "low," then you will get shrill reproduction and vice versa; if it goes very low and does not go high it will be boomy and unnatural. That is what was happening to the speaker mentioned at the beginning of the article. It was giving a preponderance of bass.

Those Cabinets!

This was because it was boxed in. If that speaker (apart from the fact that its initial design was against it) had been placed on an ordinary straight baffle it would have been far better from a reproduction point of view.

The baffle plays a very big point in speakers. Not only the size and shape of the baffle, but also the position of the speaker in the room and the walls of the room in respect to the baffle. For instance, this speaker already mentioned was placed on the floor.

This gives rise to what is known as floor resonance, and can be a very real factor in spoiling reproduction on the loud speaker. The best results are obtained when the speaker is about 5 ft. from the ground, and if you cannot place it directly *in* a wall so that the back of the speaker protrudes into one room and the baffle in the other, or in a door, then the best thing is to have it in a corner of the room, as a rule facing diagonally down the length of the room.

Here are Some Tips

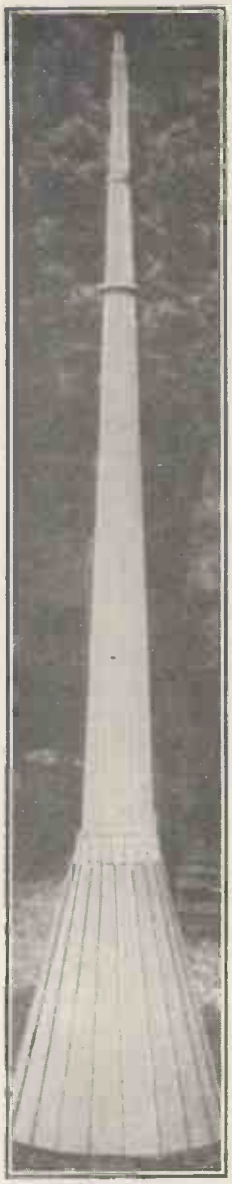
If, on the other hand, the speaker cannot be placed in a corner of the room and must be placed well into the room or well away from walls, get it as large a baffle as you can and continue the baffle backwards on three sides, omitting either the top or the bottom. It is usually best not to continue it backwards farther than the distance of the speaker's own pot, and it should certainly not be continued on all four sides, otherwise box resonance is going to occur even if you have very thick wood. The back must not be closed in.

The position of the speaker in the room is a very vital factor, and one finds the greatest differences in reproduction due to variation in position. You must, however, take into account the usual position occupied by the listener when listening to the speaker.

A Troublesome Effect

"Standing waves" are very prone to give trouble in an ordinary room owing to the confined space, and you must try and arrange the speaker so that you do not get standing waves badly at the particular point at which the listeners will usually sit when they are hearing the broadcast programme.

SOME LOUD SPEAKER



Not quite suitable for indoor use — a logarithmic type horn for outside demonstrations.

I find the best position is in the corner of the room with a baffle about 2 ft. 6 in. square fitting into the corner, closed partially at the top and completely open at the bottom facing down the length of the room — at a somewhat cock-eyed angle.

Take Care

This prevents standing waves in the particular position we occupy in the room.

But whatever you do with your speaker do not put it into a room in such a position that reflected waves will come back on to it and cause distortion. Do not put it into the wireless cabinet if you can possibly help it, because it is bound to be boxed up there, and will probably be too near the floor; and do not completely enclose it.

The straight baffle for moving-coil speakers is, of course, very necessary if resonance trouble is not to be introduced; and unless you have a fair-sized baffle, the long waves set up at the back of the cone will upset the waves from the front with the result that they will cancel out.

Unfortunately for good reproduction of low notes (and this does not affect the reproduction of the high notes), the larger the baffle the better.

Obtaining a Balance

But it is here that one must use one's own judgment.

If the loud speaker is a good one and "goes well up" the musical scale, then you can afford (if the appearance does not make it undesirable) a really large baffle. If your loud speaker is of the boomy sort, however, and does not go up very high, then it is advisable not to have a large baffle, owing to the fact that you will get the bass notes predominating.

If your set and loud speaker very largely cut out the high notes, then it is very inadvisable to aim at reproduction of low bass notes, for here again a preponderance of bass will result.

But assuming the speaker does "go up" well, here are a few figures to go on in the construction of your baffle. If you want to reproduce notes as low as 100 cycles you must be prepared to have a baffle at least 32 in. square.

Similarly, for 30 cycles you want 110 inches of baffle; that is, just over 9 ft. square.

This, of course, is far too large for the ordinary living-room, and as a matter of fact a 32-in. baffle is about as large as most people can stand in the ordinary house.

The Lower Limit

This will give you pure notes as low as 100 cycles, but, of course, enables the harmonics of lower notes to be reproduced at good strength. These will probably meet together and form quite a good representation of low notes, so that although your baffle may prevent you from adequately *reproducing direct* anything lower than 100 cycles, you should be getting lower notes than 100 cycles, due to this beat effect of the first and second harmonics. Frequencies down to 50 will be well catered for in this way.

AIR ROUTE RADIO

How to follow the flying.

By F.N.GANDON

HALLO, Imperial G—E B L F, Croydon calling! Understand you are leaving Folkestone for Paris-Plage at 2,000 feet. Is that correct? Over."

How many times, when searching on the long waves, have you heard similar words to these?

Then, the conversation ended, you pass on to some foreign broadcasting station, little dreaming that here, on 900 metres, lies one of the most interesting wave-lengths to be found.

On 900 Metres

When passing certain landmarks the pilots of air liners are compelled by regulations to report their positions, thus enabling the Traffic Controllers down below to check the progress of each 'plane.

These definitely timed communications suggested a novel and interesting "wireless game"—namely, to follow the 'planes with the aid of wireless and a map, and to estimate the speed and time of arrival.

This pastime has been practised by the writer as an alternative to broadcasting for several years, and has increased rather than diminished in interest, even to the extent of building a special 900-metre receiver. It is rather like fishing—"you never know what is going to turn up."

A Useful Map

Imperial Airways publish an excellent map of the air routes (price 6d.), and this should be obtained and fixed to a piece of three-ply wood. A few pins, a watch, and a small log-book complete the outfit.

Tuning to 900 metres, it will not be long before Croydon is heard answering a 'plane. For the sake of argument the gist of the message may be that Imperial G—E B L F is leaving the French coast at Boulogne and making for Folkestone.

These items should be entered in the log-book, together with the time. About twenty minutes later another message, repeated by the Croydon operator, will inform us that G—E B L F is just passing Folkestone.

Tracking the 'Planes

Having made the necessary entries in the log-book, we are now in a position to work out its speed. Knowing the time taken to pass between two measurable points on the map a simple calculation gives the approximate speed, and, assuming this to be constant for the rest of the journey, we can forecast the time of arrival at Croydon.

This, in turn, may be checked by the last call of the pilot as he winds in his aerial preparatory to landing. The accuracy of these forecasts is often very near the mark, and when, as frequently happens, there are three or four 'planes on the map at one time, it is quite a job to keep ahead of them.

When leaving Croydon for the Continent, the procedure adopted by the pilots is always the same. As soon as the 'plane is clear of the aerodrome the aerial is lowered and a test call put through to the Traffic Controller.

Reporting Position

It consists of the identification numbers, the destination, and the position of the 'plane when calling. This first call is always made over the Biggin Hill and Sevenoaks district. A typical example being as follows:

"Hallo, Croydon, Imperial G—calling. Am passing Biggin Hill and bound for Paris. Are you receiving me O.K.? Over."

"Over" signifies that the pilot is changing from transmitting to receiving on his wireless set. The reply from Croydon would be: "Hallo, Imperial! Croydon answering. Understand you are passing Biggin Hill and bound for Paris. Am receiving you O.K. Bon voyage. Switching off."

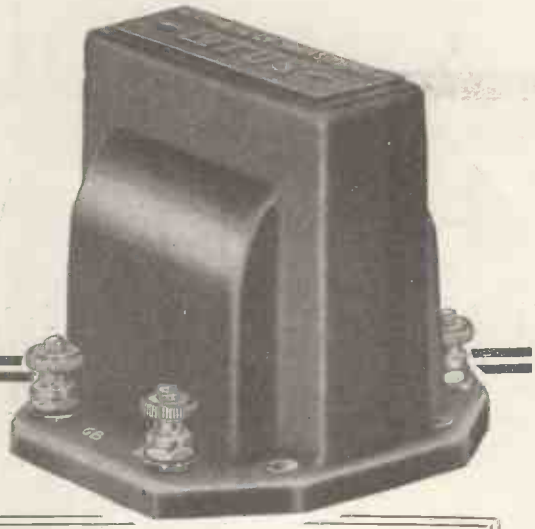
These routine calls are made at specified points throughout the whole journey: at the English coast, the French coast, and when passing the various aerodromes scattered along the Continental routes. The 'planes leave the English coast at either Dover, Folkestone, Dungeness, Dymchurch, or Hythe, and when reporting this fact they invariably give the height at which they are flying.

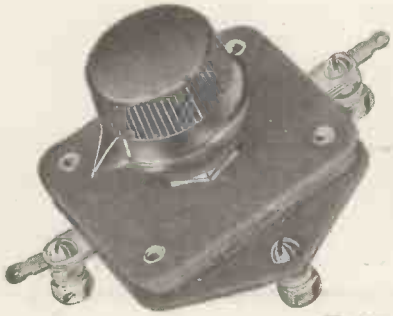
(*Continued on page* 288.)

A SUGGESTION FOR SATURDAY AFTERNOONS

In fine weather tea is served on the roof of the hotel, and you can watch the air liners arrive and depart as a preliminary to going home and, by means of radio, follow their journeyings.

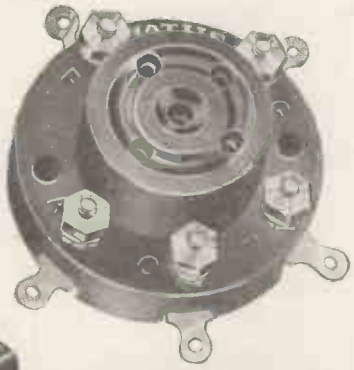
DONT EXPERIMENT -USE LOTUS COMPONENTS



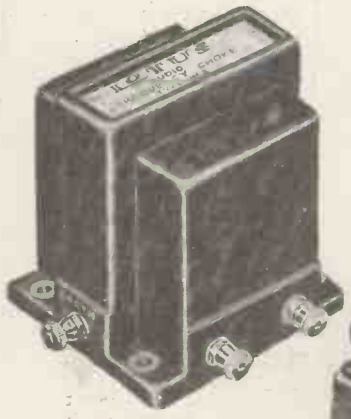


MINIATURE DIFFERENTIAL CONDENSER.
A small but highly efficient condenser with brass vanes interleaved with bakelite and flexibly mounted to ensure accuracy. '00015 and '00035 m.F. 3/- each.

THE NEW LOTUS L.F. TRANSFORMER No. 1.
An inexpensive instrument for the home constructor. It is remarkably efficient and has an excellent straight-line amplification curve. Ratio 3-1. **5/6**

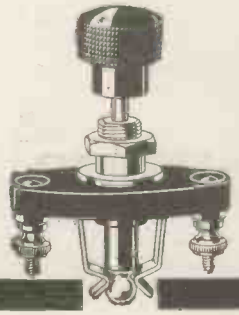


RIGID VALVE HOLDERS.
For 4- and 5-Pin Valves. Highly finished bakelite mouldings with specially heavy sockets.
With Terminals 10d.
Without ,, 9d.



AUDIO FREQUENCY CHOKE.
No. 2. Ample core and generous windings ensure high inductance and low resistance. In bakelite case with earth terminal. 12/6

RADIO FREQUENCY CHOKE.
Combining high inductance and low self-capacity, specially designed for 150–2,000 metre wave-band. Flexible connection for S.G. Valve Anode. 2/6



BATTERY SWITCH.
A neat and efficient push-pull switch fitted with both terminals and soldering tags. 1/6

THIS TRANSFORMER AND OTHER COMPONENTS ARE SPECIFIED FOR THE "EXTENSER POWER" SET AND THE "SUPER" FIVE

described in this number

The designers of the highly efficient radio receivers of to-day know that Lotus Components are absolutely reliable and will give the fine results they themselves have achieved.

That is why they use and specify LOTUS in their designs.

Far too many sets are working inefficiently through the substitution of other makes of components for those recommended. When you build the "Extenser Power" Set be sure to ask your dealer for 1 new Lotus L.F. Transformer No. 1 ; 1 Lotus Miniature Differential Condenser ; 2 Lotus 5-Pin Valve Holders ; 1 Lotus Smoothing Choke No. 1 ; and 1 Lotus Output Choke No. 2.

The "Super" Five calls for 5 Lotus Valve Holders ; 1 New Lotus L.F. Transformer No. 1 ; 1 Lotus H.F. Choke ; 1 Lotus Output Choke No. 2, and 1 Lotus Battery Switch.

Ask your dealer or write to-day for a fully illustrated list of Lotus Components.

LOTUS

LOTUS RADIO LTD., MILL LANE, LIVERPOOL

STABILISING S.G's

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

In neutralised S.G. receivers it is often difficult to obtain a proper balance unless very complete screening is employed. Our contributor here recounts his own enlightening experiences with such a set.

I HAVE recently had occasion to make up several experimental receivers of the neutralised S.G. type in which it was extremely difficult to incorporate complete screening, and the resulting difficulty in getting a proper balance to hold over the whole wave-band covered by the coil was by no means easy to overcome.

Layout Employed

A number of different circuits and circuit arrangements had to be tried, and different values for the various parts of the balancing circuit were experimented with before the cure for the trouble was finally found.

The circuits eventually arrived at seemed so opposed to what might be expected to work from a theoretical point of view that they should be of the greatest interest to those who have taken up the " neuted " S.G. valve for H.F. amplification.

Let us have a look at the sketch which shows the H.F. and detector end of a radio-gram built for use on the 200–600-metre wave-band.

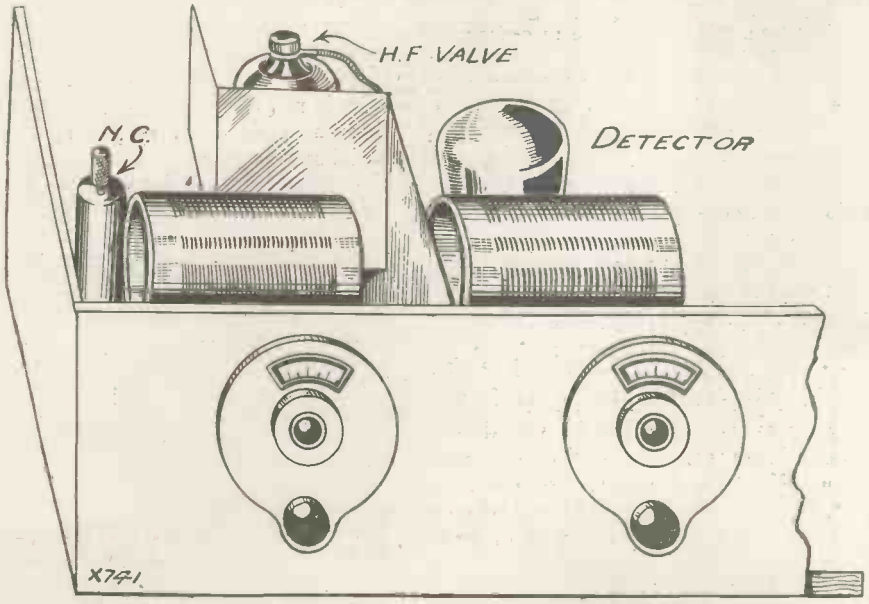
It will be seen that a relatively simple inter-stage screen only has been used to separate H.F. and detector circuits. This screen is, however, so made as to allow the screened-grid valve to be put through it, so that the screening of the two circuits as regards any capacity coupling is pretty good.

The two coils you will see are so placed that their fields shoot into the inter-stage screen. Nevertheless, there was found to be quite an appreciable degree of magnetic coupling over the top of the screen.

The First Surprise

Remembering my first neutralised S.G. H.F. amplifier, where interaction between the coil and valve resulted in my having to use six turns for the

A DIFFICULT SET TO NEUTRALISE



This receiver proved itself to be no easy one to stabilise, which was probably due to the small screen and the resulting stray coupling between the two coils.

IT WAS A FAILURE!

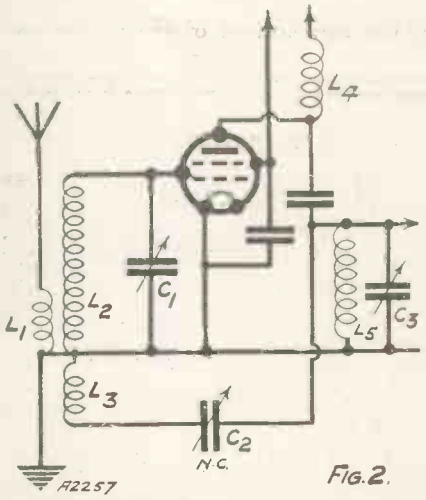


FIG. 2.

Although this is not a very freakish circuit, it failed absolutely when tried in the set discussed in the article.

Some Useful Tips Concerning the Neutralising of S.G. Circuits

neutralising winding instead of one, as expected, I started off with about ten turns on this winding—L_3 in the Fig. 2 circuit.

BETTER RESULTS

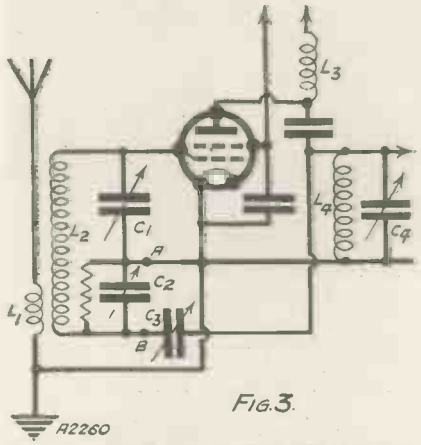


FIG. 3.

By reversing the wires marked A and B it was possible to get a proper balance and complete stability.

With an ordinary neutralising condenser for C_2 the full range of this condenser was explored both at the top and bottom of the tuning condensers C_1 and C_3, while the neutralising winding was adjusted a turn at a time in an effort to find a number of turns that would give a complete balance over the whole range.

Accurate Adjustment

But a balance was not to be found, so I then tried out a pure capacity bridge with equal lack of success. Next I tried a variation of the capacity bridge, and the circuit shown in Fig. 3 was tried out.

By using a semi-variable type of condenser for C_2 in this circuit I was able to adjust my tapping point with considerably more accuracy than by using a neutralising winding which could only be adjusted a full turn at a time, but here again I was not able to get over the difficulty.

Then more or less by chance (in fact, I am not sure that it was not quite by accident) I reversed the leads marked A and B and so produced the Fig. 4 circuit.

A SLIGHT ALTERATION

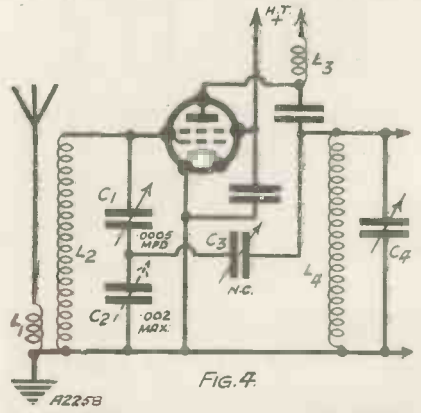


FIG. 4.

This is how the circuit appeared after it had been cleaned up, and one neutralising condenser connection altered.

A Complete Balance

Different values were tried out for C_2, and making this ·002 I found, much to my surprise, that a complete balance was obtained all over the range, either on an indoor or outdoor aerial.

Now, looked at from a theoretical point of view, this circuit is all wrong; yet in practice on the bench it worked.

ONE TURN ADDED

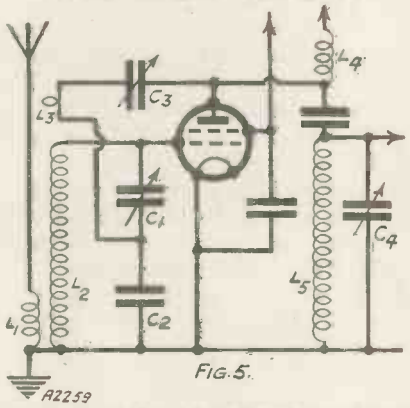


FIG. 5.

On rewiring the set and putting it into the cabinet it was found necessary to insert a single turn of wire in series with the neutralising condenser, before complete stability could be obtained.

Here, then, is a circuit to try when others have failed.

Now the set, which up till then was in the hook-up stage, was completed. The stray wires were cut down to the right length, components fixed in their correct positions and everything tidied up.

Effect of Cabinet

On putting the set into its cabinet it was found that it would not stabilise properly, and, finally, after a number of different things had been tried, a balance was obtained by connecting a single turn of wire in series with the neutralising condenser C_3 in the Fig. 4 circuit, as shown in Fig. 5.

But here is the important point. This turn was wound on the grid end of the grid coil and was put on in the opposite direction to the grid winding, and it was also found that the coupling was fairly critical. A single turn of heavy wire was used and moved about till the right degree of coupling was obtained. The turn was then fixed with a little celluloid cement.

It will be seen from the above that the cure for S.G. instability when full screening is not used may be highly unorthodox, and I trust these few notes may be of help to those interested in the neutralised screened-grid valve as used for H.F. work.

A "CONTRA-WAVE" IN CUMBERLAND

An "M.W." one-valver which does wonders in the hands of a lady reader.

Sir,—I should like to add my testimony to what must surely be a general outburst of praise for the "Contra-Wave" One, described in the May number of MODERN WIRELESS.

It really is a wonderful little set, and has fulfilled even more than my wildest expectations.

Here it has been constructed and is now working under anything but ideal conditions. Being left-handed, a semi-invalid, and having only a brother's scrapped tools to work with—and never having made a valve set before—building operations were somewhat handicapped! However, the "Contra-Wave" One obligingly picked up signals as soon as it was tested.

As you may know, the Lake District is not a good locality for reception, and although only an indoor aerial system is being used after dark the following stations have been logged: North Regional, Dublin, Midland Regional, Toulouse, Mühlacker, London Regional, North National, Hilversum, Newcastle, Heilsberg, London National, Leipzig, Hörby, Gleiwitz, Belfast, Nürnberg, Cologne, Cork, Fécamp and Königsberg.

Using an outdoor aerial in the daytime, Radio Paris, Daventry (5 X X), and Eiffel Tower have also been received. I am confident that this list will be augmented as time goes on.

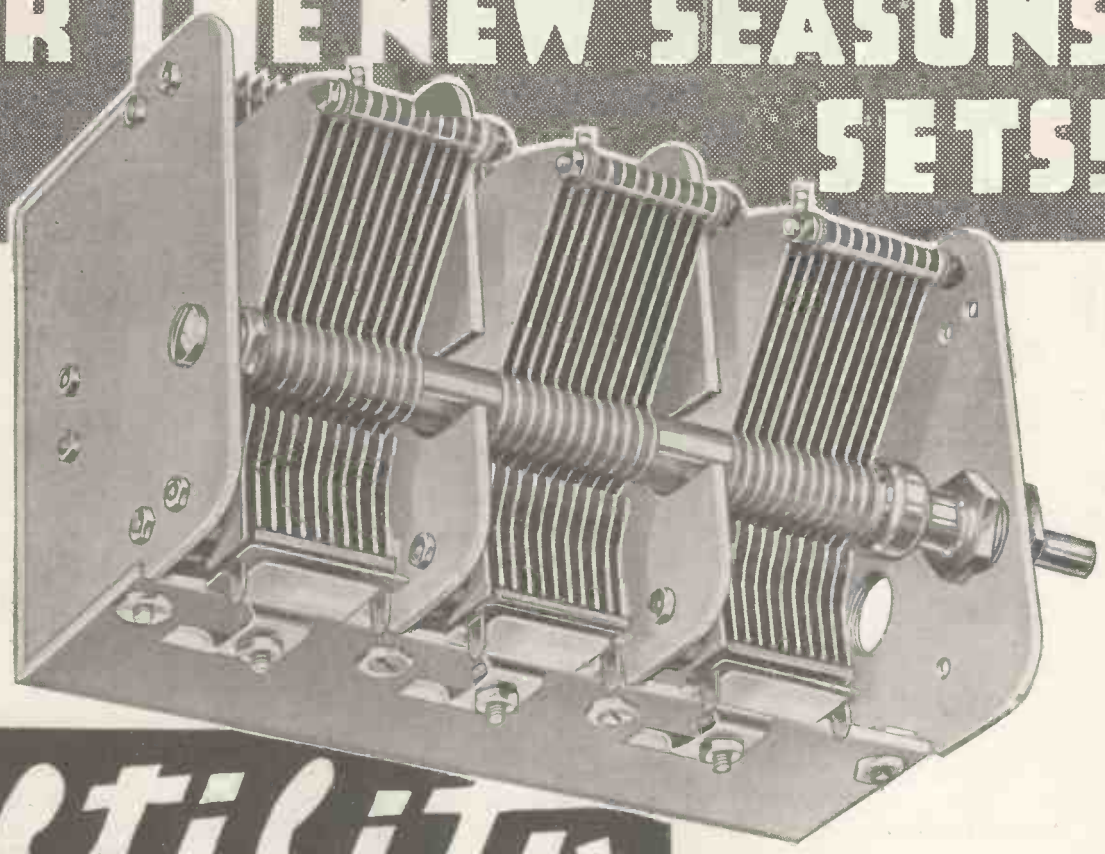
With best wishes for future prosperity,

Yours faithfully,

(Miss) MARY L. MARSHALL.

Cumberland.

SCREENED CONDENSERS FOR THE NEW SEASONS SETS!



Utility

Most of the new circuits will be ganged. But whilst tuning will be simplified in theory, the circuits will demand matching of a much higher degree of accuracy and absolutely *perfect* screening. With these requirements in mind "Utility" designers have produced a group of instruments which are unsurpassed.

The new "Utility" ganged condensers are so constructed that it is impossible to set up torsional stresses during tuning operations, a common fault with most ganged condensers. Therefore, capacity remains constant—a vital factor in delicate tuning. Exceptionally smooth action and dead accuracy of tuning are secured by an ingenious ball-bearing centre spindle.

SEMI-SCREENED		TOTALLY SCREENED	
Cat. No.		Cat. No.	
W.305/2	Two-gang 17/6	W.306/2	Two-gang .. 22/6
W.305/3	Three-gang (*as illustrated*) .. 22/6	W.306/3	Three-gang .. 27/6

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BRITISH AND BEST — THE NATIONAL RADIO EXHIBITION OLYMPIA — SEPT. 18 to 26

SEPT. 18 to 26 — BRITISH AND BEST

Belmont

BROADCAST RECORDS

THE VOCALION GRAMOPHONE CO., LTD., have increased the size of their "Tens" from eight to nine inches, so that now they will actually have a longer playing period than the standard 10-in. record. In spite of this increase the price remains the same, 1s.

The coming season, therefore, is to be one of very greatly enhanced value from the point of view of the gramophone user. Prices are down all along the line; three-shilling records have been reduced to 2s. 6d., and other most important reductions in prices have been made, as foreshadowed in our note last month.

But to get back to the Broadcast records. These are of unusual musical as well as dimensional value this month, and especially should we like to draw your attention to the records of **You Are My Heart's Delight**, from "The Land of Smiles," on 736. This is a record of a calibre that is usually only to be found in discs of a very much higher price, and the Vocalion Co. is to be congratulated on a very fine piece of vocal recording.

On the reverse side, Sidney Hamilton, the tenor who is the vocalist in question, sings **Just Two Hearts and a Waltz Refrain**. Readers should make a point of hearing this record at the earliest opportunity.

Harry Bidgood's Holiday-Makers have hit upon a popular number: **On With the Show, 1931**, a selection that will please nearly everybody. Played in dance rhythm, it includes such favourites as "Bubbling Over With Love," "On a Little Balcony in Spain," and "Bathing in the Sunshine" (726).

Sandy Powell is still hard at it. This month he is a Doctor, and Sandy fans need no further description to tickle their imagination as to what sort of a medico he is (728).

Of the dance records we particularly like **Lights of Paris** and **If You're Really and Truly in Love**, by the Riverside Dance Band, on 733. Other items of interest on the new 9-in. records are **Sally** (734), by the same band, and **When the Moon Comes Over the Mountain**, by Lew Sylva and his Band, on 735.

BROADCAST TWELVE. (*Blue Label*)

No alteration in price or size is being made in the case of the "Twelves" or the "Super Twelves," which remain at 2s. and 1s. 6d. respectively.

In the former series the Berlin Symphony Orchestra have recorded Flotow's famous **Martha Overture** (5244), while The Gershom Parkington Quintet are delightful in their rendering of **Old Favourites** (5245), including some of those old tunes that have practically become classics.

Brahm's **Hungarian Dances Nos. 5 and 6** are played on 5246 by the Viennese Eight Orchestra. These are most popular compositions and the record is bound to be a good seller.

SUPER TWELVES

A Music Hall Show in Grandpa's Day is the theme chosen by Bobbie Comber and Co. for record No. 3071. Most of the tunes will come strangely to the ears of the modern gramophile, but they are, nevertheless, worth hearing, and will be gladly remembered by the older members of the family. By the way, there seems to be quite an epidemic of "favourite" records at the present time, most of the recording companies are going in for this sort of thing.

Though one is apt to tire of them—as of other duettists of the same ilk—there is no denying the artistry of Bob and Alf Pearson, who this month entertain us with **Lazy Day** and **Roll on Mississippi, Roll On** (3072), sung with the same neatness and good balance that always characterise their work.

More of the "pot-pourri" type of recording brings us to Vocal Gems from **Florodora** (3073) and **A Highland Sing-Song** (3074), the latter being a band record by the H.M. Welsh Guards, with Male Chorus.

Somewhere a Voice is Calling and **Love's Old Sweet Song** are well matched as sugary morsels under the treatment of Edward O'Henry on the Madame Tussaud's Cinema organ (3075).

Lighter still are the dance records, which are so often such striking successes on these records. There Ought to be a Moonlight Saving Time, by Jack Harris and his Grosvenor House Band, with When I Take My Baby to Tea, are a couple of excellent numbers (3077).

Tie a String Around Your Finger (3078) is an old favourite by the same band, while **I Found You and For You**, by the Manhattan Melody-Makers (3079), with the assistance of the cinema organ, are noteworthy recordings.

We are not so impressed with the Hawaiian Band of Feuachini it is too indefinite in many parts, though the numbers chosen are by no means uninteresting.

COLUMBIA

This month we are going to put the cart before the horse, so to speak, and instead of discussing the heavier records first and ending with dance numbers we are going to reverse the order of things where Columbia recordings are concerned.

The reason is this. Jack Payne and his "boys" are such popular broadcasters that we feel that once in a way they should have major prominence in this brief review.

Jack has always been keen on comedy numbers, and this month he has excelled himself. The numbers in question from a double-sided disc (CB317), on which are "Skin-a' Ma' Link the Sergeant and **My Brother Makes the Noises for the Talkies**. They are both excellent, having all sorts of variety effects and patter by the "entire company."

The latter number is certainly one of the funniest of the year. Other outstanding numbers by Jack Payne include a new Rumba Fox-trot, **True and Sincere** (CB311). Another variety novelty, **Bell-bottom Trousers** (CB301); and that fascinating number: **Moonlight Saving Time** (CB308).

A brief selection from some of the records released during the month. They have been chosen because of their special value to the pick-up user.

And now for another Radio favourite—Will Hay. He has recorded his great school sketch, **The Fourth Form at St. Michael's** (5695). It should not be missed. Nor should the Roosters' **Sick Parade** and **Company Orders**, which will appeal to a vast number of gramophone enthusiasts (DB544).

Layton and Johnstone are regular Columbia artistes, and this month they have added to their list **We Two and Would You Take Me Back Again?** (DB560); while Mr. Flotsam and Mr. Jetsam are to be heard in **A Musical Confession and Sing a Song of England**. These two numbers are well contrasted, the first being a bracing affair and the other a parody on an English song.

What a flood of "Memories," "Pot Pourris" and the like are to be found among the latest record lists! During the last month or so Columbia have had at least six or seven. They range from **Father's Favourite**, an organ cocktail including all sorts of old tunes, such as "One of the Early Birds," "Where Did You Get That Hat?" Debroy Somers **Musical Comedy Switch**; **Song Hits Medley**, by Len Fillis and Novelty Orchestra; **Scotia**, an organ medley, by Quentin Maclean; to **The Trumpeter**, a "descriptive ballad," by Raymond Newell (Baritone), with a narrator and military band.

Such are typical examples, they are varied and offer a wide choice.

Will Fyffe (you will notice that most of the latest Columbia releases are of light type suited to holiday mood) is superb in **I Belong to Glasgow**, a particularly attractive piece of characterisation, and well worth hearing (9928).

A different type of dialogue is recorded in the **Trance Address**, by Mrs. Meurig Morris, who you will remember some time ago gave public addresses on varied subjects while said to be in a trance and under spirit influence. This record is DX265, and is one of the most peculiar records we have heard.

H.M.V.

Liszt's most popular composition, the far-famed **Hungarian Rhapsody No. 2**, has been recorded once again. This time the soloist (piano) is Alfred Cortot, who plays it with a brilliance and volume of tone that brings out to the full the wonderful picturesqueness and "local colour" the composer has crammed into the piece. (DB1042).

Another **Hungarian Rhapsody** (No. 1), in F Major, has also been recorded. This record is an orchestral one by the London Symphony Orchestra. According to the makers this bids fair to "rival in popularity the sensational version of the Second Rhapsody by the Philadelphia Symphony Orchestra." We will not go so far as to say that, but the "First" is almost as well known as the "Second," though we do not consider that with all its excellence the London Symphony Orchestra is quite the recording ensemble that the Philadelphia Orchestra is. But it is a fine record and should certainly be on your shelf (D1931).

A valuable record for the pick-up user is the cornet solo **Until**, and **A Perfect Day**, on B3773. Although these tunes are hackneyed, they still retain a fascination all their own, and the solo instrument, accompanied by the Band of H.M. Coldstream Guards, is wonderfully recorded. The clear, bright tone is heard to perfection on this disc, and it forms a very useful test record for radio-gram. outfits.

Two of the most popular vocalists have again recorded for H.M.V., they are Peter Dawson, and John McCormack, the famous tenor. The former has given us **The Cobbler's Song** ("Chu Chin Chow"), and **The Mountains O' Mourne** (B3772); while the latter has recorded a couple of Irish ballads, **The Garden Where the Praties Grow** and **The Harp That Once Through Tara's Halls** (DA1171).

Lighter recordings still there are in the **Gilbert and Sullivan Selection**, by the Light Symphony Orchestra (C2236), Marek Weber's Orchestra playing **Viennese Waltzes** (B3829), and **The Spirit of Vienna**, by Ferdy Kauffman and his Orchestra (C2199).

Echoes of younger days, called **Other Days**, are recorded for us by F. Rowland-Tims, F.R.C.O., on the organ of the New Victoria Cinema; while some popular incidental music of the past, **The Druid's Prayer** and **Dreaming**, are played by the London Palladium Orchestra. These records are B3899 and B3852 respectively.

It is some time since we heard John Henry "on the wireless," but he has not been idle, as witness his records, two more of which have been released. These are: **John Henry's Night Out** (B3766) and **Over the Garden Wall** (B3085). As the makers say, the former is a record for every husband and bridegroom-to-be. It describes the terrible predicament of one who, on returning from a night out, is discovered by his wife to have a garter in one of his pockets. A nasty situation, and one which suits John Henry perfectly. And, finally, the **Aldershot Tattoo**, in two records (C2250 and C2251).

ZONOPHONE

During the month some very interesting Zono. records have been published. These embrace practically all branches of the art of music. The London Orchestra, in 2908, has recorded a selection of **On With the Show, 1931**; while the Zonophone Salon Orchestra has chosen two more musical gems in **Love, Here is My Heart** and **Standchen** (Serenade by Haykins). This is recorded on 5916 and is an exceedingly tuneful disc.

Esther Coleman, contralto, sings a couple of May Brake's famous ballads, **Down Here and That's All**; while Herbert Thorpe (tenor) has chosen **The Song of Songs** and **When Dawn Breaks Through**, forming an unusually beautiful recording. These records are Nos. 5912 and 5910 respectively.

A Sailor's Philosophy and **That's Us** will appeal to those who like the sort of song that has with it the tang of the sea, hail-fellow-well-met sort of numbers that form excellent light, yet musical, entertainment. They are recorded on 5909 by Herbert Thorpe and Foster Richardson.

Norman Blair and Maurice Elwin are a little treacley, if we may use the term, especially the former, though no one could deny the artistry with which their items are rendered. The pieces in these cases are **I Bring a Love Song** and **Live the Old Times Again** in the former case, and **Pretty Kitty Kelly** and **A Cowboy Serenade** in the other (5915 and 5914).

We do not, as a rule, take kindly to the sort of item Clarkson Rose chooses, but **Tell England** has become a favourite all round the seaside concert parties, and his singing of it on 5919 is worth hearing. On the other side is the official song of the hikers, **I'm Happy When I'm Hiking**, a breezy number that also has become popular.

A complete new range of Tungsram Barium Valves will shortly be announced, comprising General Purpose, Screened Grid, Multi Grid, High Power Output, Double Grid, Power Detector and Power Valves, at prices ranging from 5/6 to 19/-; built to the Tungsram tradition of quality in the largest valve factory in Europe.

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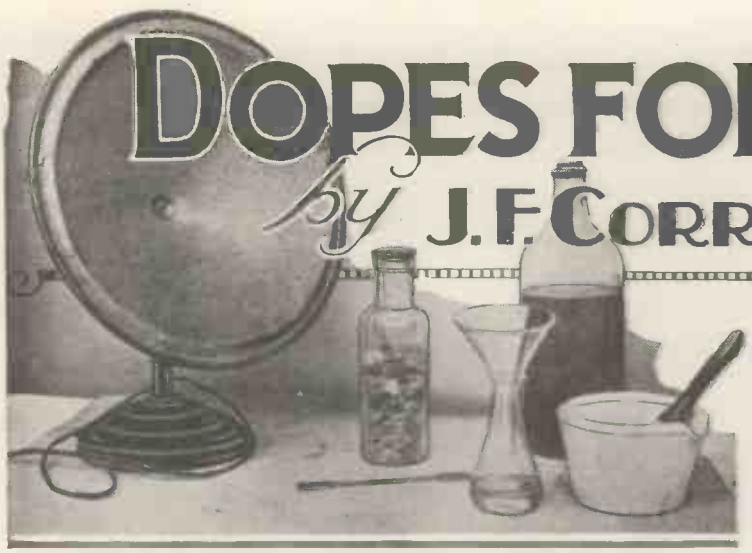
B 11

DOPES FOR CONES

by J. F. CORRIGAN, M.Sc., A.I.C.



What they are and how they work.

Our contributor, who is an authority on chemical research, applies his considerable knowledge and experience to a subject that should prove of great interest to all radio enthusiasts.

MYSTERIOUS-LOOKING liquids, labelled "Dope for Cones," or some such name, are often to be seen, put up in bottles, in the windows of radio dealers' shops, and in some districts, they command a fairly ready sale.

I have analysed several of these preparations and have in each case found them to consist of filtered solutions of gum arabic, with or without admixture of a trace of preservative and a little gum-water. Doubtless, of course, other preparations are sold for the same purpose that have similar, or even better, actions in actual use.

You'll ask whether such preparations are of any value in applying to the fabric of cone speakers.

Well, to be candid, although I personally would certainly hesitate to apply them to the fabric of any high-class instrument, there are nevertheless, I think, many types of cone speakers which indeed do benefit by the judicious application of one or other of these preparations.

Curing "Floppiness"

Cone speakers of the older type, for instance, in which the fabric has stretched and has shown a tendency to sag and to become "floppy." Home-made cone loud speakers, again, in the construction of which, perhaps, a poor quality of fabric has been employed. These, and all similar instruments, I think, are the ones which are likely to benefit by the use of a suitable dope.

Although, all things considered, it is better—and generally as cheap—to purchase a bottle of cone dope ready made, you can prepare your own cone dope simply by placing two or three small lumps of gum arabic into half a teacupful of *cold* water and by allowing the gum to soak overnight.

After twelve hours or so the gum will have swelled up. The liquid should now be heated and well stirred, and finally filtered through cotton wool in order to get rid of any insoluble matter. The consistency of the dope required for cone fabric uses should be about equal to that of thin gum.

How To Apply It

In applying the dope to the fabric of the speaker, use a short brush, and do not *lay* the preparation on the surface of the fabric like you would if you were giving it a coat of paint. Use a *dabbing* movement with the brush so that the preparation is forced between the interstices of the material.

It is best to begin at the edges of the cone fabric, for then these will dry the first, and, in so doing, will tend to pull the other portions of the fabric equally to them.

Bad Effects of Heat

At all events, the entire fabric should thus be "doped" as quickly and as evenly as possible. Having completed the operation, quickly wash out the brush in hot water, and wipe it as dry as possible on a clean towel. Then, with the semi-dry brush, rapidly run over the whole surface of the cone fabric in order to even up any areas which may have had too much or too little of the dope applied to them.

Put the cone away to dry in a dust-free place for twelve hours. Heat should not be used for drying purposes,

A damp-proof cone dope can easily be made by dissolving shreds of celluloid in a mixture of amyl acetate and acetone. But, remember, all these ingredients are highly inflammable and you should keep them well away from fires, etc., while you are mixing them up.

Improved Results with Many Types of Loud Speakers

owing to the risk of it producing uneven drying and consequent uneven strain on the fabric.

Of course, before treating a cone in this manner you will satisfy yourself of the effectiveness of the dope by treating a spare piece of fabric first.

It is rather surprising how stiff a fabric can be made after subjection to one or two of these treatments. An effective dope will easily stiffen a fabric to such an extent that it will bear the weight of a few ounces without crumpling up.

Do not use the dope too thickly. If you do it will tend to flake away in little particles. If one application of the dope does not stiffen the fabric sufficiently, repeat the process.

The fabric of a cone loud speaker which has been so treated ought not to be exposed to damp atmospheres, otherwise it will become flabby.

A Celluloid Dope

A damp-proof cone dope may be made by dissolving thin shreds of celluloid in a mixture of one part of amyl acetate and two parts of acetone. This mixture of liquids, made up at your local chemists, can be obtained at a cost of about sixpence an ounce, which is a reasonable quantity for the treatment of an average-sized speaker.

Here, again, the celluloid dope should be about the consistency of ordinary thin gum, and it should be applied to the fabric as rapidly as possible, and with a dabbing motion of the brush.

The liquid is highly inflammable, and on this account care must be taken to carry out all operations with it well away from naked lights.

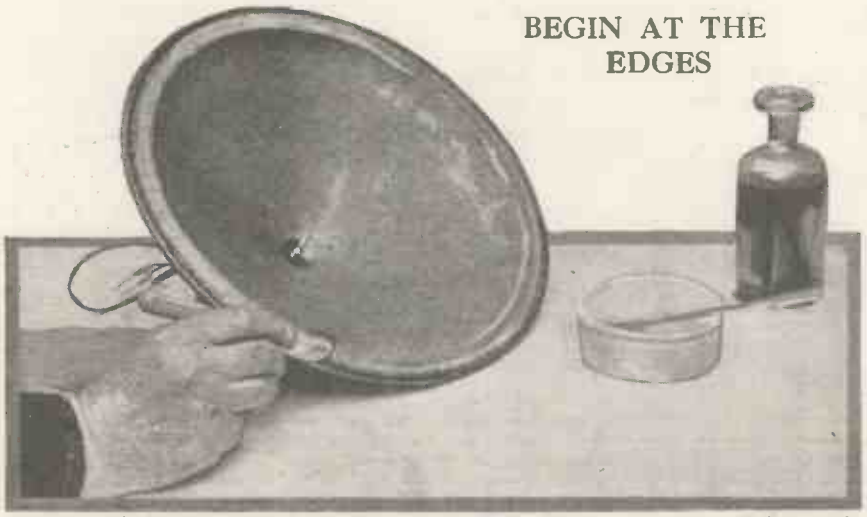
Quite Damp-proof

These celluloid dopes have not been used very greatly, because owing to the rapid drying of the liquid it is rather difficult to obtain an even spread of the material throughout the fabric of the speaker. Moreover, the celluloid does not penetrate into the fabric very satisfactorily, forming, on the contrary, a thin skin on its surface, and being often liable to peel off.

Nevertheless, a dope of this type is quite damp-proof, and it forms a useful material for amateurs who may desire to conduct experiments into the varied properties of these chemical preparations for fabric-stiffening purposes.

There is no doubt, however, of the fact, as I have previously remarked, that in certain instances the modern cone dope which is now coming into prominence is a useful material, and that its judicious employment is capable of effecting improved results with many types of loud speakers. It has a special use in those loud speakers with stretched linen diaphragms, which were at one time so very popular.

BEGIN AT THE EDGES



It is desirable to start applying the dope to the edges of the cone so that the fabric will tighten up evenly.

But it is not advisable to apply it indiscriminately. In some cases cones are held by surrounds of wash-leather or similar flexible material, and stiffening here might seriously impede the operation of a loud speaker by restricting the axial movement of the cone diaphragm. It might also cause the cone to go out of shape.

PRACTICAL PROOF

Showing the extent to which fabric can be stiffened. This piece is supporting 4½ ounces.

NOTEBOOK NOTIONS

A good scriber for marking panels, etc., can be made in a moment from a pen-holder in which an old gramophone needle has been mounted.

* * *

A couple of sheets of newspaper placed between the panel and the work-bench when drilling will save scratching the panel surface.

* * *

When drilling an ebonite panel do not use too strong a pressure, especially as the drill is "breaking through," or you may chip the surface.

* * *

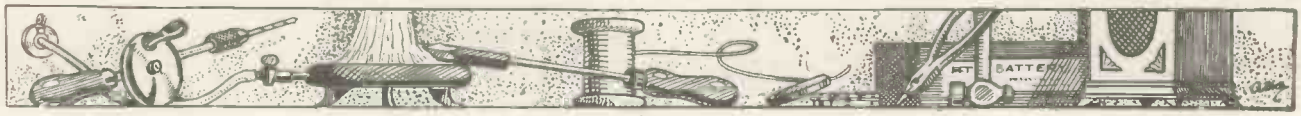
Stains and finger marks on a panel are easily removed by a trace of methylated spirits on a soft cloth.

* * *

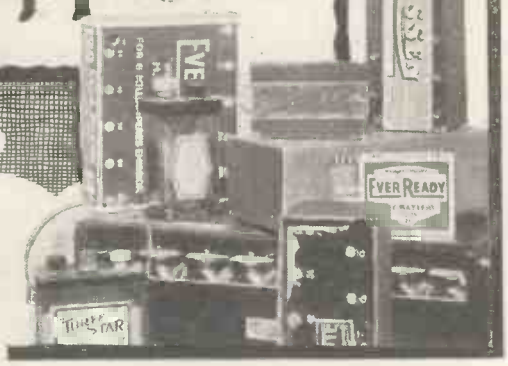
Imperfect insulation in an anode tuning condenser, such as is caused by dust between the plates, is often the cause of crackling.

* * *

If you use a milliammeter in the plate circuit of the last valve to test for distortion, shift it occasionally to the H.T. negative lead to see that no current due to defective insulation flows when the set is "off."



Unconventional H.T. Supplies



Details of an economical method of stepping-up or stepping-down the voltage of D.C. mains for purposes of H.T. or for battery charging.

WHEN the supply voltage available is unsuitable for the requirements of your set, it is necessary to raise or lower it as the case may be. For instance, 110-volt mains will be too high for the low-tension circuit and may be too low for the high-tension circuit.

If the supply is alternating current, it is a simple matter to step-up or step-down the voltage by means of a suitable transformer, and with A.C. this is the universal practice.

The voltage for the high-tension supply must be stepped-up to a higher value than that actually required, so as to allow for the drop in voltage due to rectification and in the smoothing circuits. Similar remarks apply where the voltage is to be stepped-down for use in a low-tension supply unit or charger.

Changing D.C. Voltage

But where the supply is D.C. and the voltage is unsuitable, the problem of stepping-up or stepping-down is quite different. Any required D.C. voltage can be obtained by means of a motor generator, the motor being wound to run on the electric supply available, and the generator being designed to give the desired D.C. output voltage, allowance being made for the voltage-drop in the smoothing circuits.

There is another method of stepping-up D.C. voltage which is sometimes used in connection with portable transmitting sets, but used with receiving sets only in exceptional circumstances. This consists in principle in breaking up the D.C. current by means of some form of interruptor, then feeding the interrupted current into a transformer and taking off the corresponding alternating current from the other side of the transformer, and rectifying.

You will see that the moment you adopt the principle of *interrupting* the D.C., you are able to take advantage of the step-up or step-down property of the transformer just as with alternating current.

Interrupting the Current

The interruptor may be a rotary interruptor, after the fashion of a commutator or, simpler still, a vibratory interruptor such as is used in a buzzer.

Special Smoothing Arrangements

However, there are several points which require special attention. For one thing, the *smoothing* of this current after rectification is much more difficult than with alternating current of regular wave-form, whilst for another thing there is a danger (unless special precautions are taken) of the interruptor causing interference in the receiver. Furthermore, the transformer, for efficient working, must be specially designed for the purpose, but this is not a very serious matter for ordinary experimental use.

Better for Charging

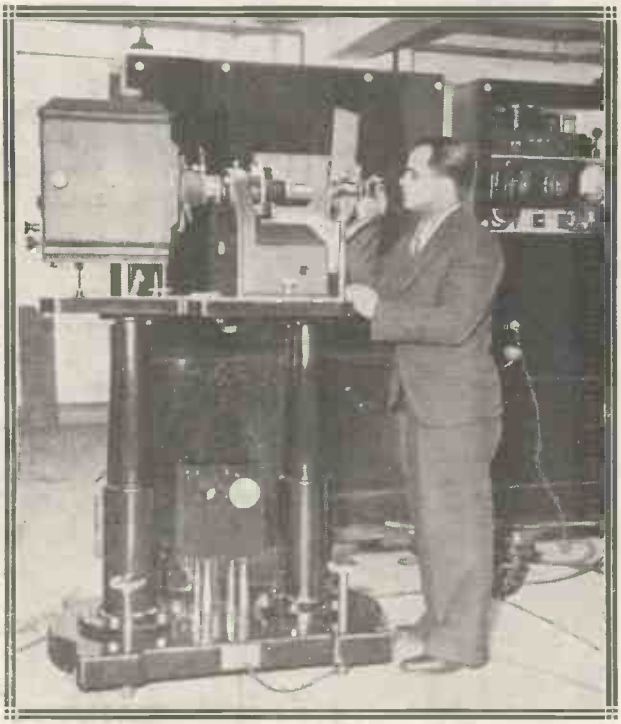
As a matter of fact, I should say that this interrupted D.C. method of stepping-up or stepping-down voltage is really more suitable for charging high-tension and low-tension batteries, for which purpose it is really quite satisfactory, rather than for supplying current direct to the receiver.

In the ordinary way, battery-charging on D.C. mains is carried out by means of a series resistance, which is very wasteful, since the whole current passing through the batteries is drawn from the mains at, say, 200-250 volts. About 90 to 95 per cent of the energy drawn from the mains is wasted in this series resistance, only the remaining 5 per cent being used for charging the battery.

Economical

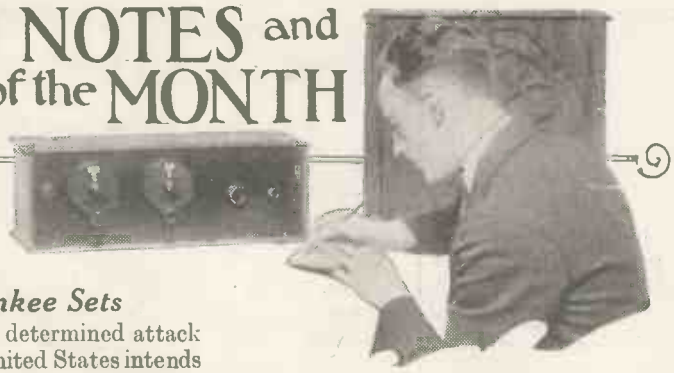
By interrupting the D.C. current, however, and stepping-down the voltage, it is possible to effect an enormous increase in the overall efficiency of the arrangement, comparable with the efficiency of a step-down transformer arrangement when using alternating current; and instead of wasting over 90 per cent of the energy the waste may be reduced to a very much smaller percentage.

BIGGER TELEVISION PICTURES



This is the transmitter of a new American system of television which makes possible the projection of six-foot square pictures at the receiving end.

RADIO NOTES and NEWS of the MONTH



Those Yankee Sets

TALKING of the determined attack which the United States intends to make this year on the British radio market, a leading British manufacturer said to me the other day that he was confident—and so were his colleagues in the industry—that the invasion can be repulsed. My friend pointed out that the American mass-produced set cannot hope to compete with the British models this season, for the latter are constantly being brought up to date, and the American mass-production plant cannot possibly keep pace with us.

A Dumping Disadvantage

Furthermore, few wireless sets made in the States are capable of receiving on the necessary wave-lengths for this side of the Atlantic. Americans are forgetting—but we sincerely hope our readers won't—that our wave-length arrangements are far different from those in America, and so we hope readers who may be tempted by one of these dumped set bargains will bear this point in mind.

About India

There has been quite a controversy about Mr. Whitley, the Chairman of the B.B.C., refusing Mr. Winston Churchill's request for an opportunity to broadcast a talk on the Indian problem. It is suggested that on the eve of the Round Table Conference the situation regarding India is too delicate for such a talk.

Mr. Churchill's Views

This seems to be rather a poor excuse. The Indian problem is not too delicate for some of our newspapers to express themselves with more force than delicacy, and so there is no earthly reason why a famous politician like Mr. Winston Churchill shouldn't put his views before the British public.

And What About Russia?

Does Mr. Whitley think the British public will be biased by Mr. Winston Churchill's talk? If so, why did he allow the series of talks on "Russia" to figure in the B.B.C. programmes? We hope Mr. Whitley will reconsider the whole matter and that before long we shall have an opportunity of listening to Mr. Winston Churchill on a topic which admittedly is of the utmost importance to the British public to-day.

Those Economy Cuts

As we go to press there is a suggestion that under the new Economy Commitments Recommendations the B.B.C. may be asked to forgo something like £475,000 in 1932. It will be a great pity from many points of view if this recommendation is put into effect, for there is no doubt that programmes—and, in fact, the whole

(*Continued on page* 280.)

RADIO NOTES AND NEWS OF THE MONTH

—continued from page 278

of the B.B.C.—will suffer considerably if any further deduction is made from its income.

A Counter Suggestion

On the other hand there is this point to consider: If this revenue reduction is made it should not interfere with the Regional Scheme nor the B.B.C.'s commitments with regard to Broadcasting House, because it is recommended by the Economy Committee that in the event of the deduction being made from the B.B.C.'s income, the B.B.C.'s debts, if any, should be taken over by the Government when the B.B.C.'s Charter expires.

If this suggestion is carried into force it would, of course, make it easy for the B.B.C. to borrow money to meet any current liabilities.

Radio Romance

News is to hand that Italy intends to dispense with the lady announcers, for it appears that quite a lot of the correspondence received by the Italian broadcasting stations has consisted of love letters addressed to the lady announcers. This is a pity, because we shall all miss the charming lady who announces for the Rome station.

Still Growing

As we have stated in past issues of MODERN WIRELESS, Broadcasting House has not proved big enough, and consequently the B.B.C. has recently concluded an agreement for the purchase of a site adjacent to Broadcasting House in Portland Place. It is obvious now that the houses on this site will be demolished and an extension made to the new building.

Everyone Doesn't Write

It is announced that last year the B.B.C. received from listeners 56,000 letters concerning the wireless programmes. This is a very small total when one considers the millions of people who are now regular listeners. It only goes to bear out, however, the fallacy of relying upon letters from listeners when considering programme policy.

Just because a listener never writes to the B.B.C. it is no indication that he finds everything satisfactory. More often than not the trouble is that the listener is far too lazy to take up his pen and tell the B.B.C. exactly what he thinks.

"Continuation School"

A correspondent in the "Daily Mail" asked the intriguing question the other day: "Is the B.B.C. foisting too much education on us?" This correspondent has been examining an analysis of the National and London programmes for June.

He found that educational talks took up 10·3 per cent of the entire programmes, while general talks accounted for another 7·9 per cent. These figures, of course, include school broadcasts. In all, 18·2 per cent of the programme time was devoted to education.

It certainly seems too much.

A Signal Invention

It has come to light recently that the man who invented the B.B.C. six-dot time-signal is Mr. Frank Hope-Jones, who has also to his credit the invention of the master clocks at Greenwich Observatory. When Mr. Hope-Jones was broadcasting in April, 1923, he ended one of his talks by counting from his watch the last five seconds of the hour, and so that really

(Continued on page 282.)

See also pages 273, 277 & 279.

RADIO NOTES AND NEWS OF THE MONTH

—continued from page 280

constituted the first time-signal sent out by the B.B.C.

Later on it was imitated by announcers. Later on still, Sir John Reith and the Astronomer Royal, Sir Frank Dyson, got together and the result was the now famous six-dot time-signal officially controlled from Greenwich.

Famous Listeners

It was stated in the "Evening Standard" a few days ago that both Mr. Macdonald and Mr. Lloyd George are passionate wireless fans. Readers of our contemporary, "Popular Wireless," will probably remember that it was "Popular Wireless" which supplied Mr. Macdonald with his wireless set—the famous "Premier" receiver which was fitted up for him at his Hampstead residence.

Congratulations

It appears that Mr. Lloyd George is quite a fan, for when something pleases him very much in the programmes he is in the habit of sending a note of congratulation or appreciation to Sir John Reith.

Good Old Jack Payne

There have been a lot of rumours flying about lately regarding Jack Payne and his band. One rumour was to the effect that Jack and his merry men were to be supplemented by a second band. But I understand there is no truth in these rumours at all.

One of the most absurd stories was that Jack Payne was going to resign; but, as he said to a reporter the other day, the best answer to that is his long-term contract with the B.B.C. and the fact that his band is the highest paid dance orchestra in the country.

A "Solo" Contract

Jack Payne has been with the B.B.C. for three and a half years, and he says he hopes he will be with the same firm for another three and a half years. Listeners may be interested to know that it is Jack Payne who is employed by the B.B.C., not his band, for Jack himself pays the members of his band out of his own salary The strength of the band has to be kept to seventeen.

Without Comment

As you probably noticed in the Press a few days ago, the much discussed yearly Government dole of £17,500 towards the broadcasting of opera by the B.B.C. was passed by the members of the House of Commons without comment.

This means we shall have 300 performances of Grand Opera a year in Great Britain. The B.B.C. will contribute £25,000 annually to the Grand Opera Syndicate (1930), Limited, thus securing the broadcasting rights of the performances. In actual fact, of course, only £7,500 will come out of the B.B.C. revenue

Stopping Interference

Broadcasting House is nearing completion and all that remains to be done now is to finish off the electric light installations, decorate the studios and offices, etc. In order to get the acoustics right in the studios, damping effects, etc., have been used which indicate considerable ingenuity.

JUST TO REMIND YOU—

When fitting a de-coupling device don't forget to increase the appropriate H.T. voltage, to compensate for the voltage-drop across the de-coupling resistance.

* * *

If you are fitting an indoor aerial remember that its position, shape and size (number of wires of which it is composed) all affect the reception, and should all be experimented with in order to find the best possible arrangement for the circumstances.

Instead of cloths, matting, etc., quite a lot of sugar canes have been used to line the walls. It's a pity some of our modern flat-builders don't use sugar canes, for then we shouldn't hear the people next door!

Alternatives That Aren't

More and more complaints are being made about the so-called alternative programmes. It seems to be the B.B.C.'s idea to use the Midland Regional transmitter almost entirely for the relaying of London's programmes.

Another irritating practice taken up by the B.B.C. is to give three performances of a radio play. This would be more or less understandable if the repeat performances were given at intervals, but, as my readers have probably noticed, just lately we have had a play one evening from the National station and the next evening from the London and Midland Regional. Can't something be done about it?

THE "M.W." "EXTENSER-POWER"

—continued from page 241

along at the other end are the output terminals for the loud speaker. Be careful that the right mains voltage is employed, or, rather. that the mains are connected to the correct terminals on the transformer for that voltage.

A Useful Guide

The valves will take a few moments to heat up, but with a four-volt lamp in the pilot lamp position you will know at once whether or not power is being supplied without looking inside the set to see if it is "on."

Do not forget, however, that this pilot lamp must be of the four- or six-volt variety. If it is a six-volt type it will give quite a dull light, and if it is a four-volt it will give a fairly bright light. A two-volt lamp, of course, would be burnt out, as the lamp is wired across the heater supply.

The handling of the receiver is simplicity itself. The two Extensers used for tuning carry out the wave-change switching at the same time; half of the rotation of the dial is used for medium waves, and the other half for long waves.

The volume control on the left acts just like any ordinary volume control with regard to operation, turning to the right to increase volume. This increases the voltage on the screening grid of the S.G. valve until a certain maximum is reached. You cannot over increase the S.G. voltage and do damage to the valve owing to the fact that it has in series with it a resistance to drop the voltage to the safe maximum.

Selectivity is varied by means of the crocodile clips on the P.J.2 and P.J.3 coils, and on the coil quoits used for the long waves. On test we found that the best results were obtained with the maximum in each case.

Very Selective

The set was quite selective enough without having to tap down the medium-wave coils at all, so that the crocodile clip going to the P.J.2 and P.J.3 coils are placed on the leads marked A (red) and those on the coil quoits on the 60-turn taps in each case.

Should, however, you be very close to a local station and want to increase selectivity, alter the tappings on the P.J.2 and P.J.3 coils for the low waves, and on the coil quoits for the long waves. It is doubtful, however, whether you will be in such a position as to need to alter those in order to increase your selectivity.

One word must be said about the pick-up switch. In order that the switches should match a mains switch of the double type was used for the radio-gram switch. The single-break type is used for the mains side, and supplied with these switches are little metal indicating taps which are placed on the panel and marked "on" and "off." In the case of the radio-gram switch such a metal piece is not available with the correct marking, and so the "on" and "off" marked taps were employed, but the little metal plate was reversed, so that no markings are visible.

As there are no H.T. voltages to adjust, and the handling of the receiver is extremely simple, reaction being applied in the normal way, there is really nothing more to be said about it. It should, however, be remarked in conclusion that it is a worthy brother of the "D.C." Three published a couple of months ago; and due not only to its power and simplicity in operation, but also to its compactness, it is a very useful home radio-gram receiver for any listener with average requirements.

It will not, of course, give sufficient volume to "fill" a dance hall, but for all average purposes in the ordinary living-room we think you will find that the volume control across the pick-up is really desirable in order to keep the volume down to a pleasant level.

COIL PARTICULARS.

P.J.2.—Former 2 in. diam., 2 in. long. Medium-wave aerial unit without reaction. wire 30 D.S.C.
AERIAL WINDING, 9 turns, tapped at 4 and 6. Beginning "A" (red flex); end "X" (blue flex). Space ⅜ in. between aerial and grid.
GRID WINDING, 64 turns. Beginning marked "G" (white flex); end marked "Y" (black flex). Space between grid and reac. windings ¼ in.
P.J.3.—Former 2 in. diam., 3 in. long. Inter-valve medium wave unit with reaction. Wire 30 D.SC..
PRIMARY, 30 turns, tapped at 10 and 20 from beginning marked "A" (red flex); end marked "X" (blue flex). Space between pri. and grid windings ⅜ in.
GRID, as P.J.2.
REACTION, 34 turns. Beginning marked "Z" (green flex); end marked "R" (yellow flex).
Windings of ALL coils in SAME direction.
QUOITS, wound with 150 turns of 30 D.S.C. wire tapped at the 30th and 60th turns from the beginning. One quoit to have reaction winding of 50 turns underneath main winding.

ON THE TEST BENCH

—continued from page 245

second-class. This may make it difficult for the constructor to discriminate between makes, but he will have the satisfaction that whichever one he plumps for will, at the very least, be good.

A Fine Design

For instance, we now have the pleasure of introducing to "M.W." readers the "Formo" Extenser, as made by Arthur Preen and Co., Ltd. And a very excellent little component it is. It could hardly be superior had it been the hundredth model of a conscientious manufacturer instead of the very first.

This is a point which may occasion some puzzlement in view of the traditional crudeness of the initial designs of a new article. Indeed, we don't mind confessing it puzzles us to some extent! But it is easy to see that modern manufacturing conditions are such that there is no room for "trial and error" once the production stage has been reached.

HELP THE NEWSAGENT

Have you ever thought how difficult it is for a newsagent to order just the right number of copies of any particular paper each week? You can make his task much easier if you place a regular order with him. You will not only help him to order correctly and avoid waste, but will make sure of getting your copy regularly each week.

Components are not produced singly and by hand these days, but are subject to repetition machine processes which can impart a beauty and precision to things that leave the skilled craftsman of bygone ages miles behind.

The "Formo" Extenser is built up from beautiful bakelite mouldings and machine stampings, and the result is an instrument without flaw.

It has a slow motion so smooth and certain in action that you could tune in short-wavers with it with great ease. And the "self-changing"—well, you wouldn't know it was there if you could not see it!

(The self-changer terminals are accessibly grouped at the back.)

The "Formo" Extenser is rather smaller than many ordinary variable condensers.

OPERATING THE "NEW D.C." THREE

—continued from page 250

the thin wire from the coil quoit which goes from the same point on the Extenser as the blue lead), and you take the remaining point of your switch to the end of the main winding on the coil quoit and to the black lead on the medium-wave coil.

A Potentiometer Point

The volume control on this receiver —as you have probably noticed— is carried out by means of the potentiometer situated just below the reaction knob. This potentiometer controls the screened-grid voltage of the S.G. valve. As the D.C. S.G. valves are not yet standardised it has not been possible to put a resistance in series with the lead to this potentiometer in order to limit the maximum which one can apply to the screening grid.

As the set stands, therefore, you can turn the knob hard over to the right, and you get the same value on the screening grid as you do on the anode (or possibly a little more, in view of the fact that the anode has a resistance in series with it, and this will cause a slight drop in voltage).

When operating the set, therefore, do not turn this potentiometer round any farther than is required for best results. You will reach a spot at which the sensitivity becomes a maximum, and on further turning to the right you will find that signals die off again somewhat. This shows that you have passed the maximum H.T. voltage for best results, and you should go back to the previous spot.

When you want to reduce volume on the local station you should turn the knob to the *left*, which reduces the voltage on the screening grid, and therefore the amplification obtainable from the valve.

Varying the Tone

We said earlier on in the article that the Spaghetti resistance, and the ·01 condenser in series with it that had been placed across the choke in the anode circuit of the detector valve, had been chosen as being about the best values for average work. The ·01 condenser, at any rate, can be reckoned to be about the correct value, but it will depend upon your loud speaker and your own personal requirements of musical tonal balance as to what value of resistance you use.

As we said before, we have found 15,000 ohms a good figure for most loud speakers, but if you have a moving-coil speaker which is particularly boomy you may like a little more high-note response from your pentode, and increasing this resistance will give it to you.

This resistance can be increased up to about 50,000 ohms, the high-note response increasing all the time, but above 50,000 ohms you will find that an increase of resistance will not make any difference at all. If you want less high-note response, assuming perhaps you have already a speaker which is rather prone to emphasise the high notes, then decrease the resistance to something like 10,000 ohms, or slightly less.

If desired, you could put a 50,000-ohm variable resistance there, and vary the value, but this is rather an expensive way to go about the job, for the Spaghetti resistance is quite cheap, and you can get several values to try for the price of one potentiometer or one variable resistance, and all those which you do not use in this set you will find useful at some future date, whereas it is not always that one wants a variable 50,000-ohm resistance.

Using Different Valves

There is nothing more to be said about this receiver except that should you decide to use valves not having ·5-amp. heaters (some different ratings are on the way, but have not yet been placed on the market) you will have to get a different mains resistance, one necessary to break down the voltage suitably to ·1 amp., or ·25, or whatever is required.

There is one more thing we should like to add. The "New D.C." Three is built in a standard cabinet, with hinged lid, because such cabinets are easy and cheap to obtain. But always remember it is a *mains* set, and never lift the lid to make some adjustment, or fiddle about inside, *until the mains are switched off.*

SELECTING THE STATIONS

—continued from page 246

We recommend the metallised S.G. valve in the first stage, an ordinary H.L. type for detector and an ordinary L. type for first L.F., and a power or super-power, preferably the latter, for output. The grid-bias battery cannot be attached to the baseboard, and a good place for it is at the back of the cabinet, where it can be mounted on brackets with the greatest of ease. This battery should be of 18 volts if a super-power valve is employed, and the H.T. battery can well be 150 if the full maximum is to be obtained from the set.

Only Two H.T. Taps

You will find that all you want in H.T. taps beside that for the S.G. valve is provided, for having no reaction control one can afford to give the detector valve plenty of H.T., as there is no need to worry about obtaining smooth reaction. Therefore, we placed H.T.+ 2 in the maximum of the battery—that is to say, 150 volts; S.G. voltage should be arranged at about 80 to 100 volts, in accordance with the valve employed.

It is not a bad plan to try 80 volts first, tune in a station of medium strength, not the local, and place the S.G. potentiometer hard over to the right. All the way up you should be getting an increase of signal strength until the potentiometer is full over to the right, where you get the maximum.

Potentiometer Adjustments

Now increase the S.G. voltage to about 100 and see if you still increase in signal strength until the potentiometer is turned to its fullest extent again. Go on increasing the S.G. voltage in steps until you find the position where you begin to lose signal strength slightly, with the potentiometer hard over to the right. That means that you have found the maximum effective voltage for the S.G. and must go back to the last tapping which gave you a maximum right up to the fullest extent of the potentiometer.

That concludes all we have to say about this set and we can now leave you with the full confidence that you will spend very many happy hours tuning in real quality programmes, not only on the local, but on a great number of distant stations.

"CONSTANT" INDUCTANCE

Some interesting notes explaining how manufacturers endeavour to make the modern output choke equally effective at all audio frequencies.

THE most that can be said for any choke or other iron-cored coil is that its inductance is approximately constant for a given range of current.

By " approximately " is here meant that the inductance is constant for all practical purposes, as the curves of the numerous excellent L.F. chokes and transformers on the market to-day show. Actually, however, the very presence of an iron or steel core makes absolute constancy of the inductance impossible.

We may define the inductance of a coil as the ratio of total magnetic flux × turns/current, or, if we denote inductance by L, total flux by N, turns by T, and current by I, then $L = NT/I$. Since the turns in the coil are constant, the inductance is directly proportional to the ratio N/I.

Magnetic Saturation

From this it will be evident that if the flux in the core always varied in direct proportion to the current, the ratio N/I would remain definitely constant. In a coil having an air core that condition is satisfied, but directly we introduce iron or steel the question of permeability crops up, and since the latter varies with the current, the inductance will also vary.

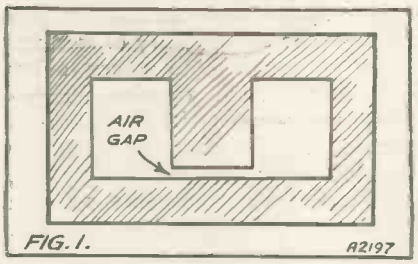
What actually happens is that as the current is increased the increase in flux gets less and less as the iron approaches magnetic saturation, with the result that the ratio N/I obviously falls, since I increases more rapidly than N.

The only way to make the inductance reasonably constant is, therefore, to work the core well below the saturation point, or on the approximately straight portion of its magnetic saturation curve. This can be done by either increasing the gross section of the core, or by introducing a small air gap into the magnetic circuit as shown in Fig. 1.

Use of Air Gap

The air-gap method is the one most frequently employed, because it is cheaper and leads to the same results as a large core. The high permeability materials used in modern cores enables a large total flux to be obtained at quite a small core section, and, apart from the better magnetic characteristics of these substances, an air gap is frequently employed.

INSIDE THE CORE



A small air gap, arranged as shown, greatly improves the evenness of frequency response.

Another immense advantage towards securing the conditions just stated is to divert any steady D.C. component from the coil whenever possible. Hence the advisability of using the parallel feed or auto connections for L.F. transformers.

H. R.

AIR ROUTE RADIO

—continued from page 264.

this fact they invariably give the height at which they are flying.

From the French coast onwards the pilots report to the air stations of the country over which they are flying, and, therefore, by listening to the replies of the ground stations it is still possible to follow a 'plane long after its own transmissions have passed out of range. The same general scheme applies to the inward as well as the outward journey.

The telephony from the air liners themselves is rather rough owing to the wind-driven generators and heavy damping of the microphones, but with practice and careful tuning they can be understood quite well.

Simple Tuning

There is no need to rotate the tuning dials incessantly; they can be left in the 900-metre position and then carefully tuned when a signal is heard, for the wave-lengths are never more than a few metres above or below 900. It should be remembered also that the French and Dutch air companies run 'planes to Croydon as well as Imperial Airways, and they are to be heard every day of the week.

It is not generally known that visitors are welcomed to Croydon aerodrome. There is a car park, a public enclosure, and a first-class hotel and restaurant.

And, having seen an air liner depart for Paris, one can return home and tune it in, a much more interested listener for having seen the engines started up, the passengers go on board, the graceful take-off, and eventual disappearance over the horizon.

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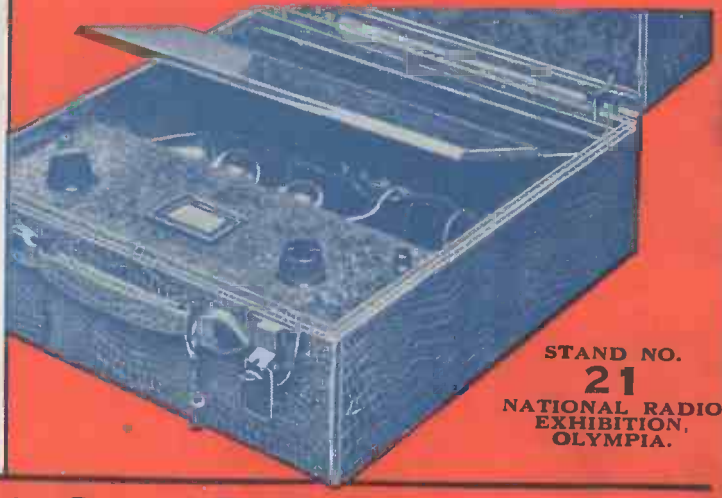

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