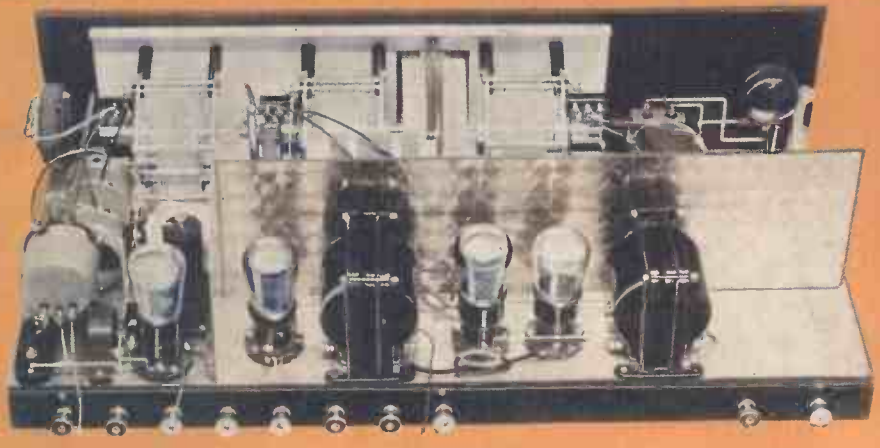
The Wireless Constructor

6d

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

Vol. XII. SEPTEMBER, 1931. No. 59.

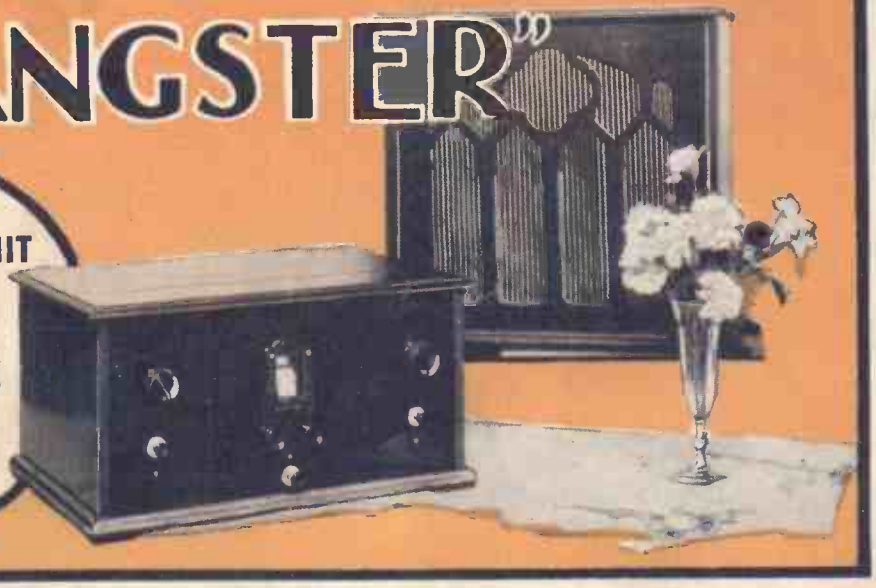
THE "EXTENSER" FIVE



DESIGNED BY VICTOR KING

ALSO IN THIS ISSUE

THE "GANGSTER"



AND DON'T MISS

AN "ALL-METAL" MAINS UNIT

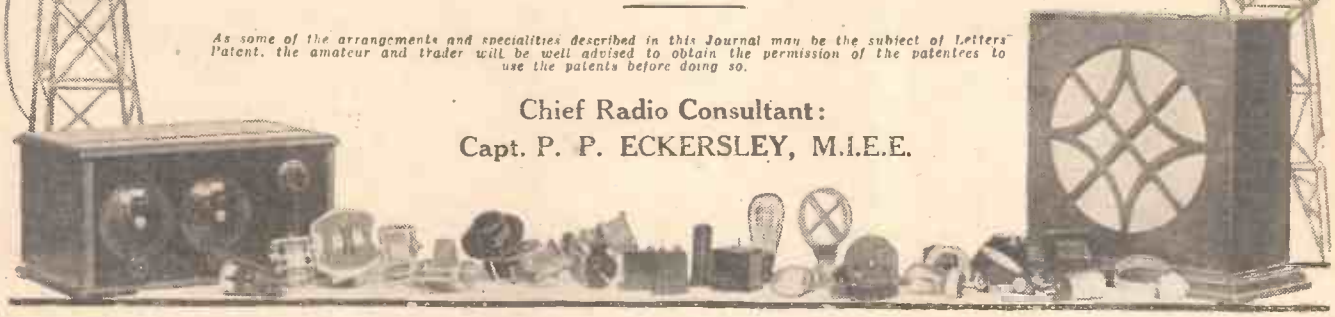
TWO-BAND TUNING TROUBLES

WATCHING VALVES WORK

AND THE OTHER CONTRIBUTIONS TO THIS EXCEPTIONALLY FINE NUMBER.

CONTENTS

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



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METALLISED VALVES

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The WIRELESS CONSTRUCTOR

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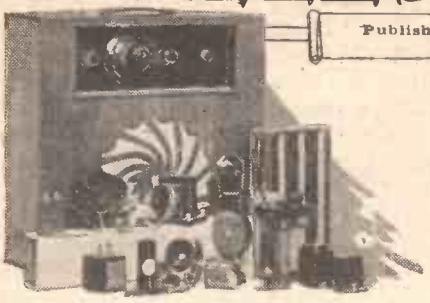
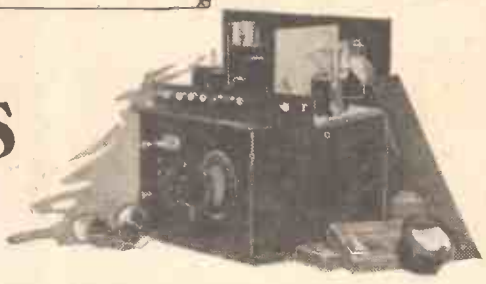


THE EDITOR'S CHAT



A few Notes concerning a New Receiver which emphasises and makes full use of the many Technical Advantages of Extenser Tuning.

SIMPLICITY in a set does not necessarily mean reduction in efficiency. Some people seem to have the idea these days that if you simplify a thing you automatically make it less efficient. This is a fallacy. Take a look, for example, at the "Extenser" Five in this issue of the WIRELESS CONSTRUCTOR.

A Long Range Receiver

If you examine the circuit carefully you will see that the application of an Extenser means that not only is there a considerable simplification of construction, wiring and operation, but, in actual fact, an *increase* in efficiency.

With an ambitious receiver such as this Five-Valver the advantages are even greater than they appear at first sight. In fact, I might say that the gain in simplicity increases as the square of the number of tuned stages employed.

When it comes to a question of ganging the Extensers, as in the "Extenser" Five, the receiver jumps away immediately from the ordinary stereotyped design and becomes a leading light in a super-class all by itself. Imagine the "Extenser" Five built without the use of the Extenser.

"Extensers" Essential

The set, despite its many advantages, would not be popular, for the simple reason that it would be one mass of knobs and panel controls, and a lot of other gadgets which, although they might look very impressive, would simply be a confounded nuisance when the set was operated.

In fact, I don't quite see how you could work the "Extenser" Five without the Extensers, unless an attempt were successfully made to gang wave-change switches. And a nice sort of job that would be! Even supposing it were successful, it would still be necessary to have a wave-change switch and two sets of dial readings.

For when you gang Extensers you automatically gang wave-change switches as well. Complications are smoothed away, and by no manner of means can it be indicated that there is the slightest loss in efficiency. In fact, considering the elimination of a lot of wires, points of contact, etc., it can be very easily proved that there is a gain in efficiency.

Briefly, in the "Extenser" Five you have three tuned stages with two S. G. valves working at maximum efficiency. You can tune in to any wave-length on medium or long broadcasting waves by using just a thumb control. If you can think of anything simpler, I should be very pleased to hear of it, and, in fact, pay any reader of the WIRELESS CONSTRUCTOR a fee for the idea!

The P.J. Coils

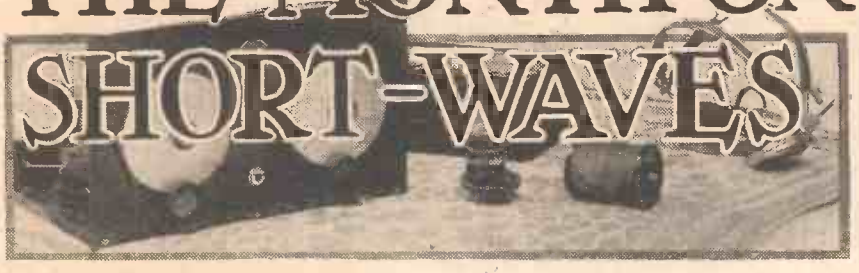
Naturally, such a fine tuning component as the Extenser calls for first-class inductances to go with it, and here I should like to mention the P.J. Coils and Coil Quoits. They make an ideal pair, and constitute one of the further special fixtures in the "Extenser" Five.

You will also find these coils used in The "Gangster"—another fine set which is fully described in this issue.

TRACKING THOSE THUNDERSTORMS

This film projector is used to locate lightning flashes recorded on cathode ray direction-finders, employed by the Radio Research Board. It keeps watch on the thunderstorms of a whole continent.

THE MONTH ON SHORT-WAVES



IT is rather gratifying to be able to commence my notes this month with the news that during this July of ours there has been a distinct improvement in short-wave reception conditions.

"Conditions" Improving

Our old friends, W 2 X A D and W 8 X K—both of whom for some weeks have been far removed from the "punch-merchant" class into which I usually put them—are at last beginning to come over at something like decent strength.

At the time of writing, W 8 X K is undoubtedly the better of the two. His signals are much more constant and seem to suffer less from fading. But static is pretty bad on both transmissions, in fact, during the last week I have been troubled with bad atmospheric noises on all the short-wave bands. Never mind, winter will soon be here.

By the way, for those of you who make a regular habit of listening to the Yanks, W 2 X A L no longer transmits on Fridays and Saturdays on his usual wave of 49·18 metres. On these two days you will find his signals (providing Moscow isn't on) on 46·6 metres.

The reason given for the alteration is that the normal wave is temporarily reserved for transmissions from the "Nautilus," the Polar submarine that is now on its way to the Arctic.

Incidentally, no one has as yet reported reception of signals from the "Nautilus," and I'm hoping that the distinction of being the first to do so will go to one of you CONSTRUCTOR readers. Who's going to claim the laurels?

"Nautilus" News

For those of you who are interested, the "Nautilus" transmits daily at 15.00 and 21.00 B.S.T., on a wavelength of 30·55 metres, under the call-sign of W S E A. As I have already mentioned, transmissions also take place on 49·18 metres, but I'm afraid I can't give you any regular schedule for this wave other than that it is some time on Friday or Saturday evenings, American time.

I was reminded the other evening of the WIRELESS CONSTRUCTOR Nairobi broadcast, for I came across C T 1 A A again. That was the first time I have heard him for weeks, and I found his signals right at the top of the amateur band.

I am continually receiving letters asking when we are going to organise another of these great Empire links on the lines of the Nairobi effort. While it is as yet much too premature to tell you anything definite, I have it on the best authority that the CONSTRUCTOR technical fellows are certainly not going to let it rest with just the one effort. G. M. (Eckington) and others kindly note, and look out for some fun later in the season.

Around 10 Metres

For those of you who are interested in pioneer work, my friend G 6 H P tells me that there are unlimited possibilities for record breaking on the 10-metre band. Already claims are beginning to come in, one of which—and, I think, a particularly noteworthy effort—is the reception by G 6 V P of C E 3 C H (Chile).

I believe that this is the first time on record that South America has been heard on 10 metres. If you do build yourself a 10-metre receiver, don't forget to report anything and everything you hear. So very little, comparatively, is known of the 10-metre band that reports of any kind are appreciated tremendously.

G. T. K.

"ON THE GRID"

FRAME aerials are springing up in the homes of radio enthusiasts like mushrooms. This is largely due to the revival of interest in the super-het, and it is quite surprising the number of firms who are turning them out.

Quite apart from this new interest, though, they have always been rather fascinating items, and as such are often constructed at home. The work is easy enough until one arrives at the question of how to swivel them, and in this connection I have a little suggestion to make.

A Useful Dodge

It is quite a practical one, for I have put it to the test myself. Briefly, then, provide the frame with a good solid base and stand it on one of those ball-bearing stands that are sold for portable sets. Yes, it's simple enough!

If the frame-aerial is on the light side, or the stand in need of a little running-in and therefore stiffish, you will have to clamp them together by some dodge. But I don't suppose you will find this necessary. I didn't.

Do you remember a month or so ago I remarked that it was time we had a combined reaction condenser and volume control? And how the very next month I told you an enterprising firm was marketing one?

Well, if you turn to the details of the "Extenser" Five, which is described on other pages, you will see that he has used one. And a neat component it is, too; little larger than an ordinary reaction condenser.

I recently had an actual demonstration of the usefulness of the Extenser. Strangely enough, the set concerned was quite a simple affair, *but* not using an Extenser. There was a tuning condenser, a reaction condenser, and two small switch knobs, one for wave-changing and the other for switching on and off.

The set was home-built, and soon after it had been finished I happened to drop in for a chat.

The Invaluable Extenser

When I got up to go, my friend went over to the set and—"click," he switched off. But as I passed the set I heard faint jazz coming through.

Wonderingly, I gave the condenser a twist and there was 5 X X at full blast. Instead of pushing in the L.T. switch, the proud owner had gone over to long waves by pushing in the wave-change switch, and the batteries might have been working all night.

Certainly an easy enough mistake, but it simply could not have happened with an Extenser. A. S. C.

THE "EXTENSER" FIVE

A magnificent long-range loud-speaker set that represents the very last word in receiver design.

By VICTOR KING

IF you want to take a self-styled expert down a peg ask him these two questions: "What are the advantages of push-pull amplification?" and "How does it work?"

There are probably more weird ideas current concerning push-pull than about anything else in radio. But having given you my "tie-him-up" questions, it is only right that I should volunteer some information.

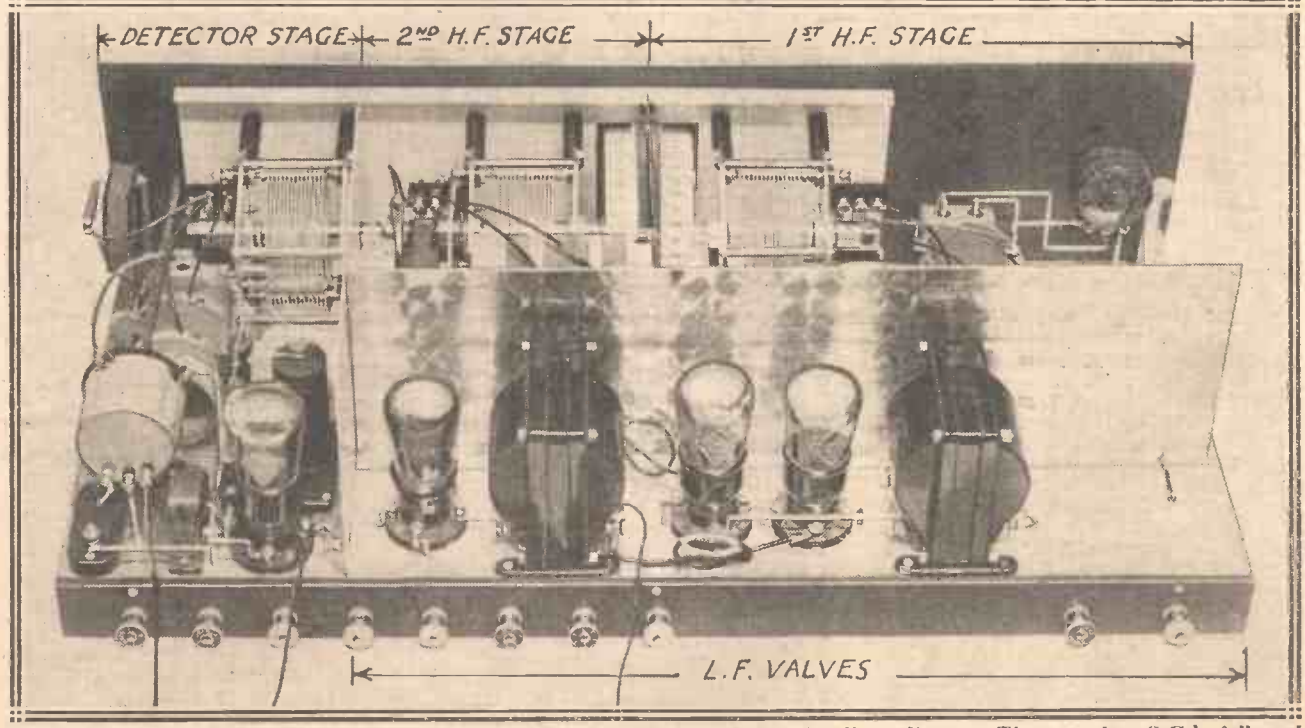
Very Economical

The volume that your set can handle is largely dependent on the H.T. voltage you have available. Even if you use a larger-size power valve, the grid swing it will take is, after all, governed by the H.T. applied to it.

Most of us are limited to a certain voltage, whether the limiting factor is our mains unit, batteries available, or voltage of D.C. mains; and this is where advantage number one comes in. With push-pull amplification and a given H.T. voltage you can handle considerably more volume without distortion than the ordinary methods.

Another great advantage lies in the fact that slight overloading and peak effects at certain frequencies are by

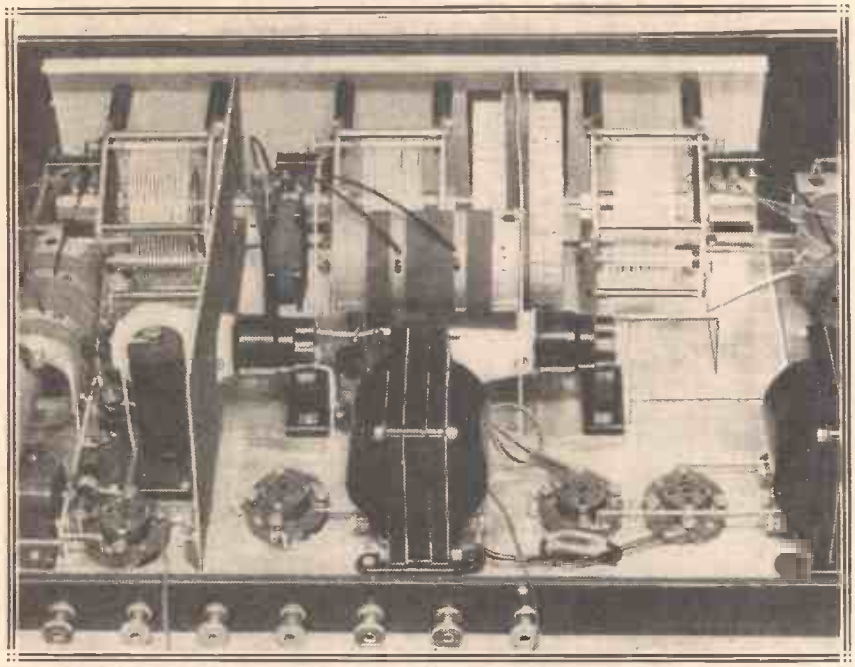
IT INCORPORATES THE LATEST ACHIEVEMENTS IN RADIO ENGINEERING



One look at this striking set is enough to convince anyone that it is something out of the ordinary. There are two S.G.'s followed by a detector and two L.F. stages, the last of which employs a pair of valves in push-pull. And then, to crown it all, there is a special Extenser assembly, the many advantages of which Constructors will immediately appreciate.

The "Extenser" Five—*continued*

THE S.G. VALVES MUST BE EFFICIENTLY SCREENED



This photograph gives a splendid view of the very effective screening employed in the H.F. stages of this receiver. There is still one more screen, however, which is not shown here, as it was removed to enable you to see the S.G. valves. Note the detector and L.F. valve holders in the foreground.

no means so pronounced in a push-pull amplifier. This is due to the balancing effect of the anode currents of the two power valves, which, incidentally, also makes it impossible for the primary of the output transformer to be so loaded that the core becomes saturated.

So much for the advantages, now for the working. When an L.F. inter-valve transformer is in operation the end of the secondary attached to the grid of the valve is rapidly changing from positive to negative, and negative to positive, in relation to the filament end of the winding.

If we now make a tap at the centre of the secondary and join this to the filament, when one end is positive in relation to this the other will be negative to it, and vice versa. By connecting the two ends to the grids of two power valves we get our push-pull arrangement.

Special Transformers

When the grid of one valve is negative the other is positive, and when the anode current of one valve goes down the other goes up. But each valve deals with only half the voltage generated across the ends of the secondary, because of the mid-way tap.

If the two anode currents were passed through the primary of a transformer by direct connection to one end of it, they would merely cancel one another out. So they are fed to either end of a centre-tapped primary; thus they flow in opposite directions and, adding together, give a voltage change across the secondary equal to that of one valve with double the grid swing applied to either of the power valves in the push-pull case. That is why valves in push-pull will handle much more power than similar valves used in the ordinary way.

ALL THE PARTS YOU REQUIRE ARE INCLUDED IN THIS COMPREHENSIVE LIST

1 Panel, 24 in. × 7 in. (Permcol, or Becol, Peto-Scott, Parex, Goltone, Wearite, etc.).
1 Cabinet to take above panel, with baseboard 10 in. deep (Pickett, or Ready Radio, Camco, Osborn, Gilbert, Peto-Scott, Langmore, etc.).
1 ·0005 triple double-drum-drive Extenser (Cyldon).
1 50,000-ohm three-terminal type volume control (wire-wound) (Sovereign, or Magnum, Wearite, Watmel, etc.).
1 Three-contact L.T. switch (Wearite, or Ready Radio, Junit, Bulgin, Magnum, etc.).
1 Combined reaction condenser (·0001 mfd.) and volume control (1 megohm) with fixing bracket and extension rod (Magnum).
2 Horizontal-mounting type 4-pin valve holders (Parex, or Junit, Bulgin, etc.).
4 Ordinary 4-pin valve holders (Telsen, or W.B., Igranic, Lotus, Clix, Bulgin, Benjamin, Junit, Formo, Wearite, Dario, Magnum, etc.).
1 ·0003-mfd. fixed condenser (T.C.C., or Graham-Farish, Formo, Watmel, Igranic, Ferranti, Ediswan, Dubilier, Telsen, Ready Radio, etc.).
2 ·001-mfd. fixed condensers (Ferranti, or see above).
3 ·01-mfd. fixed condensers (Dubilier and Mullard, or see above).
4 1-mfd. fixed condensers (T.C.C. and Helsby, or Hydra, Dubilier, Mullard, Igranic, Ferranti, Formo, Peto-Scott, etc.).
1 2-mfd. fixed condenser (Ferranti, or see above).
3 Coil quoits (Ready Radio, Peto-Scott, Wearite, A.E.D., etc.).
4 oz. 30 D.S.C. wire for winding above.
1 P.J.2 coil (R.I., or Wearite, Tunewell, Goltone, Peto-Scott, Ready Radio, Parex, Watmel, A.E.D., Formo, Ferranti, Lewcos.).
2 P.J.3 coils (R.I., or see above).
3 H.F. chokes (Ready Radio, Lewcos, and Telsen, or Peto-Scott, R.I., Lotus, Dubilier, Varley, Parex, Wearite, Watmel, Magnum, Sovereign).
1 2-megohm grid leak (with connecting wires or terminals) (Igranic, Dubilier, Graham-Farish, etc.).
1 Push-pull input transformer (Ferranti A F.5C., or R.I., Varley, etc.).
1 Push-pull output transformer (Ferranti O.P.M.1C., or see above).
3 600-ohm Spaghetti resistances (Lewcos and Bulgin, or Ready Radio, Peto-Scott, Graham-Farish, Magnum, Sovereign; Telsen, Varley, etc.).
3 30,000-ohm Spaghetti resistances (Peto-Scott and Magnum, or see above).
1 100,000-ohm Spaghetti resistance (Varley, or see above).
1 Fuse (Belling & Lee, or Ready Radio, Magnum, Peto-Scott, Bulgin, etc.).
3 Copper screens, all 5 in. high. One 18 in. long, one 9⅜ in., and one 6 in., the last two having holes for S.G. valves (Parex, or Ready Radio, Peto-Scott, Wearite, Magnum, etc.).
1 Piece copper foil, 24 in. × 10 in. (Ready Radio, or see above).
2 Panel brackets (Magnum, Peto-Scott, Collett, etc.).
1 Terminal strip, 24 in. × 2 in.
10 Indicating terminals (Eelex, or Belling & Lee, Igranic, Clix, etc.).
3 Battery wander plugs (Clix, Eelex, Belling & Lee, Igranic, etc.).
Glazite or Lacoline for wiring.
Flex, screws, six spring clips, etc.

The "Extenser" Five—*continued*

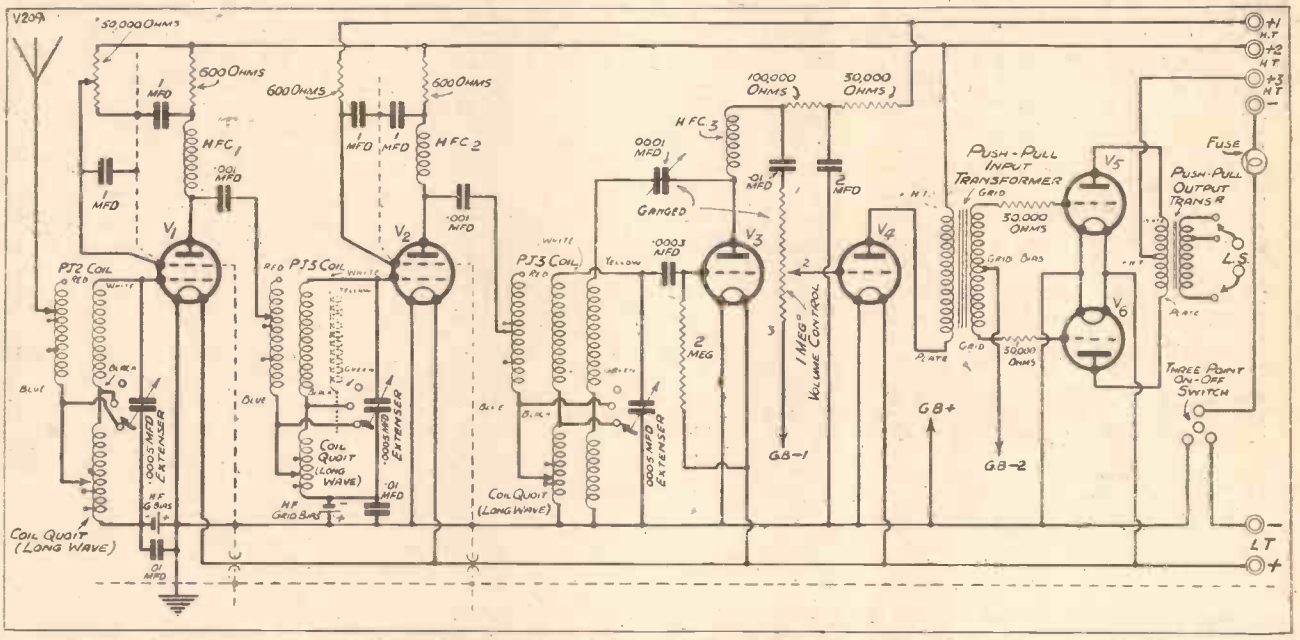
Push-pull, then, is just the sort of thing one would expect to find in a real super set. Consequently I have employed it in the "Extenser" Five, which is the last word in "hot-stuff" receivers.

from one another, and this is explained in a special photograph.

The long-wave coils are home-wound on coil quoits, and the medium-wave ones can also be wound at home if desired.

As the coils, if made at home, must be wound before they can be fitted in place, I am going to tell you all about them right away, and then when you commence to assemble the set you will have a straightforward job.

A ONE-HUNDRED PER CENT COMBINATION OF SELECTIVITY, QUALITY AND POWER



A few years ago even an expert would hesitate to tackle such an enterprising set as this, but thanks to modern components and really effective screening, not forgetting the Extenser, it is now within the scope of any home-constructor. It gives excellent results, too, and is one of the most powerful designs we have published.

It is intended for those who want a set that is the finest possible in range, volume, and quality. Nothing has been spared to make it one hundred per cent efficient in every way.

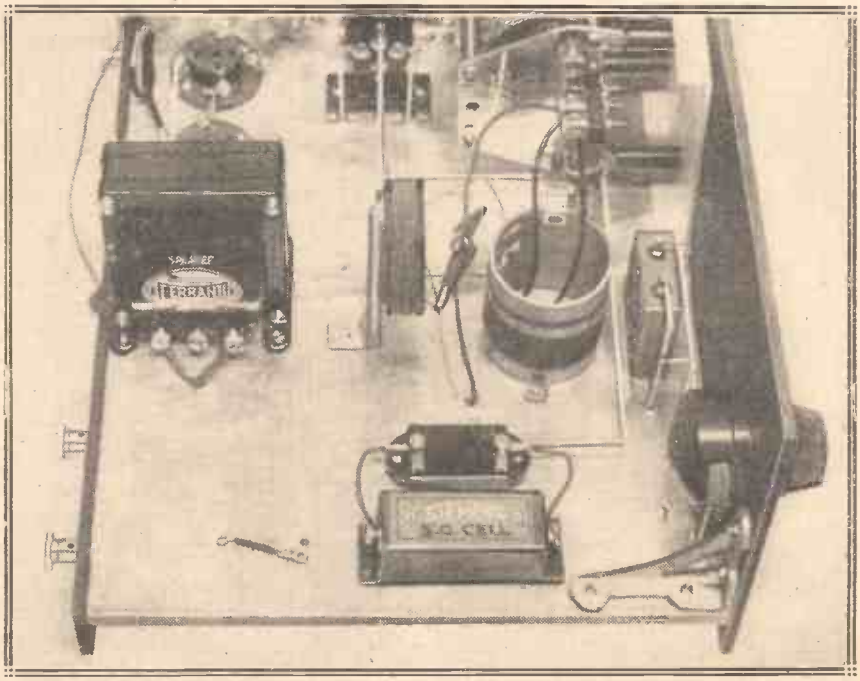
You will see from the circuit diagram that actually six valves are used although it is called a "Five." The "five" in this case refers to the number of stages; two valves, of course, going into the push-pull stage.

Ample Amplification

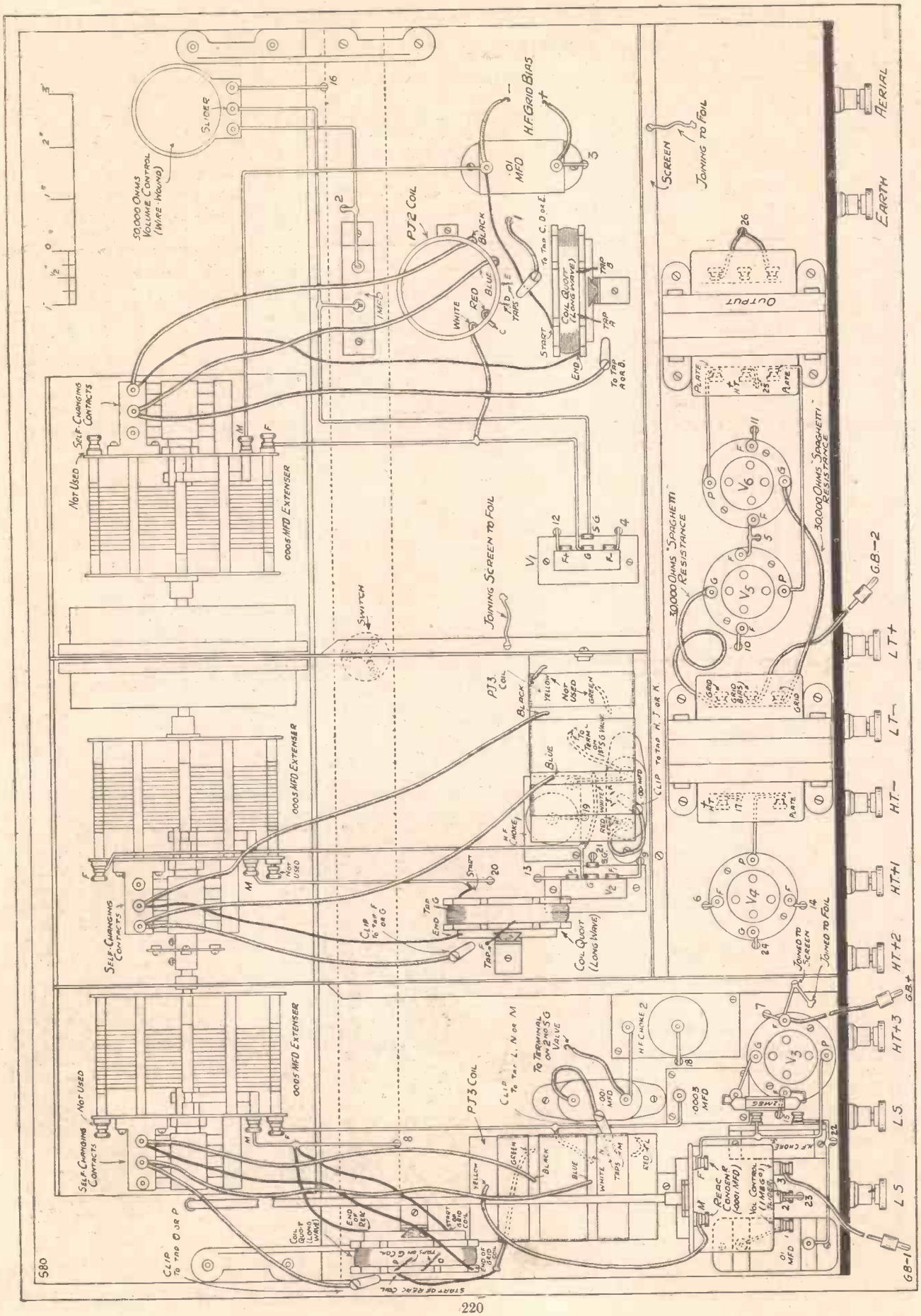
First of all there are two S.G. valves, both fully tuned, then a detector, resistance-capacity coupled to the first L.F. valve, which is followed by the output valves. The second H.F. stage and the detector are tuned by a ganged section of the triple-drum Extenser used for tuning.

This Extenser does away with the three wave-change switches that would otherwise be necessary for changing from one wave-band to the other. A big feature of the set is the way the various circuits are screened

IT USES OUR NEW COILS



Here is the input end of the receiver. The new P.J.2 aerial coil with its long-wave "Quoit" can be seen in the centre of the photograph. The push-pull outpu transformer is on the left.


SLIDER
50,000 OHMS VOLUME CONTROL (WIRE WOUND)
PJ2 COIL
BLACK
WHITE
RED
BLUE
H.F. GRID BIAS
.01 MFD
COIL QUOIT (LONG WAVE)
START
END
SCREEN
JOINING TO FOIL
AERIAL
EARTH
OUTPUT
SELF-CHANGING CONTACTS
NOT USED
.0005 MFD EXTENSER
SWITCH
JOINING SCREEN TO FOIL
V1
V2
V3
V4
V5
V6
30,000 OHMS "SPAGHETTI" RESISTANCE
G.B.-2
L.T.+
L.T.-
H.T.-
H.T.+1
H.T.+2
H.T.+3
G.B.+
L.S.
G.B.-1
PJ3 COIL
YELLOW
GREEN
BLUE
RED
.001 MFD
.0003 MFD
H.F. CHOKE
PEAK CONDENSER (.0001 MFD)
VOL. CONTROL (1 MEGO)
580

The "Extenser" Five—*continued*

If you buy the P.J. coils ready made you will only have the Coil Quoits to wind, and they won't take more than a minute or two. So let's go into making the medium-wave coils first.

I think it will be a good idea to give a list of the few materials needed. There are three medium-wave coils, so three plain formers of insulating material are required.

These should all be 2 in. in diameter, two of them being 3 in. long and the other 2 in. long. The wire to use is 30 gauge D.S.C., and I expect you will require some beyond the ¼ lb. mentioned in the list of components. That ¼ lb. is for the Coil Quoit windings.

That's all you want; there are only two items, so perhaps it was hardly correct to call it a list, still it helps to emphasise the simplicity. Now for the actual winding.

The P.J. Coils

We will start with the P.J.2 coil, which is wound on the 2-in. piece of tubing. Secure the wire by means of two small holes about ¼ in. from one end of the former. The beginnings and ends of all windings on all the coils should also be fixed by threading in and out of two such small holes.

This winding consists of 9 turns tapped at 4 and 6 turns from the beginning. These taps are made by twisting small loops in the wire, and afterwards baring them of insulation.

Before proceeding farther we must pause to consider the method of identifying the various connections to the coils. On commercial versions different-coloured flex leads serve this very useful purpose.

We will use this scheme also for our home-wound ones, but as it is unlikely that you will be able to produce at short notice the various coloured pieces of wire, you can write the colours on small pieces of paper and attach these to their proper leads.

The beginning of the coil we have just wound will be "red" and the end "blue." The beginning of the next winding will be "white" and should be started ⅜ in. farther along the former.

It is wound in just the same direction and has 64 turns, there being no taps to make on it. The end is "black."

That, you may be a little surprised to hear, finishes the first coil, and the other two are hardly any more

THE "WIRELESS CONSTRUCTOR" "EXTENSER" FIVE

Circuit: 2 S.G., det., 1 R.C., and 1 push-pull L.F. (Six valves and dual wave-range.)

VALVES.

1st (in left-hand compartment): Screened-grid type.
2nd (in centre compartment): Screened-grid type.
3rd (in right-hand compartment): Special detector type or H.F. type.
4th (right-hand one in back compartment): L.F.
5th and 6th (same name and types): Power. May be small or super. Use former if dry battery H.T. is employed.
All directions given as though looking at front of set.

CONTROLS.

Switch set on and off with bottom centre knob. Pull out for "on."

Tune on double drum immediately above. Keep reading about same on both drums and search by moving both at once. Make fine adjustment when station is heard, by moving drums separately.

Left-hand knob is pre-detector volume control. Cut volume down with this when working on local or nearby powerful stations. Adjust for most sensitive position for distant reception.

Right-hand knob is combined reaction and volume control. Turn completely anti-clockwise for minimum volume. As it is turned to the right, volume control changes to maximum volume, where it then remains set while the reaction condenser comes into operation.

VOLTAGES.

L.T.: 2, 4, or 6, according to rating of valves used.
G.B. for 2 H.F. valves: 1½ volts each.
H.T.+1: 60 to 80 volts.
H.T.+2: 120 or 150 volts.
H.T.+3: Up to maximum H.T. voltage rating of power valves used.
G.B.—1: 1½ to 4½ volts. Find best value by trial.
G.B.—2: Depends on power valves used and H.T. applied to them. Be guided by makers' data.

NOTES.

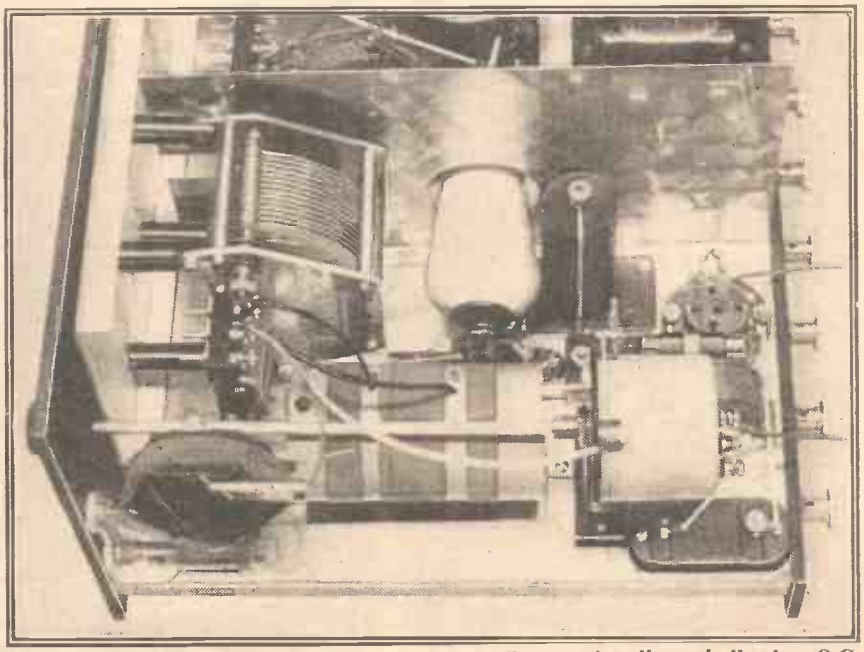
Two-figure readings on Extensers are medium waves; three-figure, long waves.

The long screen parallel to panel must be removed for purposes of inserting 1st S.G. valve.

There are six coils, three solenoid type and three hank type. They all have two taps each, and a spring clip on end of flex lead goes to one tap in each case. The better tap of the two should be used, and will depend upon conditions under which set is used and degree of selectivity required. It should be found by trial.

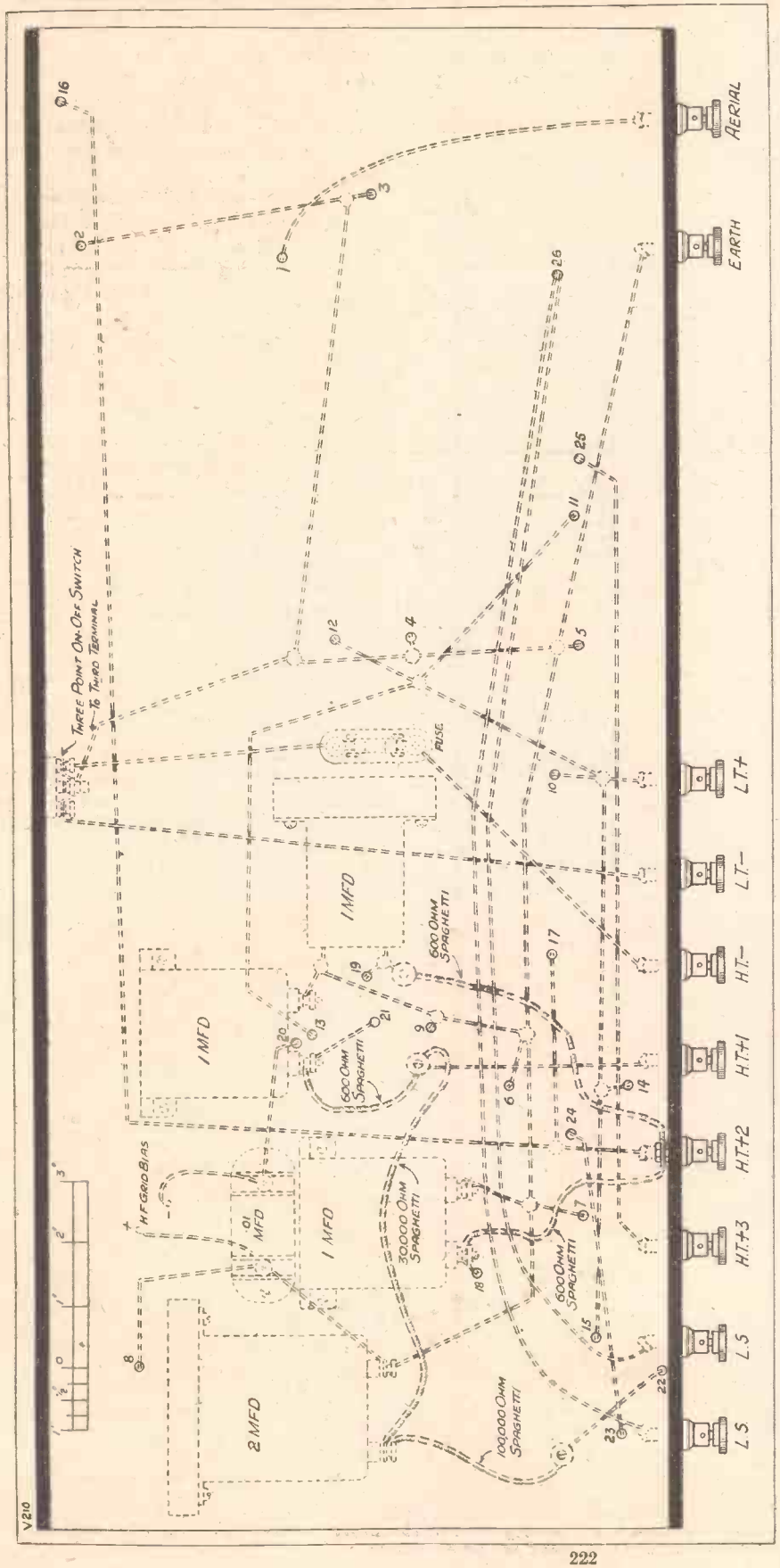
Try all combinations of three output terminals on secondary of output transformer to find which suits loud speaker best.

THE END OF THE "S.G." STAGES



This is where the amplified energy emerges after passing through the two S.G. valves. It is then rectified by the valve which normally occupies the holder on the right. The coil in front is a P.J.3.

The "Extenser" Five—*continued*



difficult. Perhaps I should say they are just about as easy!

Both P.J.3's are identical with the exception that you will only want a reaction coil on the last one. If you buy them the winding will already be there, so you just ignore it. Start off in the usual way about $\frac{1}{4}$ in. from one end of one of the larger lengths of former. The first winding, the primary, in this case has 30 turns tapped at the 10th and 20th turns from the beginning.

Easy to Wind

The colour indication is the same as before for this winding and also for the next, which starts $\frac{3}{8}$ in. farther along as before. Winding in the same direction, put on 64 turns.

That leaves the reaction coil to go on, which is another $\frac{1}{4}$ in. farther along the coil and also in the same direction as the other windings. It has 34 turns, and the beginning colour is "green," while its end is "yellow."

For the long waves, take a Coil Quoit, secure the end of the wire through two of the holes provided, and away you go. The first winding (all windings are put on in rough hank fashion) consists of 150 turns with taps at the 20th and 40th turns from the beginning.

There is only this one winding to the first two long-wave Quoits, namely, the ones associated with the P.J.2 coil and the medium-wave coil in the centre screened section. The one which goes in the detector section has a similar winding to start with, but also has a reaction winding on top of it.

Before putting on this extra winding, which is in the same direction as the first one, wrap a piece of stout paper or a piece of Empire tape round the first winding. Then proceed to put the other on top; it has 60 turns.

Metal Mountings

Now you really have finished the winding; not a bad job, was it? The method of mounting the coils I can safely leave to you.

You can make neat little metal brackets, or devise some other scheme. The latter is easy if you start by fitting pieces of wood across the inside of one end of the various formers.

When you reach this stage your "Extenser" Five will be well under way. Before going on with details

The "Extenser" Five—*continued*

of the assembly I think we had better take a careful look at the diagrams and photographs and note the general method of construction.

But just one other point, collect everything you need in the way of components and materials together before you start construction, and make sure they are all of the right type and will fit into place. The set is extremely compact and it is very necessary that you stick to the layout shown, or the receiver may turn round and bite you when you come to try it out.

That point about compactness is the first you will spot on looking over the general design. You will agree that not a bit of space has been wasted.

Novel Layout

Next you will discover that instead of working from one end of the baseboard to the other, the "practical circuit," as it were, starts at one end, goes along next to the panel to the other end, and then works its way back again to the end at which it started.

This, with the aid of the long screen running parallel with the panel, enables very efficient screening to be effected. Each S.G. stage and the detector have entirely separate sections to themselves, and both the L.F. stages are in a compartment by themselves and completely screened from the rest of the set.

There is one other point, and that is, the baseboard is arranged so that its top is 1½ in. up from the bottom edge of the panel. With a ⅜ in. thick board this leaves 1⅛ in. underneath.

There are a number of large fixed condensers tucked away out of sight below the baseboard, and it is quite possible that 1⅛ in. will not be sufficient for some makes. If it is not quite enough room for the ones you are going to use, just arrange the baseboard an ⅛ of an inch or so higher up the panel. This alteration will not affect any other details at all.

ASK FOR THESE ACCESSORIES

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

Accumulator. (Voltage to suit valves.) Capacity about 30 amp. hr. actual or more. (Oldham, Exide, Pertrix, Ediswan, G.E.C.)

Mains Units (with suitable taps). (Heayberd, Lotus, R.I., Atlas, Tannoy, Ekco, Regentone.)

H.T. Battery (120 or 150 super or triple capacity). (Ever Ready, Drydex, Pertrix, Grosvenor, Fuller, Siemens, G.E.C., National, Oldham.)

1 18-volt G.B. battery, and 2 1½ or ·9-volt G.B. batteries (see above list).

Valves (2 S.G. type, 1 H.F. type, 1 L.F. type, and 2 power type). (Mazda, Cossor, Osram, Mullard, Eta, Marconi, Six-Sixty, Fotos.)

The method of constructing the set is the same as that for any other receiver—you drill the panel, mount the components, and so on. In spite of its elaborate nature, it is merely a matter of taking a little longer over the work in the case of the "Extenser" Five.

The main thing is to follow the diagrams carefully, and, let me repeat even at the expense of being accused of rubbing it in, paying special attention to the layout. Of course, the diagrams really explain everything, as properly drawn-up diagrams should, but there are nevertheless a number of points that can stand a bit of extra elucidation.

So I am now going to deal with these in the order in which you are most likely to come up against them. That is, say, dealing with component-mounting points first, and then going on to wiring details, and so on.

To start off with there are a number of remarks to be made about the components. The first of these concerns the H.F. chokes, of which there are three.

Limited Space

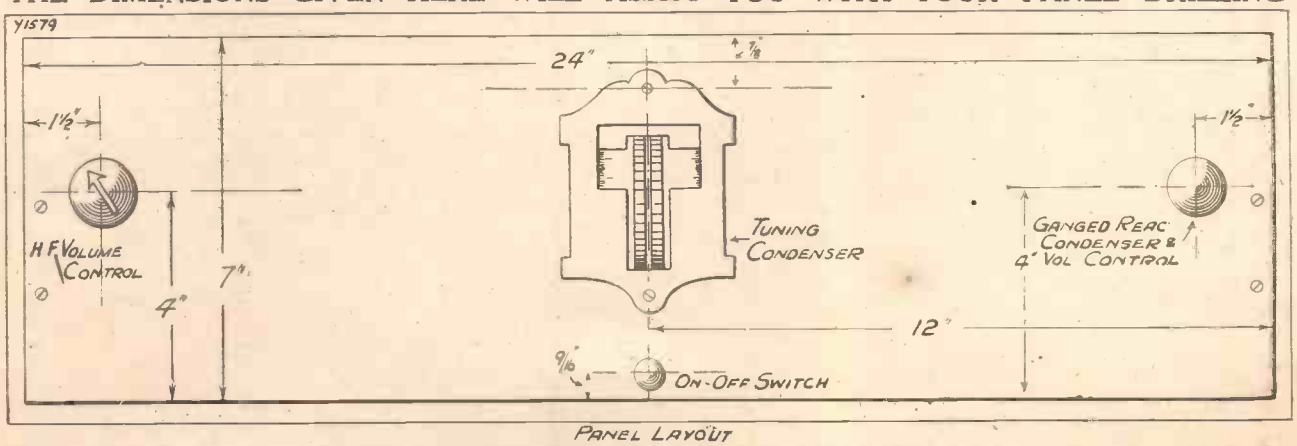
Two of these are tucked away in very small corners, and consequently must be of small dimensions, a point to bear in mind when buying these components. The two referred to are the one in the centre screened compartment, and the detector's H.F. choke, which is situated right next to and almost beneath the combined reaction condenser and volume control.

This latter is an entirely new component, which avoids the necessity for separate reaction-condenser and L.F.-volume-control knobs. Its action is as follows.

Over the first half of its movement, starting with it turned fully in an anti-clockwise direction, the volume-control part varies from minimum to maximum. When maximum is reached, the volume control remains set in that position, and turning farther to the right causes the reaction

(*Please turn to page* 263.)

THE DIMENSIONS GIVEN HERE WILL ASSIST YOU WITH YOUR PANEL DRILLING



PANEL LAYOUT

The preparing of this panel should not present you with any difficulty. When mounting the Extenser assembly, however, take advantage of the very useful template supplied.

QUEER QUERIES

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

By P. R. BIRD.

A "Paratune" Puzzle

WOULD you have known how to find the following fault, which greatly puzzled a builder of the A.C. "Paratune"?

Here are his own words:

"I built the set in February, when it first came out, and it went fine from the word 'Go.' On medium waves I clearly identified exactly fifty stations, and sixteen on the long waves. There were plenty of others, but the above I actually identified by programme. My best capture was W P G, Atlantic City, New York, on 272·6 metres. (This was at 3 a.m., after a dance. It is the only occasion I have tried for America this year!)

"Naturally, I was proud of the set. Imagine my consternation when, some weeks ago, it seemed 'off colour.'

"This got worse, and then *quality*—always very good indeed—started to fall off. It is now so bad I am ashamed to let anyone hear the set.

"As nothing on it has been altered, and voltages at plates, screening grid, etc., are O.K., I cannot think what has caused such a set to give rotten results after only five months."

The Sleuths at Work

Now, if that had been your set, would you have known what to suspect? Well, this is how the Query Department figured it out from the above information.

To turn such a good set into a bad one the fault must be a very serious one, and not a broken lead, or it would have caused the set to stop working suddenly.

Not a dud contact, or there would be scratching, and "come and go" effects. Not a bad aerial or earth, or quality would not have fallen off. Not an H.T. supply fault.

What is left? Some fault in the heater supply, or in the valves, or in one of the remaining components. Neither a power-supply failure nor a component fault is likely to show up *gradually*. (They are generally all right one day and wrong the next!)

With valves, on the other hand, faulty emission nearly always comes on as described, and quality goes. So a milliammeter test was suggested.

Result: power valve's emission found to have gone west, giving only 7 milliamps. when bias reduced right to zero. New valve plugged in. Miles of smiles!

"Not a Sound"

Quite a different class of fault was recently the cause of much sorrow in Staffordshire. From that county a Cannock reader wrote a long letter, the burden of which was "not a sound."

He had built a straightforward Det. and 2 L.F., spending precious time and money on it—"and not a sound." Disconnected batteries again, checked every wire and joint with a careful friend's assistance, connected up again—and not a sound!

Valves worked O.K. on his pal's set. Batteries (new) ditto. Aerial and earth worked with his crystal set. Battery connections good, plugs tight-fitting, etc. But still this awful silence.

And, of course, that silence was just what gave the game away. You can guess the trouble, I expect?

When you can't get even an "H.T. click" from a set it is a sure sign that either the loudspeaker is out of action altogether, or else no H.T. is going to the last valve.

Investigation showed that in this case the H.T. negative lead had a fuse in it, consisting of a flashlamp bulb. The bulb holder was of a cheap porcelain type, and although it was screwed tightly and "held" the bulb, it was not making contact with the little blob in the centre of it. Consequently no H.T. was getting to the set. A new holder put things right.

And then even the friend—who had been openly sarcastic about the set—had to admit it was a winner. "Eh, lad, he did and all!" as they say in Cannock.

A DROP IN TIME—

If someone accidentally kicks your accumulator over, or the man at the charging station does not give it a wipe-round and acid gets on the carpet, a little liquid ammonia applied immediately will "save the situation."

HOW'S THE SET GOING?

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

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

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

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

Watch Those Screens

The increasing use of metal foil for screening seems to be inevitable. And although most constructors realise that, being an earthed conductor, a screen must be treated with great respect, occasionally somebody forgets, or else gets careless.

To save unnecessary and very expensive displays of "fireworks" and sparks, may I remind all who construct screened and "foiled" sets that no wire must touch the screen unless it is supposed to.

If you allow a G.B. lead to dangle on it, or an H.T. plug to touch it, the screen is probably going to short something, and you are going to be out of pocket.

TWO-BAND TUNING TROUBLES

BY VICTOR KING

The division of European broadcasting into two distinct groups of wave-lengths, which are generally styled "ordinary" and "long," is viewed with mixed feelings by many enthusiasts.

However, as our popular contributor points out, it gives us quite a bit to be thankful for, and, anyway, set designers are making the very best of these ether conditions.

Our new coils, for instance, are designed to give completely equal treatment to both bands and . . . but read about them in this informatively engaging article.

THERE is one thing the British radio industry has to be very thankful for, and this is that the broadcasting of Europe is divided into two distinct wave-bands, wave-bands that cover such wide areas that it is impossible to deal with them, at any rate with any efficiency, using one tuning coil and one variable condenser.

Where Europe Scores

Had it not been for this there is no doubt whatever that the British market would have had dumped into it all the superfluous radio receivers of the slumping American industry. As it is, enough of these U.S. sets are pouring into the country to cause no little perturbation in the "trade."

Our double-band broadcasting certainly may have its drawbacks—and we will deal with these later—but it also has its very obvious advantages, quite apart from any commercial aspects of the question. For instance, the good sprinkling of long-wave stations that exists gives us a respectable distant-programme service at all times of the day.

The ordinary wavers beyond a certain distance are gravely subject to fading. Even our powerful North Regional fades to Londoners; but even though the "Heaviside" is in its most difficult mood, the long-waver remains comparatively unaffected.

Reliable Long-Wavers

For example, you can pick up stations such as Radio-Paris or Konigswusterhausen, and, once you have them tuned in properly, can rest assured that they will stay put; and I, personally, maintain that unless you can rely upon a station retaining that even strength it has no real programme value.

I know there are those who enjoy manipulating the controls of the set with as much zest as a motor-car fan enjoys fiddling with his ignition and other controls, but I do not believe that lasting satisfaction results from radio if it is regarded merely as a medium for the expression of one's manual dexterity.

Indeed, I am convinced that without the solid foundation of pleasurable appreciation of the good things in the way of programme items that there are to be sifted out of the ether, radio can remain only a serious study for those with engineering inclinations or a passing craze.

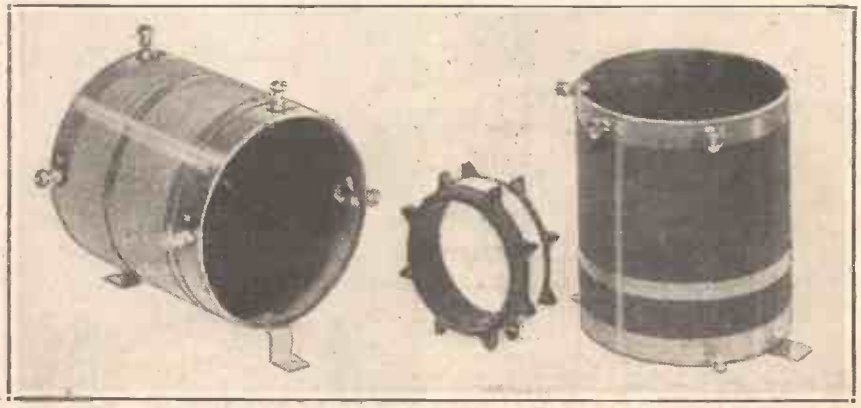
But surely every constructor does not build sets merely for the sake of building them; the majority obviously do so in order to get better results. And better results mean, of course, more programmes at superior quality and with less trouble. That, at least, is the aim of the set designer who originates designs for others to copy.

The Extenser

It was in pursuance of this idea that panel wave-changing was evolved, to replace plug-in coils, switches being provided on the panel to enable the apparatus to be changed over in a moment to another wave-band with its complete scheme of new programmes.

But progress is such that even the wave-change switch is now practically dead. The Extenser gives both wave-bands all on the one dial and quite automatically. Indeed, as has already been pointed out in the WIRELESS CONSTRUCTOR, the terms "ordinary wave-band" and "long wave-band" have now largely lost their original meanings. Probably the listener of

ATTAINING THE VERY HIGHEST EFFICIENCY



In the centre of this photo is a Coil Quoit, which is a special former designed for the accommodation of various windings. Any number of Coil Quoits can be fitted together, by the lips and grooves moulded in them, to form complete tuners and transformer assemblies. Also in this photo are seen a P.V.1 (left) and a P.V.2 coil. Together these comprise a most efficient two-band tuner, especially suitable for use with an Extenser.

Two-Band Tuning Troubles—*continued*

the future will not worry at all about such arbitrary groupings. His Extenser dial will direct him to any station he desires, either long or ordinary wave, without the necessity for the comparatively crude "gear-changing" of the parts concerned.

At present, of course, we are in the period of transition, and no doubt for some months, if not years, the panel wave-change will struggle for existence, although its inevitable obsolescence and eventual complete collapse into the obsolete are two of the few things we can safely predict.

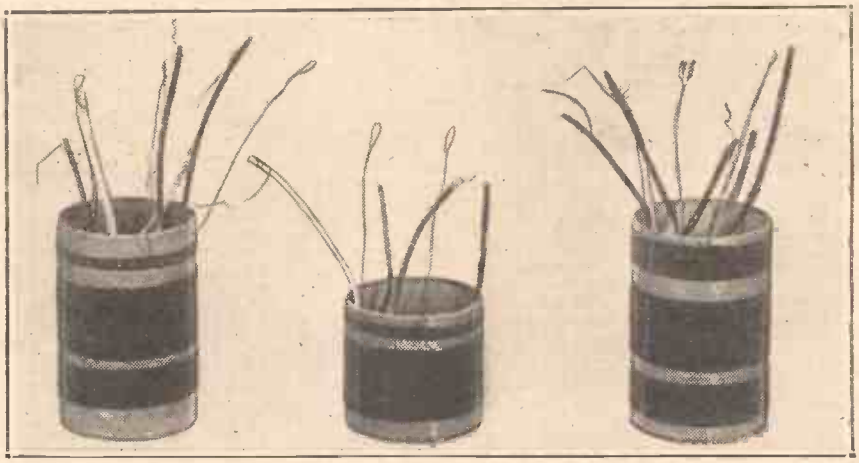
Placing the Coils

In the meantime, however, there is a behind-panel problem of no small dimensions. The difficulties of the actual change-over from one set of inductances to another are solved, but we are still feeling our way in regard to the disposition, electrically that is, of the inductances concerned.

The uninitiated might consider that there is a very straightforward solution in the provision of tappings on the one-coil arrangement; but this is not the case, because idle windings are apt to absorb energy from live windings, and such losses cannot be suffered in a modern design.

A very successful means of overcoming the difficulty is to be seen in the extremely popular "P.W." dual-range unit; this comprises a scheme of paralleling windings for the ordinary waves, and separating the long-wave section for its single use on the appropriate wave-band. Now, however, we have been able to go a step farther.

A SIMPLE IDENTIFICATION SCHEME



Here we have (from left to right) P.J.1, P.J.2 and P.J.3. These coils have coloured wires to denote the various winding ends. P.J.1 is a medium-wave tuner with reaction, and P.J.2 is similar, but minus reaction. P.J.3 is an intermediate coupler with reaction. The P.J.'s are generally used in conjunction with Coil Quoits; the other photo on this page gives you an illustration of this "pairing."

In principle the new coil units which will appear in future WIRELESS CONSTRUCTOR receivers are not novel. Their claims to originality lie in their electrical characteristics and in the definite manner of their use. Briefly, this is the fundamental *motif*, as it were, underlying their application.

Two complete sets of inductances are joined in series, and their added values provide inductances suitable for tuning-in the long-wave stations, but by simple switching it is possible to short out sections and thus reduce the effective inductances so that the ordinary-wave stations can be handled.

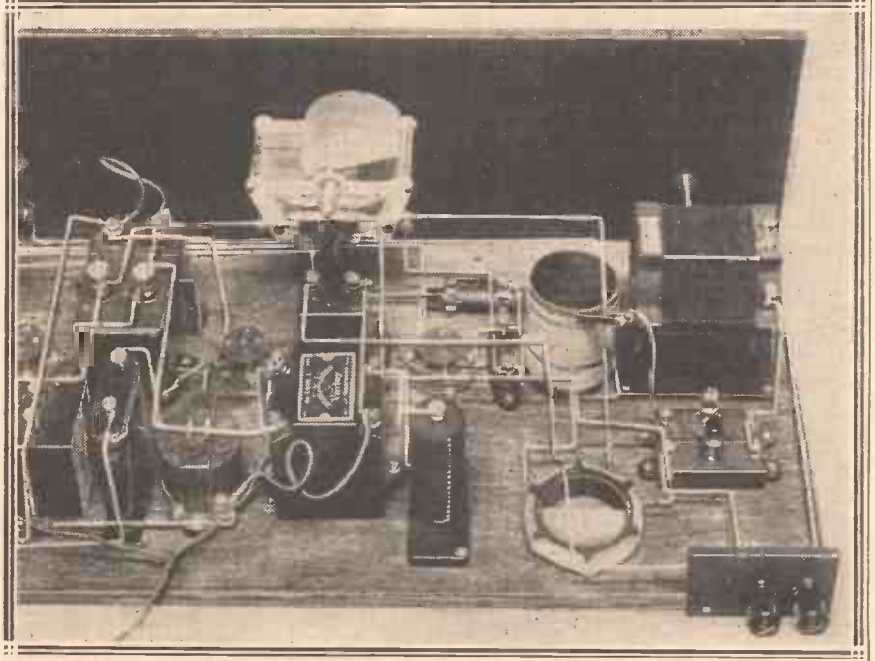
Complete Isolation

Those windings which are now shorted out are all wound on separate formers, which are removed from those having the other windings on them. Therefore, when you are on ordinary waves, the shorted-out long-wave sections do not tend to draw away energy. They are no more potent than ordinary wire externally connected to the earth terminal of the set.

The switching cuts right across and isolates the inoperative turns. We feel that we have at last approached mighty close, if not entirely equalled, the indisputable merits of plug-in coils with a system applicable to the ever-simplifying Extenser.

We are also going to use Coil Quoits in order to cheapen and simplify the long-wave sections and other windings. Needless to say, smooth and completely virile reaction is possible on both bands with this new system.

NOTE THEIR NEATNESS



The "Wireless Constructor" A.C. "Ace" employed a P.J.1 coil for the medium waves, in conjunction with a winding accommodated on a Coil Quoit for the long-wave loading. The total cost of this very effective two-band tuner runs into only two or three shillings, despite the fact that it gives really wonderful results. The remaining coil in this set is one of our "Paratunes."

SAVOY HILL —NEWS—

Dialect in the North—The Wireless Theatre Orchestra—A Swedish Band—Provincial Music Directors for London—Russian Opera from Paris—Mr. Levering Tyson in Europe—B.B.C. Dance Bands—Conductors' Whims.

Dialect in the North

I HAVE listened a good deal to the excellent transmissions from Moorside Edge, and have been impressed not only by the unexpectedly good strength and technical quality, but also by the pleasing programme characteristics. Not the least of these has been faithful adherence to the main dialects of the vast population on either side of the Pennines.

It seemed to me that the variety entertainments were much more robust and by no means lacking in art. Undoubtedly, Mr. E. G. D. Liveing, *alias* "Red Ted," is making good in his endeavour to produce from North of England material one of the best balanced set of programmes in the world.

The Wireless Theatre Orchestra

The recent re-classification of the various B.B.C. Organisations of Instrumentalists seems to be working out well in practice, and is yet another tribute to the foresight and sagacity of Dr. Adrian Boult. I notice that there has been one slight change.

The B.B.C. Theatre Orchestra has become the Wireless Theatre Orchestra in order to avoid confusion.

Incidentally, it is good news that Mr. Woodgate is to be its regular conductor. As much of its work will be carried out in connection with dramatic production, Mr. Woodgate will act closely with Mr. Gielgud and Mr. Harding.

A Swedish Band

The Royal Swedish Navy Band, which is visiting England in the autumn, will be heard on the wireless. This suggests that the B.B.C. might do something more than it has been doing to relay bands of this kind from their own countries. Military bands in particular offer a wide field for exploration.

Provincial Music Directors for London

At Dr. Boult's initiative the B.B.C. has instituted a system of regular visits to London by B.B.C. music directors at stations outside London. They will be invited on these occasions to conduct one of the larger orchestral sections in a serious programme of symphony.

This is a somewhat belated, but all the more welcome, recognition of what has been done musically apart from Savoy Hill. It is indeed fortunate that Dr. Boult has his Birmingham background. It keeps him clear of the pitfalls of assuming that there is nothing meritorious in art beyond the sound of Bow Bells.

Russian Opera from Paris?

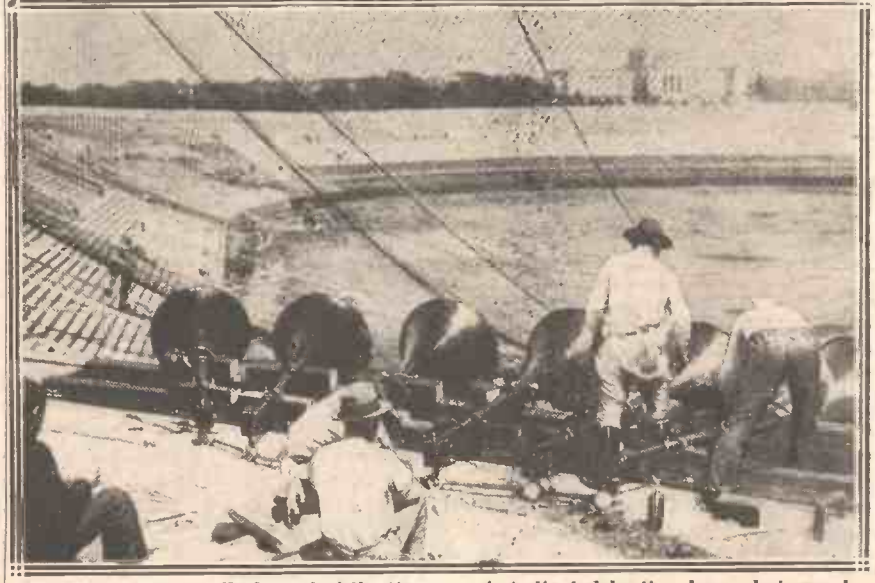
I told you before it became public that the B.B.C. had invited Sir Thomas Beecham to put on a special performance of "Prince Igor," or the "Czar Sultan," or some similar work, as a special production for broadcasting with Chaliapine and, if desired, a supplemented Lyceum cast.

The offer appears to have been rejected in the first instance, but the B.B.C. has not yet given up hope. Negotiations are proceeding with other conductors, one of whom may still be induced to bring over a company from Paris in October.

Mr. Levering Tyson in Europe

A correspondent in New York tells me that Mr. Levering Tyson, Director of the National Advisory Council on Radio and Education, has "escaped" from America and is at present somewhere in Europe. I say escaped advisedly, because Mr. Tyson takes life more seriously than anyone else I have ever heard of.

LOUDSPEAKERS AT A TOKIO BASEBALL GROUND



Japan is keeping well abreast of the times, as is indicated by the above photograph. It shows workmen installing loudspeakers at the Meiji Shrine Baseball Ground, Tokio.

Savoy Hill News—*continued*

He makes Broadcast Education more than a religion; he thinks it, eats it, sleeps on it. He is a man of great ability and wide experience. But I had my apprehensions when I heard that he was seeing a good deal of Sir John Reith during the Director-General's visit to North America.

However, as things turned out, Sir John was much more in the company of people like David Sarnoff, Merlin Aylesworth, Herbert Hoover, E. W. Beatty, and Sir Henry Thornton. Therefore, I believe he returned unscathed by the educational dialectics of Mr. Levering Tyson!

B.B.C. Dance Bands

I have not been surprised at the criticism of the way in which the conductor of the B.B.C. dance orchestra has assumed to himself a special perogative. No doubt he is competent and certainly has done his work with reasonable efficiency.

To my mind, however, he made a cardinal error in not placing himself entirely at the disposal of Dr. Adrian Boult, who is qualified beyond all other conductors I know to put into practice what Mr. Jack Payne professes to have as his objective.

Events, however, are moving rapidly in the dance music world, and it is now practically certain that the B.B.C. will take steps to ensure independence of outside broadcast dance bands before the end of the year.

This will mean the development and re-organisation of B.B.C. dance music. I give this word of warning—let it be under the guidance and with the agreement of Dr. Adrian Boult. On this subject more anon.

Conductors' Whims

It occurred to me the other night that it would be a good plan in the interests of listeners generally to examine the attitude of big musical conductors towards the B.B.C. Of course, one should make allowances for "genius," and all that goes in its train. For instance, there is Sir Thomas Beecham, whose chief anxiety at the moment is credibly alleged to be the fact that the B.B.C. keeps on indefinitely turning the other cheek and inviting him to come from even remote corners of the world with a special production of opera.

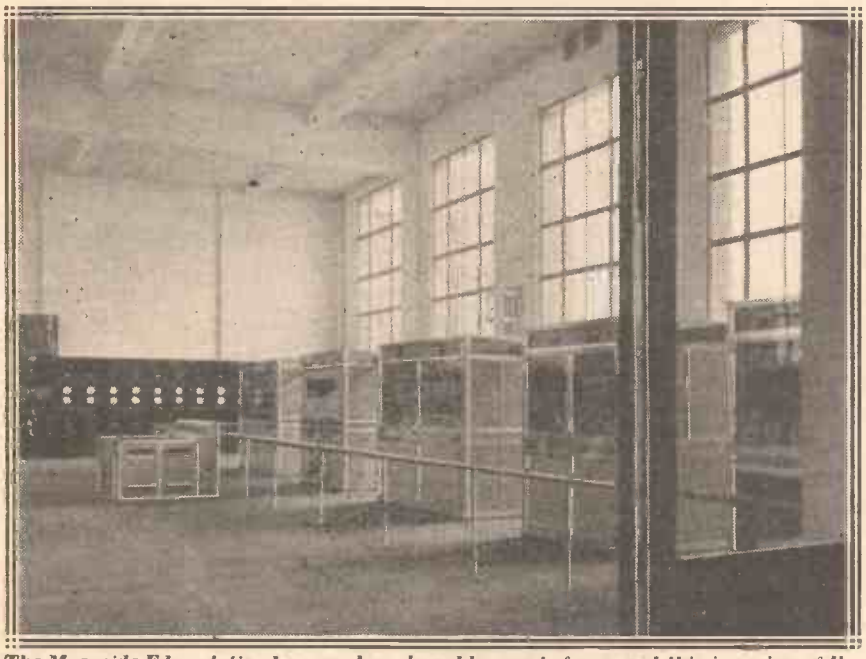
Then there is Sir Landon Ronald, the most tried and tested friend of the B.B.C., who gets very scanty treatment and keeps on smiling. Then there is Sir Henry Wood, who acts on the precept of "treat 'em rough," and appears to develop in strength as the B.B.C. grows.

Sir Hamilton Harty is incurably consistent in his antagonism to broadcasting and still is not disliked at Savoy Hill. And now I come to the most curious and perhaps significant example, namely, that of Dr. Malcolm Sargent.

I have never known quite what to make of Dr. Sargent. In the beginning I looked upon him as a natural ally of broadcasting. When, however, Dr. Boult secured the succession to Mr. Percy Pitt there was a change in the attitude of Dr. Sargent, despite his continued friendship with Mr. Roger Eckersley.

Then came the occurrence of the deputation from various musical interests which went to Savoy Hill to belabour the B.B.C. for its failure to support "executant" music, when Dr. Sargent, as spokesman, soundly "rated" the B.B.C.

PUSHING OUT THE POWER FROM SLAITHWAITE



The Moorside Edge station has now been heard by most of you, and this is a view of the transmitting hall with the North Regional apparatus on the right. In the background you can see the white dials of the instruments on the main switchboard.

A FRAME HINT

Try this little tip for improving the sensitivity of your receiver.

THOUGH for all ordinary purposes the frame aerial gives excellent results when there is plenty of high-frequency amplification available, it may be found that it will not answer satisfactorily when very weak and distant signals are being sought. Here is an instance. I have a set using three screen-grid stages which will furnish loud-speaker reproduction from even tiny European stations such as Freiburg or the little Swedish relays.

Hearing the Americans

But, despite these performances, it would not bring in American stations on nights when I knew that they were coming through well.

As soon, though, as I connected a piece of No. 22 double cotton-covered wire between the high-potential terminal of the frame and a curtain pole, and took a lead from the other frame aerial to a handy gas-pipe, I picked up numbers of American stations at such strength that I had to use the volume control in order to prevent other members of the household from being awakened. A tiny auxiliary aerial helps out the frame in such circumstances, and you should certainly try it if you are not getting results with distant stations.

R. W. H.

The "GANGSTER"

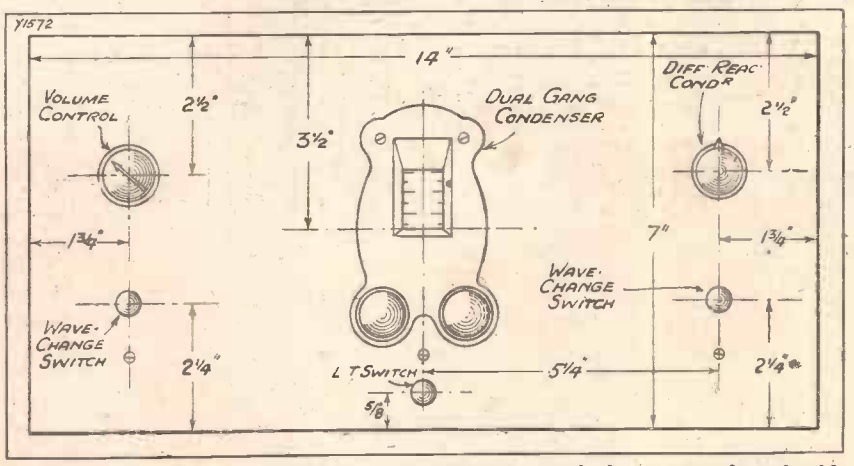
A "screened-grid three" of particularly compact design which is capable of a wonderful performance.

Designed and Described by our Research Dept.

YOUR SHOPPING LIST FOR THIS OUTSTANDING SET

1 Ebonite panel, 14 in. × 7 in. (Goltone, or Permcol, Becol, Wearite, Parex, Peto-Scott, etc.).
1 Cabinet for above, with 10-in. deep baseboard (Camco, or Gilbert, Kay, Lock, Compton, Osborn, Pickett, Langmore, etc.).
1 Dual-gang ·0005-mfd. variable condenser with drum drive (Formo, or similar small type).
1 30-ohm filament rheostat (G.E.C., or Igranic, Wearite, Peto-Scott, Magnum, etc.).
2 Three-point wave-change switches (Junit, or Ready Radio, Wearite, Peto-Scott, Bulgin, W.B., Red Diamond, Ormond, Magnum, Telsen, etc.).
1 ·0001 to ·00015-mfd. differential reaction condenser (Ormond, or Lotus, Ready Radio, Igranic, Polar, J.B., Dubilier, Cyldon, Telsen, Wavemaster, Formo, Burton, Parex, Magnum, Astra, etc.).
1 L.T. switch (Bulgin, or Lotus, Goltone, Igranic, Ready Radio, Benjamin, Peto-Scott, Magnum, Red Diamond, Wearite, Junit, Ormond, Telsen, etc.).
2 4-pin ordinary type valve holders (Lotus, or Telsen, W.B., Clix, Bulgin, Benjamin, Junit, Formo, Dario, Wearite, Igranic, etc.).
1 Valve holder for vertical mounting (Parex, or W.B., Junit, etc.).
2 Screens, one 14 in. × 6 in., and one 6 in. × 6 in. (Magnum, or Parex, Peto-Scott, Ready Radio, Wearite, etc.).
1 P.J.2 and 1 P.J.3 coil (Wearite, or R.I., Tunewell, Goltone, Peto-Scott, Ready Radio, Parex, Watmel, A.E.D., Formo, Melbourne Radio, Ferranti, Lewcos, etc.).
2 Coil quoits (Peto-Scott, or Wearite, A.E.D., Ready Radio, Melbourne etc.).
2 H.F. chokes (Telsen and Lewcos, or Peto-Scott, R.I., Ready Radio, Lotus, Dubilier, Parex, Varley, Wearite, Watmel, Magnum, Sovereign, etc.).
1 ·01-mfd. fixed condenser (Mullard, or Ediswan, T.C.C., Dubilier, Telsen, Ready Radio, Ferranti, Igranic, Watmel, Formo, Graham Farish, Mullard, etc.)
1 ·001-mfd. fixed condenser (Ferranti, or see above).
1 2-mfd. fixed condenser (Lissen, or Igranic, Ferranti, Dubilier, T.C.C., Hydra, Mullard, Formo, Peto-Scott, Helsby, Franklin, etc.).
2 1-mfd. fixed condensers (T.C.C., or as above).
1 ·0003-mfd. fixed condenser (T.C.C. small type, or Formo, Ormond, etc.).
1 2-megohm grid leak with terminals or leads (Graham Farish, or Dubilier, Igranic, etc.).
1 25,000-ohm Spaghetti resistance (Lewcos, or Ready Radio, Bulgin, Magnum, Peto-Scott, Varley, Sovereign, Graham Farish, Telsen, Tunewell, etc.).
2 600-ohm Spaghetti resistances (Bulgin and Peto-Scott, etc.).
1 L.F. transformer (Ferranti A.F.3, or Telsen, Igranic, Varley, R.I., Lotus, Mullard, Lewcos, Goltone, Atlas, Formo, etc.).
1 Terminal strip 14 in. × 2 in.
10 Indicating terminals (Belling and Lee cheap type, or Eelex, Clix, Igranic, etc.).
4 oz. 30 D.S.C. wire for long-wave coils.
Battery plugs (Clix, or Belling and Lee, Eelex, Igranic, etc.).
Glazite or Lacoline.
Flex, screws, spring clips, etc.
1 Fuse (Belling and Lee, or Ready Radio, Bulgin, Magnum, Peto-Scott, etc.).

IT HAS A PERFECTLY BALANCED PANEL



An inexpensive dual-gang condenser simplifies the controls enormously and adds refinement to the "Gangster's" appearance.

The "Gangster"—*continued*

"ALL very well, but you're bound to lose efficiency." That is the idea so often put forward in connection with ganged tuning circuits. And it can be quite true, but it need not necessarily be so in all cases.

Let's just look into the conditions that are necessary for the successful operation of several circuits with one control. First of all there is the important item of matched inductances.

If they are not matched we shall find ourselves very much up against it when we try to balance the variables so that they remain in step over the whole tuning range. Still, that is not so difficult if a little care is taken, and the circuits to be ganged are the same electrically.

Matching Inductances

And that brings us to one of the chief difficulties which the exponents of ganging are up against, namely, balancing *aerial* inductances with *intervalve* inductances. In the early days this seemed an almost insuperable obstacle, which accounts for the period during which ganging was more or less dropped.

But it was too near an ideal to be forgotten entirely, and a compromise came along in the form of balancing capacities. These are often used to-day in sets where all the circuits are ganged.

Another good scheme with circuits using two H.F. stages is to gang the H.F. coils and have separate tuning for the aerial inductance. Then there is a third idea, which is ideal for sets using just one H.F. stage, and which ensures maximum signal strength over the whole of both wave-bands.

A Huge Success

The scheme is to arrange for one half of the condenser to be variable independently of the other. A state of affairs that can quite simply be arranged by making the *fixed* vanes of the one half movable through a small distance.

In operation there is just one knob to turn for tuning, the other then being adjusted for accurate balance if necessary. It thus becomes much the same operation as the one-time popular "vernier" tuning control.

This "maximum-efficiency" ganged tuning is the main feature of the "Gangster," the compact, simply-operated receiver illustrated on these pages. The ease with which Continentals can be found, and their tremendous volume, puts this set far ahead of most three-valvers.

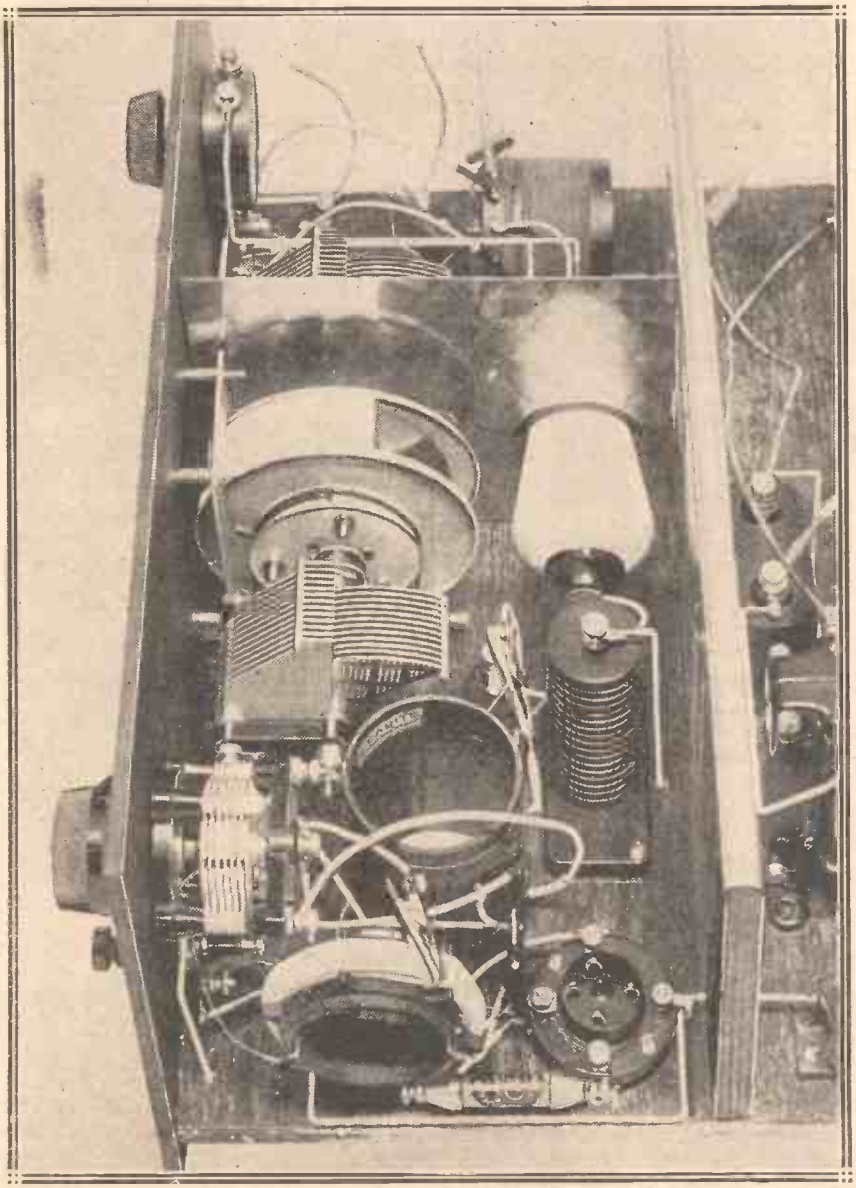
Look at the circuit—straightforward, did you say? Yes, but its *difference* must be experienced to be properly appreciated. Apart from its main feature, already mentioned, you should note the type of inductances used. The long and medium-wave coils are entirely separate, so that there is no undesired interaction between their windings.

Highly Efficient

The medium-wave coils are wound on "solenoid" formers, the long-wave ones being wound on the coil quoits, which makes them the simplest things on earth to construct. Also, if desired, the medium-wave coils can be purchased ready-made.

Batteries or mains units are equally suitable for the "Gangster," because de-coupling resistances and by-pass condensers are provided for the S.G.'s anode and screening grid as well as for the detector.

THE DESIGN INCORPORATES OUR NEW COILS



Here you can see the components which figure in the H.F. intervalve coupling. Note the "coil quoit" right in the foreground. This, in conjunction with the P.J.3 coil, constitutes the complete dual-wave H.F. transformer.

The "Gangster"—*continued*

A pre-detector volume control is employed, and consists of a variable resistance in series with the filament circuit of the screened-grid valve. This type of volume control has the advantage that it prevents detector overloading as well as preventing the output valve being given more than it should in the way of grid swing.

The taps on the coils enable varying degrees of selectivity to be obtained, both on the long- and medium-wave bands. A final point to note is the fuse in the H.T. negative lead. And now we will turn to the constructional details.

First of all you should make the coils, and then when you start on the assembly you will be able to go right ahead. If you are not going to buy the medium-wave coils you will want a piece of plain former 2 in. in diameter and 2 in. long for the P.J.2 coil, and another piece 2 in. in diameter also, but 3 in. long, for the P.J.3 coil. The same wire, namely 30 D.S.C., is used for all windings.

The New Coils

Start the winding of the P.J.2 coil on the 2-in. long former about ¼ in. from one end. This will be the "red" connection (connections are indicated by coloured flex leads on most commercial coils, as shown in the wiring diagram).

This winding should have nine turns, and be tapped at the 4th and 6th turns, and the end is the "blue" connection. Finish off the winding by twisting the wire through two small holes in the former in the usual manner.

Then ⅜ in. farther along the former commence winding again, in the same direction. This will be the grid winding and the beginning will be white. It consists of 64 turns, the other end being indicated by "black."

That completes the aerial coil, and before going on to the second one it will be a good idea for me to indicate the equivalent lettering for the leads. Just in case anyone gets hold of a coil so marked instead of with colours.

Red equals "A" and blue "X." The equivalent of white is "G" and of black "Y." That leaves green, which is represented by "Z," and yellow, which is the same as "R."

The last two are not used on the P.J.2 coil, but will be found on the P.J.3, with which we will now deal. It is wound on the 3-in. long former, and the first winding is started a ¼ in. from the end, as with the other coil.

Wound While You Wait!

The primary goes on first, and consists of 30 turns tapped at 10 and 20 turns from the beginning (red). The end of this winding is blue.

ACCESSORIES FOR THE "GANGSTER"

Valves. 1 S.G., 1 H.F. type or special det., 1 power or super-power (Mazda, Osram, Cossor, Mullard, Eta, Fotos, Marconi, Six-Sixty).

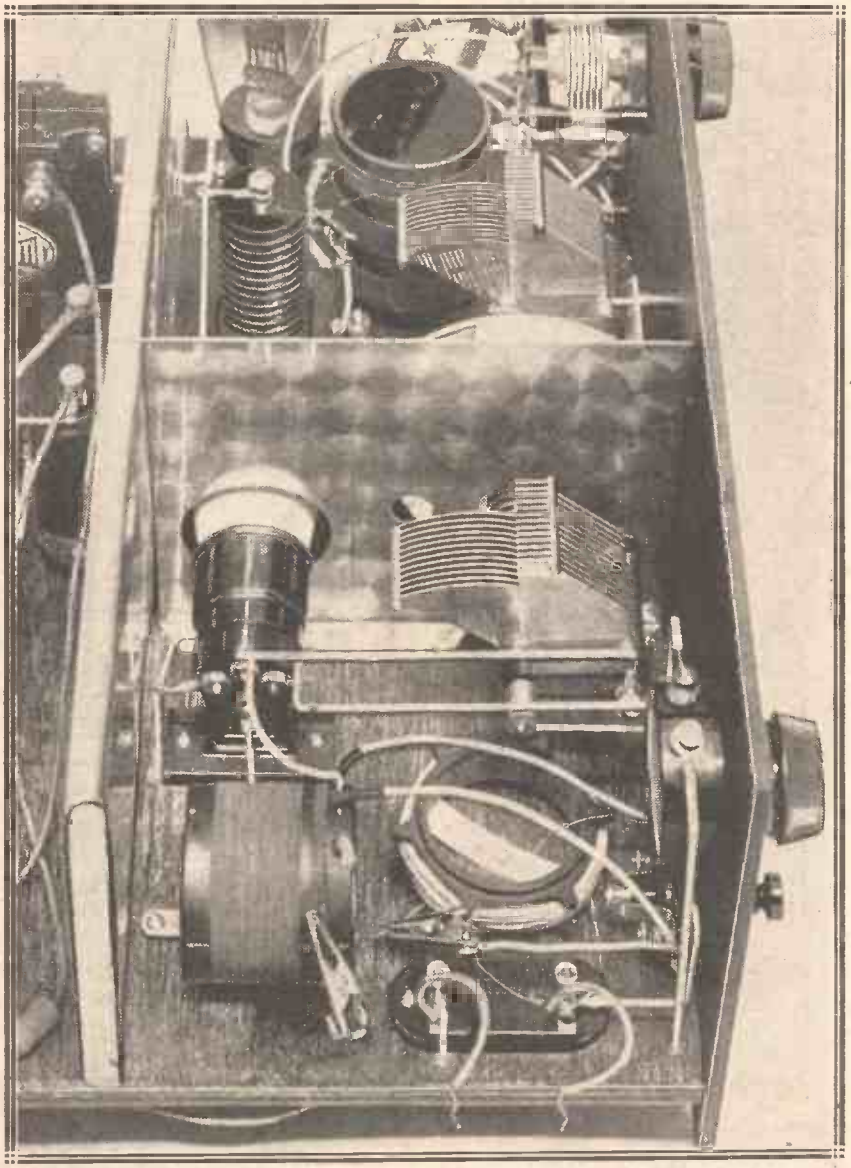
Batteries. H.T. and G.B. (dry) (Drydex, or Ever Ready, Pertrix, Oldham, Fuller, Grosvenor, Siemens, G.E.C., National).

Accumulator. 2-, 4-, or 6-volt, to suit valves (Fuller, or Exide, Ediswan, Pertrix, Oldham).

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

Mains Unit (with suitable number of taps and capable of giving sufficient current for valves used). (Varley, or Lotus, R.I., Junit, Atlas, Heayberd, Tannoy, Ekco, Regentone.)

REMARKABLE TWO-BAND VIRILITY

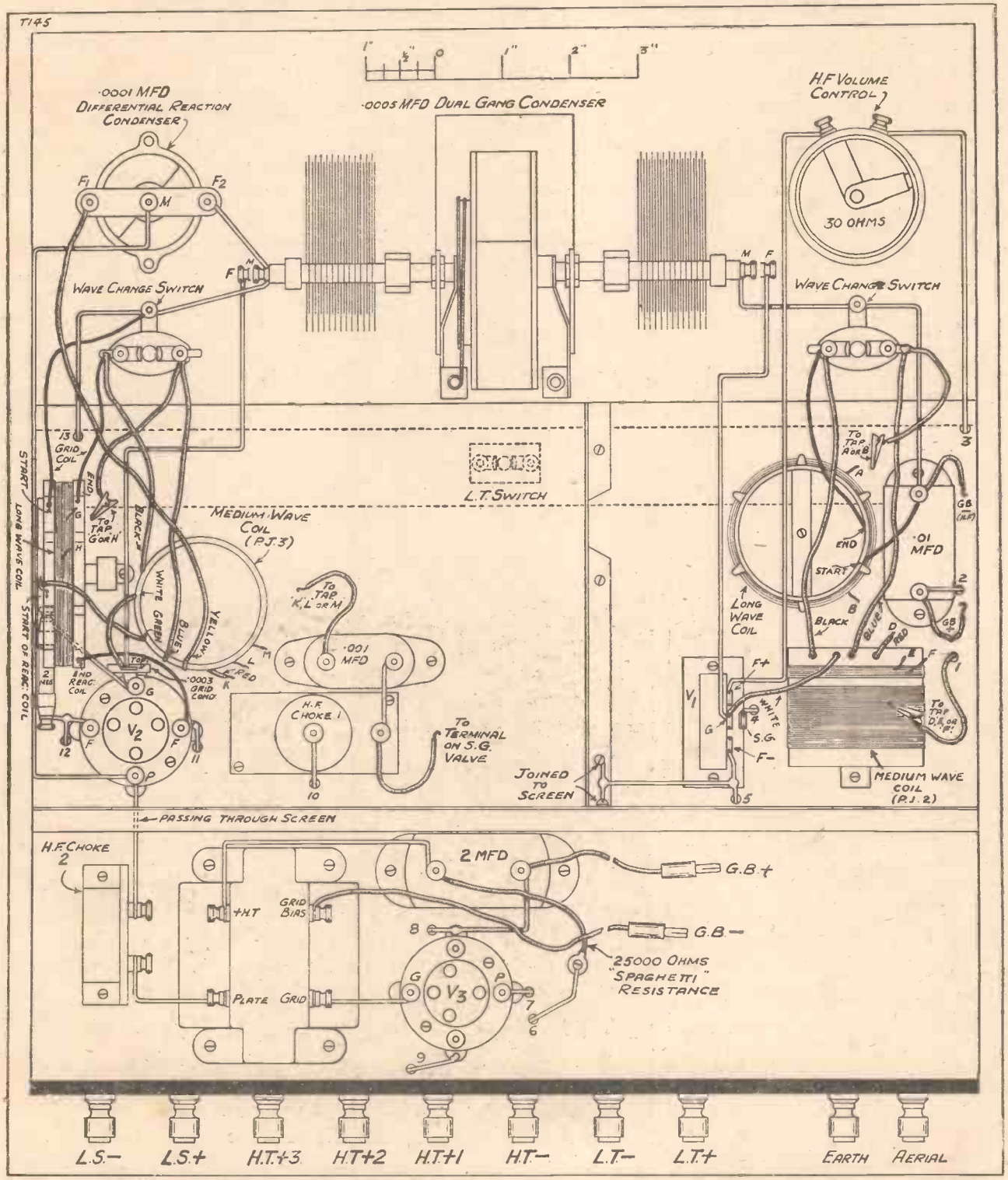


The P.J. 2 coil and a coil quoit carrying the appropriate winding comprise the all-wave aerial tuner. By using two separated coils in conjunction with "earthing" switching you get the highest possible efficiency on both ordinary and on long waves.

The "Gangster"—*continued*

Next comes the grid winding, $\frac{3}{8}$ in. away and in the same direction. It has 64 turns, the beginning is white and the end black. There is a third winding on this coil, the reaction, which starts $\frac{1}{4}$ in. from the grid winding. It has 34 turns, the beginning being green and the end yellow. It is wound in the same direction.

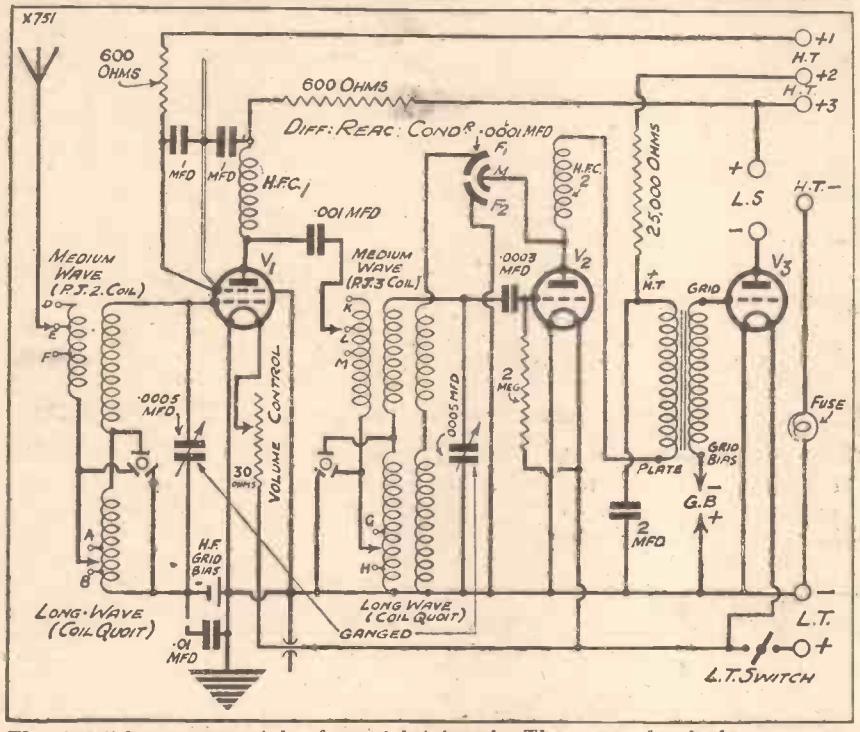
HERE IS A FINE EXAMPLE OF SCIENTIFIC COMPACTNESS



Our more experienced constructor readers will immediately appreciate the ingenious layout of the "Gangster." Although it is built into a smaller cabinet than is generally used for this class of set, there is no "crowding" anywhere—everything is very accessible. A number of the components and some of the wiring are underneath the baseboard, and illustrated on another page.

The "Gangster"—*continued*

THE THREE VALVES WORK IN PERFECT HARMONY



The circuit has many points of special interest. There are, for instance, a pre-detector volume control, automatically adjusted couplings to the aerial and H.F. tuners, rendering them exactly suitable to ordinary or long waves according to the positions of the wave-change switches and grid bias for the S.G. valve.

That completes your medium-wave coils. The long-wave coils won't take you long and are wound in hank fashion on the coil quoits. First of all the one for the aerial.

Start by winding on 150 turns for the grid coil, which has to be tapped at 30 and 60 turns from the earth end, this means that taps must be made at the 90th and 120th turn from where you commence. This is because the beginning of the coil does not go to earth.

"Quoits" for Long-Waves

That's all there is in the long-wave aerial coil, and the other long-wave coil is started in just the same way. When you have put the grid winding on the second quoit, wrap a piece of empire tape or stiff paper round it, and commence another winding in the same direction.

This is the reaction winding and should have 60 turns. When completed this coil should, of course, have four ends running out of it. Now that the coils are completed you can go ahead rapidly with the remaining constructional work. This you will not find difficult so long as you pay careful attention to the layout.

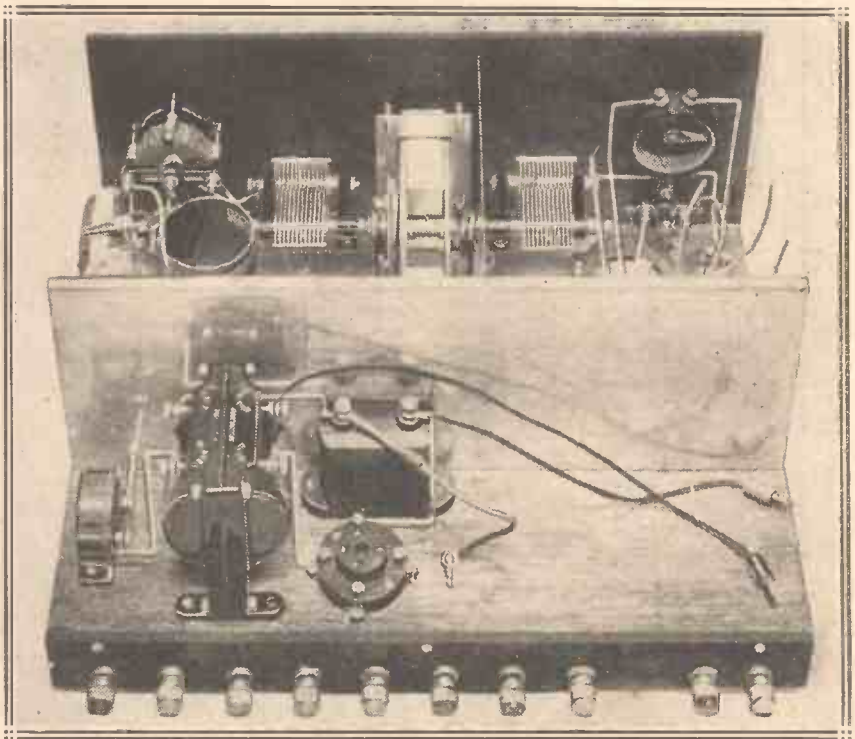
The top of the baseboard is arranged 1½ in. up from the bottom edge of the panel, so that some of the components and a certain percentage of the wiring can be accommodated underneath. Before anything else is started the baseboard should be covered with a sheet of copper foil. This can be held in place with a few brass brads. The components, when in place, will help to hold it securely.

Simple Screening

There are two vertical screens apart from this baseboard screening. In the original the smaller one of these is of the ordinary kind of copper or aluminium sheet. The longer one, however, is a piece of plywood covered with foil. You can either employ this method of making the screen or can use a screen of more usual type.

You will find two practical diagrams, one of the components and wiring above the baseboard, and the other of the components and wiring beneath the baseboard. When connecting up you will have to make use of both of these, and you can follow the run of the wires after they pass

ALL THE STAGES ARE PROPERLY SEPARATED



The screening, though straightforward and free from complications, is most effectively arranged. The H.F. and L.F. stages are unusually well separated and can operate with complete stability at their highest effectiveness and without the slightest unwanted interaction.

The "Gangster"—*continued*

through the baseboard by the numbers against the holes which correspond in the two diagrams.

Take care that the "joints to screen" from the filament negative terminal of the S.G. valve holder are well and truly made. Otherwise the screens may cause instability instead of preventing it.

Mounting the Coils

The coils can be mounted quite simply with small pieces of wood. These, in the case of the ones mounted horizontally, should be fitted across the inside of the formers, while for the other two they can be passed through the formers or screwed to the outside. Connections to the coils are made by running the ends of the windings direct to the various points to which they have to be connected.

THE WIRELESS CONSTRUCTOR "GANGSTER"

Circuit: Wave-change, S.G., Det., and L.F.

VALVES.

1st: S.G. type.
2nd: H.F. or special det. type.
3rd (in back compartment): power or super-power.

VOLTAGES.

L.T.: 2, 4 or 6 volts, according to rating of valves.
H.T.+1: 60 to 80 volts.
H.T.+2: 50 to 70 volts.
H.T.+3: 120 or 150 volts.
G.B. (according to particular valve employed for output and H.T. voltage in use).

CONTROLS.

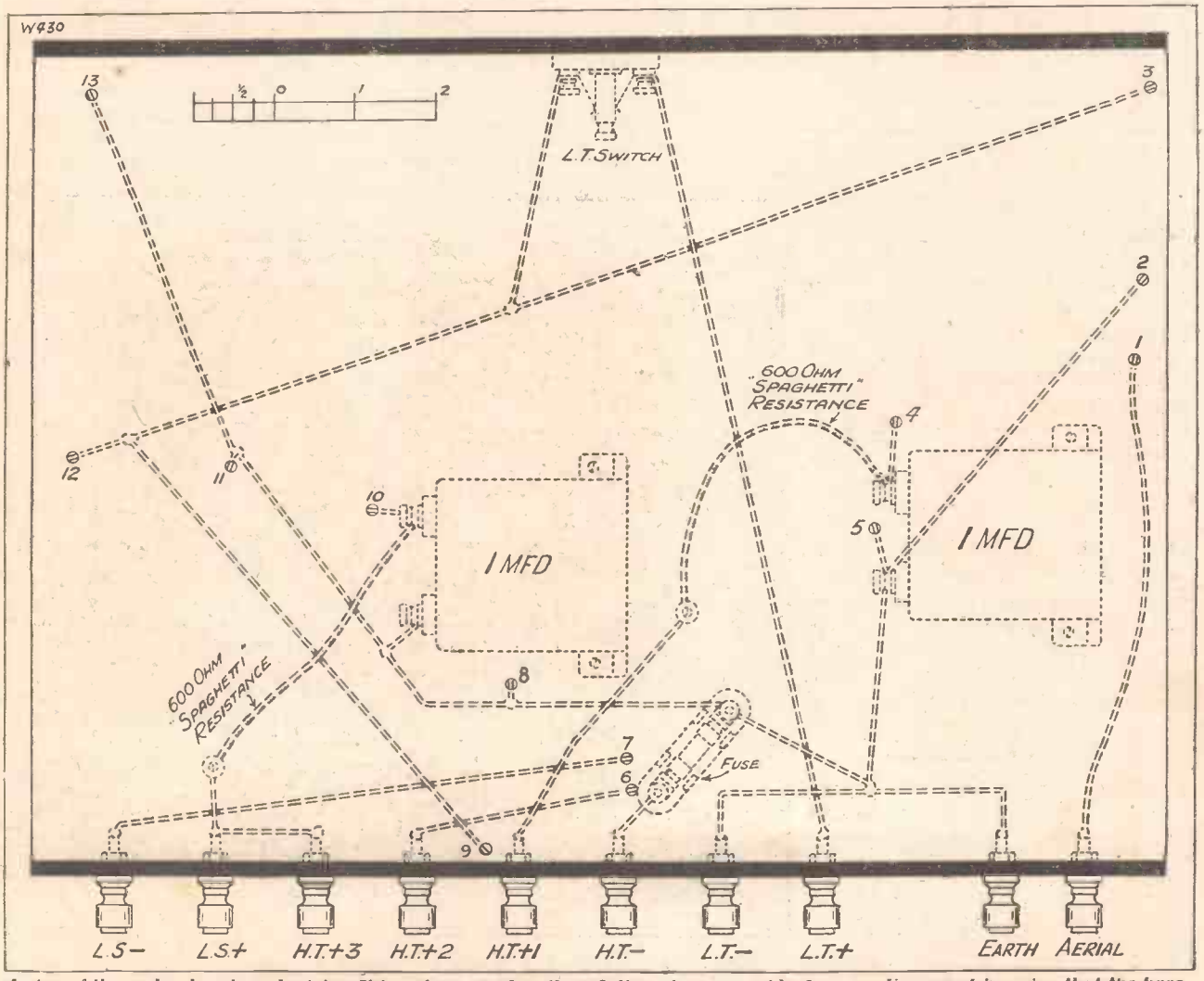
Tune on right-hand centre knob, when station is received adjust left-hand centre knob for maximum volume.
Knob below is "on-off" switch. Pull out to switch set on.
Left-hand top knob controls volume.
Left-hand bottom knob is wave-change switch.
Right-hand top knob controls reaction.
Right-hand bottom knob is wave-change switch.

NOTES.

Push in both wave-change switches for long waves. Pull out for medium.
Varying taps on which spring clips are fixed will alter selectivity. Find best taps by trial.

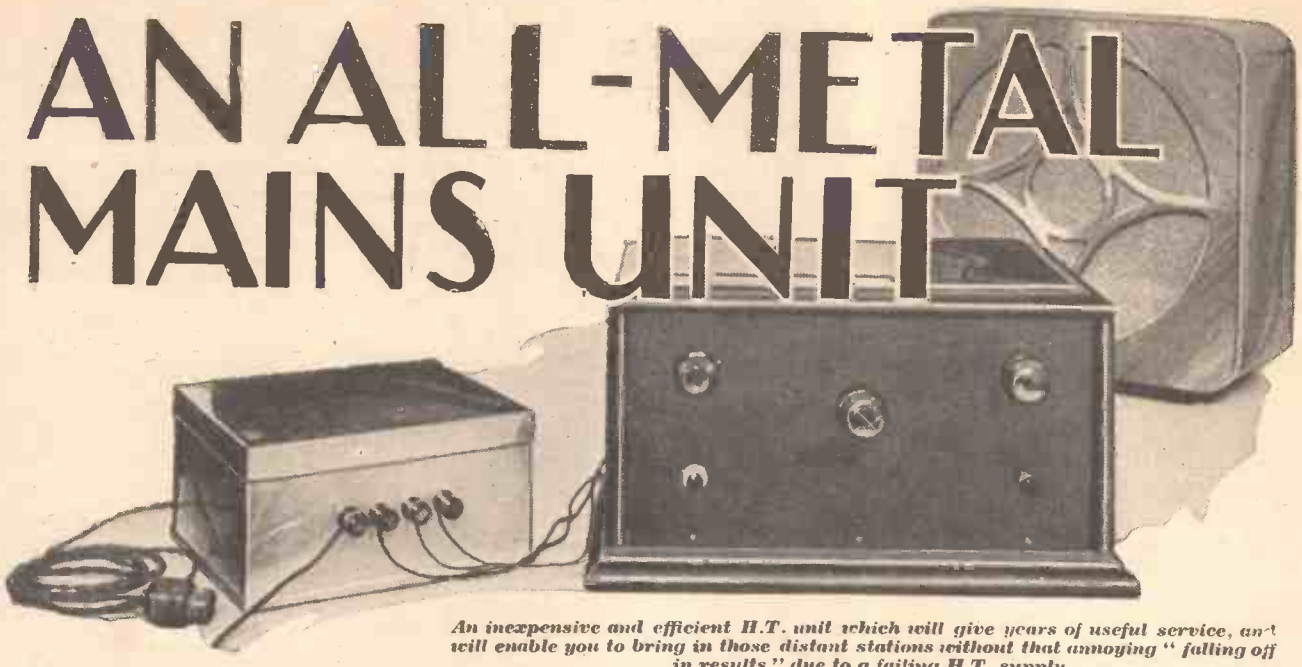
You will see that in the diagrams the tapping points to which the various clips can be attached are all lettered. While it is not important to know which is which (the best ones being found by trial), it will be as well to mention them, however.

(*Please turn to page* 262.)



A plan of the under-baseboard wiring. It is not reversed as though the set were upside down. You must imagine that the baseboard has become transparent and that you are able to look through it down on to the wires and components underneath.

AN ALL-METAL MAINS UNIT



An inexpensive and efficient H.T. unit which will give years of useful service, and will enable you to bring in those distant stations without that annoying "falling off in results" due to a failing H.T. supply.

Designed and Described by the Research Department.

How long do your H.T. batteries last? And how many batteries could you buy for three pounds? Five?

Then don't you think it's time you went in for radio economy by building yourself a mains unit? Just reckon it out.

Real Economy

Five batteries costing, say, twelve shillings a time, and each one lasting three months. Why, you've more than paid for the unit in eighteen months!

But please don't imagine that we are trying to tell you that H.T. batteries are uneconomical. As a matter of fact, it's a jolly good job that such things are offered to us at such reasonable prices for all those readers who have no electric light.

But if you are one of the lucky ones who happen to reside in a house where A.C. mains are laid on, then why on earth not make the best of your enviable position—enviable by all those readers who are not "electrified"—by building yourself a suitable unit and doing away with battery renewals?

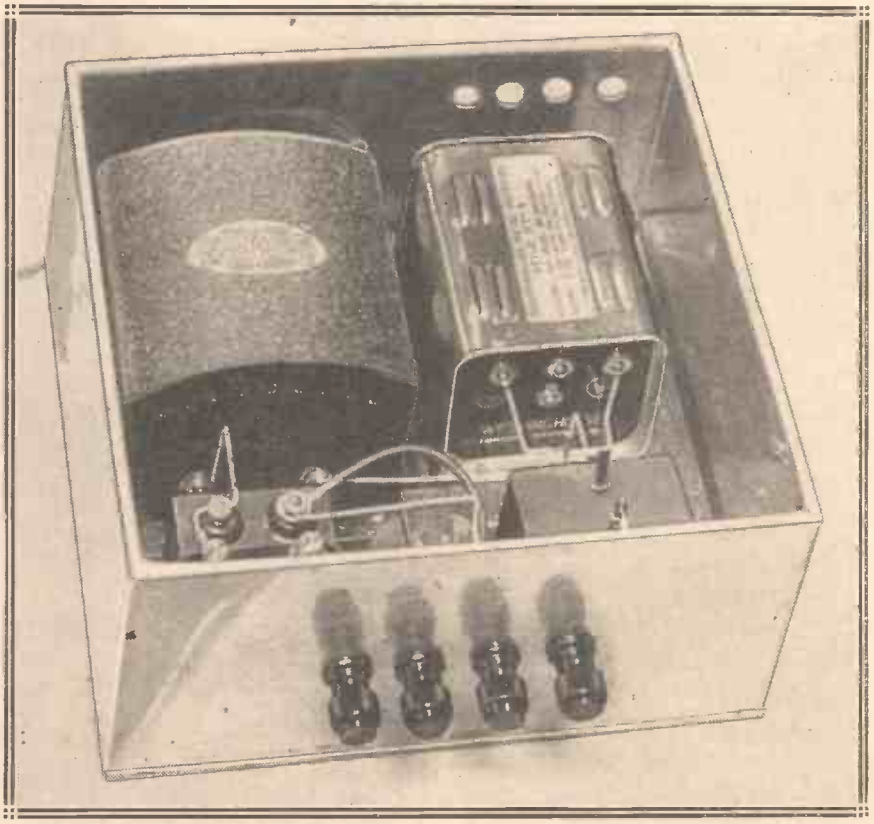
Simplest Imaginable

The A.C. mains unit for high tension that we are going to describe to you in this article is about the simplest outfit that could be imagined. It shouldn't cost you a penny more than three pounds to build if you go the right way about it, and when you have built it—well, you just connect it up and forget about it.

There is nothing to adjust, there is nothing to go wrong, it is perfectly safe in operation, and it's about the cheapest short-cut to trouble-free radio that you'll find.

Not a penny have we spent in our allocation of cost that isn't absolutely necessary. The container is nothing more or less than an ordinary half-size biscuit tin obtainable from any

TOTALLY ENCLOSED FOR PERFECT SAFETY



All the components are first mounted on a wooden baseboard, and after the wiring has been completed the assembly is dropped into a biscuit box. This makes a very neat job and, moreover, completely eliminates all risk of electric shocks, as the tin case is effectively earthed.

An All-Metal Mains Unit—*continued*

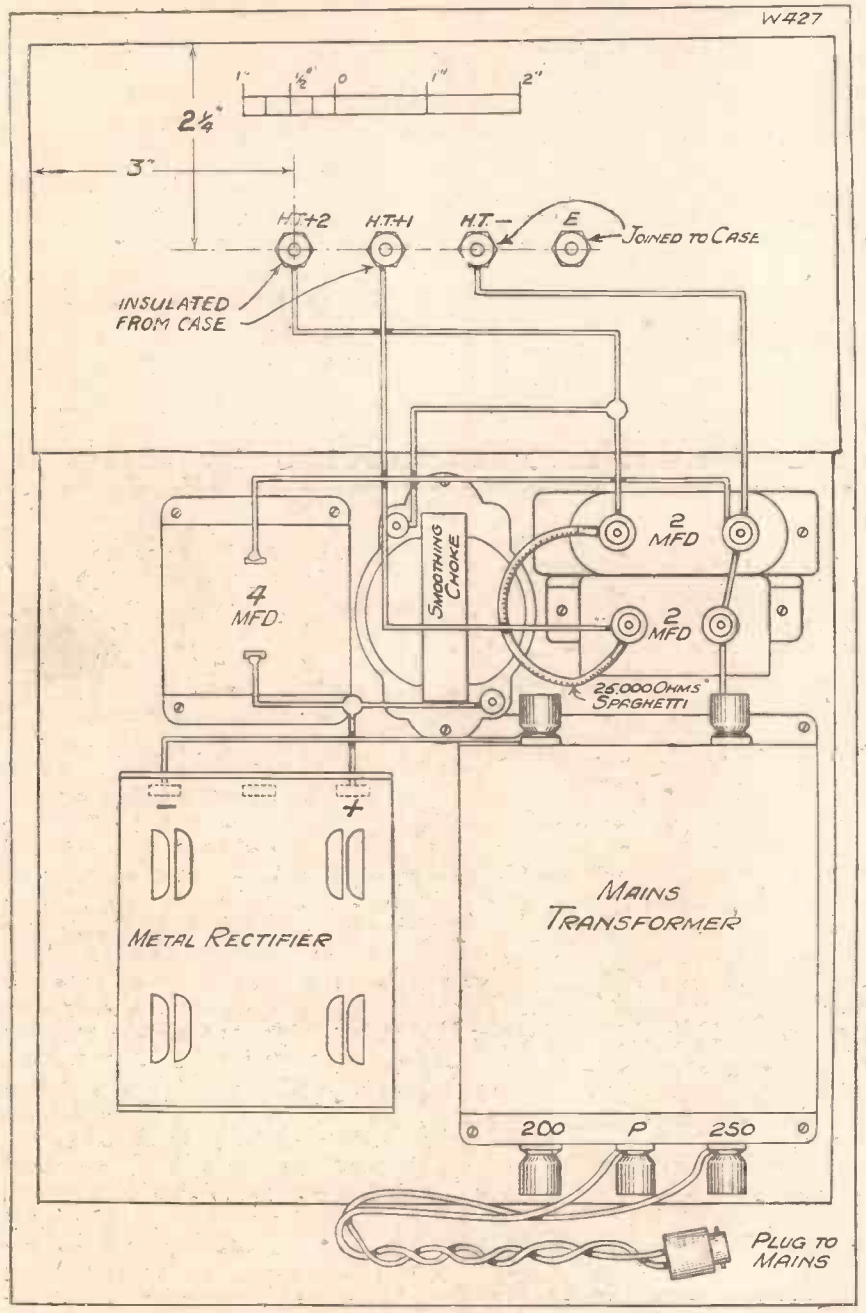
grocer for 8d., and the components have been cut down to the barest minimum possible, yet without going to the extreme of sacrificing efficiency.

This simple mains unit (it won't take you more than a couple of hours to build) is suitable for any set of the det.-L.F. or det. and two L.F. type irrespective of the circuit arrangement employed.

The only reservation we have to make to that is that the set should be fitted with an output filter (any respectable modern set should have one, anyway), and if your set does not employ a filter circuit then you can obtain details for making a suitable unit from the last issue of this journal.

We do *not* recommend you to build this mains unit for use with H.F. sets, or anything more ambitious than the popular det.-L.F. or det. and two L.F. combination, because it's not intended for that purpose. It has been designed simply and solely to meet the needs of all those readers with the types of sets to which we have referred, and to whom anything more ambitious in the way of a mains unit would be a sheer waste.

ONLY A FEW CONNECTIONS



As can be seen from the above diagram, the wiring is very simple. Counting everything, there are only about a dozen connections to make. You will be surprised how easy it is to build.

What About It?

Now all you CONSTRUCTOR readers who are A.C. main-ites, and who are working det.-L.F.'s or det. and two L.F.'s, what about it?

You'll find a complete list of the parts required in this column, and if you discriminate when buying, and select your parts only from among those given in our list and in the alternatives, then you needn't spend a penny more than three pounds.

THE PARTS TO USE

- 1 Half-size biscuit tin, or other tin of suitable dimensions (approx. 9 in. × 8 in. × 4½ in. deep).
- 1 Baseboard to fit inside.
- 1 Metal rectifier (Type H.T. – 5) (Westinghouse).
- 1 Transformer for above rectifier (Regentone W.R. 34, or R.I. E.Y.16, Ferranti E.M.3, etc.).
- 1 Smoothing choke (Igranic, or Varley, R.I., Wearite, Atlas, Bulgin, Telsen, etc.).
- 1 4-mfd. fixed condenser (200-volt working type). (Dubilier, or Lissen, Ferranti, T.C.C., Igranic, Hydra, Mullard, Franklin, Formo, etc.)
- 2 2-mfd. fixed condensers (Ferranti and T.C.C. in set, or see above).
- 1 Spaghetti-type resistance (To obtain about 70 volts for H.T. + 1, assuming an anode current of 2 m.a., this should be 25,000 ohms). (Ready Radio, or Lewcos, Bulgin, Magnum, Keystone, Sovereign, Graham Farish, Lissen, Tunewell, Telsen, Varley, etc.)
- 4 Engraved terminals (two of these must be with bushes to insulate them from metal case). (Belling & Lee, or Igranic, Eelex, Clix, etc.)
- 1 Mains plug.
- Flex, screws, etc.
- Glazite or Lacoline for wiring.

The container, as we have already mentioned, consists of an ordinary half-size biscuit tin which will cost you 8d. It is almost inconceivable that you won't be able to obtain the biscuit tin, but if you should experience any difficulty—well, any old tin of approximately the right size

An All-Metal Mains Unit—*continued*

will answer the purpose. The size, by the way, is given in the component list.

When you have obtained a suitable tin, the first thing to do is to soak off all the paper "trimmings." Hot water and elbow grease will soon put paid to that task.

So then you can proceed to cut a baseboard and to drill the holes in the tin. If you haven't any large drills, the latter task is best performed when the scissors are not likely to be in demand by any other members of the household. A pair of scissors and a file will work wonders.

The Terminals

Don't forget, when making the holes in the tin, to make some at the top and bottom at the back of the tin for ventilation purposes. You will also require a fairly large hole ($\frac{3}{8}$ in. diam. will do) at the back through which to pass the mains flex.

When all these little points have been attended to you can proceed to mount up the terminals at the front of the tin. Remember, in this connection, that the terminals for H.T. plus 1 and H.T. plus 2 *must* be bushed in order completely to insulate them from the metal container.

Securing in Place

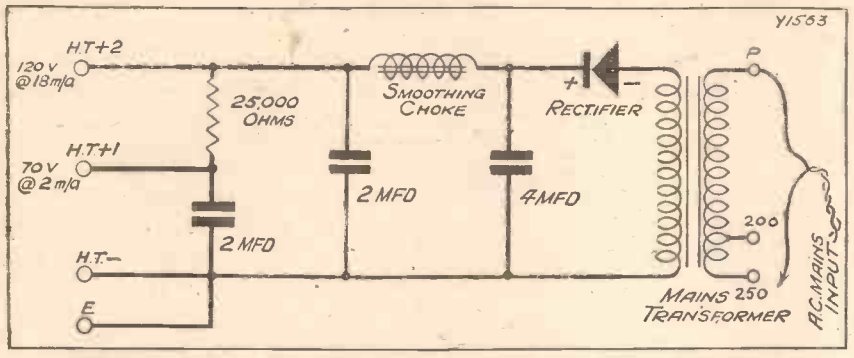
The components, all of which are fixed to the baseboard which fits inside the tin, should, of course, be mounted up and wired before the baseboard is fixed inside.

When the components are all fixed and wired (a task best accomplished by reference to the wiring diagram), the whole assembly can be secured to the tin by means of a couple of screws passed through from the underside.

Don't forget to wire up the terminals on the side of the tin, and connect the flex to the terminals on the mains transformer to suit your particular supply before you screw the baseboard assembly inside.

When ordering the mains transformer, by the way, do not omit to mention the voltage of your mains. If your mains are round about the 100 mark you will want a different transformer from the one shown in the wiring diagram, but if you just mention your mains voltage when ordering, the makers will supply you with the right article.

AN EASY CIRCUIT TO FOLLOW



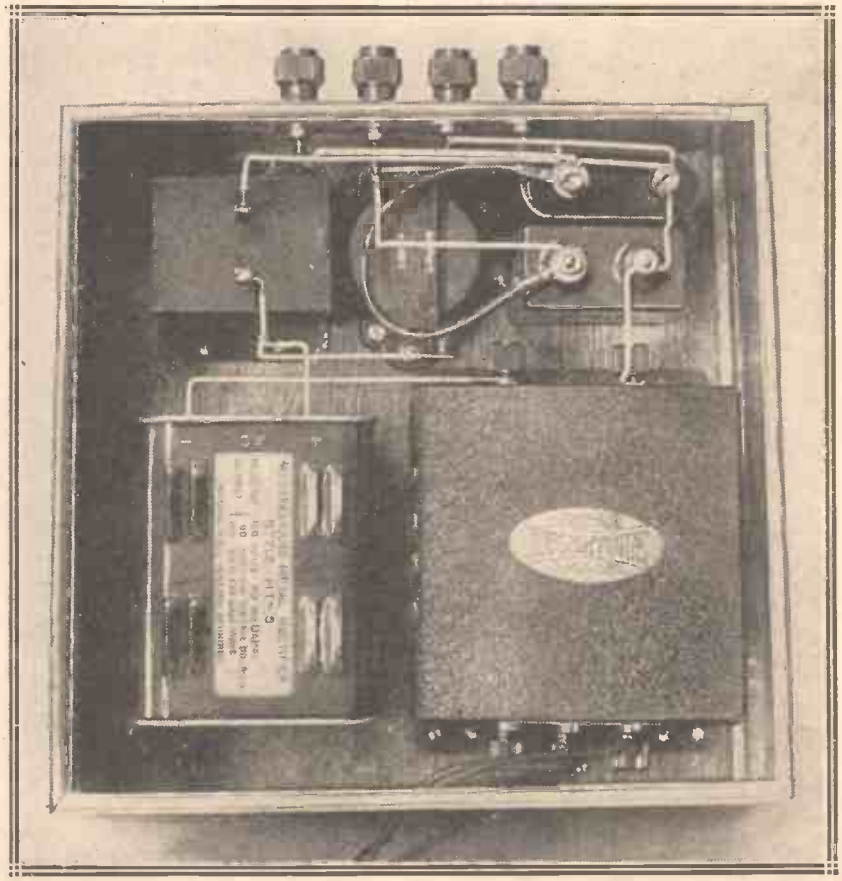
Here is the theoretical circuit of this inexpensive accessory. You will notice that only half-wave rectification is used, making the whole affair extremely straightforward.

How to Connect Up

When the instrument is finished put the lid on, and for absolute safety solder it on (you need only put just a blob of solder on each of the four sides), and you can then connect it up to your set.

To connect the mains unit to your set is a very straightforward job. You just connect the H.T. plus 1 terminal on your set to the appropriate terminal on the unit, do the same with H.T. plus 2 (the highest voltage) and H.T. minus, and when you have joined the earth terminal on your unit to the earth terminal on the set all is ready for use.

IT ENDS ALL YOUR H.T. TROUBLES



This photograph shows very clearly the positions of the various components. In the top left-hand corner is the 4-mfd. condenser, with the two smaller ones on the extreme right. Build this unit and you can forget there is such a thing as high-tension.

ROUND the DIALS

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

THE past four weeks have not been very eventful, but considering that long-distance reception is now supposed to be at its lowest ebb this is hardly to be wondered at. Nevertheless, the dials have been by no means dull.

On long waves there was a good deal of interest created by some experimental transmissions from Kootwyk, Holland, on 1,053 metres. This was in connection with the business broadcast from Scheveningen Haven, it having been decided to transfer the commercial service from there to Kootwyk, owing to the superior aerials and situation of the latter place. The tests were carried out on 15 kilowatts, and certainly came over at great volume.

Not Much Change

Provision is made for using higher power than this, but in general the service is not likely to prove of much interest to listeners in this country.

The other long-wave stations have been behaving normally, with the usual small ups and downs. Oslo, for instance, appears to have been both off colour on certain nights and off wave-length, and neither Motala nor Kalundborg have been so good in daylight as they were a few weeks ago.

Both the Paris stations seem to be doing well, and the increased power at Konigswusterhausen has certainly proved successful, for this station is now a possible daylight alternative for the good British sets. The spell of hot weather seems to have taken all the sting out of the Russian stations, and Warsaw, for all its high power, has been distinctly below par.

On the lower wave-lengths the slight worsening of conditions has resulted in a number of fairly powerful stations taking a back seat, leaving only such steady old-stagers as Rome, Hilversum, Heilsberg, and Toulouse, aided by the two Brussels stations, regularly to represent the continent of Europe.

Other Good Stations

After darkness there have been many others, of course; notable arrivals who are able to deliver a punch being Beromunster and Sottens (the two Swiss regionals), three or four of the Germans, Turin, Strasbourg, and Stockholm.

The last-named station has always been comparatively shy of my aerial, and it was certainly a surprise to find him going strong at a strength almost equal to his neighbour, Rome. But the difference was that Rome is there seven nights out of seven, whilst Stockholm is one of the drop-in-occasionally type of programmes.

POINTS FOR PURCHASERS

Interesting details from manufacturers about recent trade activities.

ATTRACTIVE advertising is always of interest, and the British Blue Spot Co. certainly deserve a pat on the back for their latest leaflet. It depicts two attractive figures of the Alexander and Mose type, and underneath they are quoted as saying: "Why's yo bow tie got blue spots, unconscious?" "Wal, jes' 'cause I'se such a good speaker, yo black pudden!"

Incidentally, this firm is to be commended on the special folder for leaflets which it supplies to dealers.

High-Voltage Condensers

The British Insulated Cables, Ltd., have issued a new folder showing the whole range of their condensers for wireless working. In fact, it shows such super-condensers as a 6 mfd. which works on 2,000 volts D.C. and is tested at 4,000 volts D.C.

Actual capacities are guaranteed to be correct within 10 per cent, and this firm makes the interesting point that one customer of world-wide reputation recently purchased 70,000 Helsby condensers for incorporation in receiving sets.

New Super Het Kit

Igranic Electric, Ltd., have two interesting new lines before the public, illustrated on recently issued leaflets. One of these is the new Phonovox, for which several improvements are claimed over the 37s. 6d. pick-up, the old model which gave such satisfactory service.

This new Phonovox sells at 21s., and should certainly be a great boon to gramophone users.

The firm have also produced an up-to-date line of super-heterodyne coils comprising one triple wave-band oscillator coil and three intermediate-frequency coils. The price, complete with instructions, is 50s. per set, and they are fitted with standard four-pin bases so that they may be plugged into ordinary valve holders.

A Compliment

Wingrove & Rogers, Ltd., have forwarded us photographs of two receivers which were recently shown at a Swiss radio exhibition with great success. They incorporated the Polar Tub condensers, in different models, and the fact that these British-made ganged condensers were used in foreign sets is certainly a compliment to the Polar people.

For Mains Users

Messrs. Turner & Co., of 54, Station Road, New Southgate, London, N.11, inform us that their new list of mains components and eliminators is now ready for distribution, and can be obtained by any WIRELESS CONSTRUCTOR reader on application to the above address.

The various components are well illustrated, and the booklet is commendably full of information as to exactly what voltage can be obtained from the eliminators, what the limits in current are, what apparatus is required in connection with the various transformers, and similar important data.

The booklet has been well prepared and is certainly well worth having.

WITH PICK-UP *and* SPEAKER

By A. JOHNSON RANDALL.

Which Method is Best ?—R.C. Coupling—Effect of High Anode Resistances—Transformer Coupling.

WHICH is the best method of L.F. amplification, resistance-capacity coupling, transformer coupling or resistance and transformer ? This always has been a debatable question, and there is, of course, a large number of factors in favour of each method.

Looking at the question from the point of view of the radio-gram enthusiast one has to consider two main points, the first is quality and the second is magnification per stage.

Greater Amplification

Now, resistance-capacity coupling doesn't give much amplification per valve stage. For example, taking a valve having (say) an amplification factor of 20 and an A.C. resistance of 17,000 ohms, one can obtain a magnification from that valve of about 10-12. On the other hand, if a transformer is used in conjunction with a valve having the same characteristics, there is no reason why a magnification of 60 should not be obtained. Thus it will be seen that the amplification given by a transformer stage is much greater than that obtained from an ordinary resistance-capacity-coupled stage.

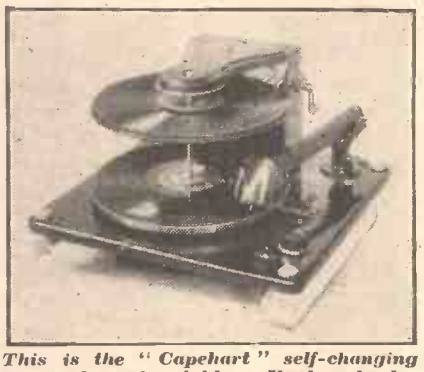
In the example given it has been assumed that the anode resistance is one of comparatively low value and that the transformer is a first-class instrument.

There are "Snags"!

If one desires to get the absolute maximum out of a resistance-capacity-coupled valve it becomes necessary to employ an anode resistance of high value, and also a valve having the biggest possible amplification factor, but there are certain "snags" in this, and I do not recommend such a combination for the pick-up enthusiast.

Let us now consider which method is likely to give the best results in conjunction with the modern pick-up. In the first place it is not usually necessary these days to employ an amplifier giving a large overall magnification, the reason being that the present-day pick-ups are highly sensitive, and in consequence two stages

A LUXURY EQUIPMENT



This is the "Capehart" self-changing gramophone turntable. It plays twelve 10-in. records, and is sold complete with pick-up, A.C. induction motor, and volume control.

of L.F. amplification with a moderate step-up per stage will give ample volume. In view of this there is no reason why one should not obtain splendid quality with two stages of resistance-capacity coupling. That is, of course, using three valves in all; namely, the valve to which the pick-up leads are attached, then the first L.F. stage, followed by an output stage.

The values are not difficult to choose. I would suggest 100,000 ohms for the anode resistance, ·01 for the coupling condenser, and 1 megohm for each grid leak.

Serious By-Passing Effect

One of the "snags" in resistance-capacity coupling is the fact that there is always a tendency for the characteristic to fall away on the upper musical frequencies. This is caused by the by-passing effect of stray capacities, which are virtually in parallel with the anode resistance, and therefore provide an alternative path for frequencies in the neighbourhood of eight to ten thousand cycles.

When the value of the anode resistance is increased beyond a certain figure, this by-passing effect becomes so serious that the curve will frequently commence to fall away at 2,000 cycles or thereabouts, in which case reproduction becomes low-pitched and, to my mind, unpleasant.

If, on the other hand, the values of the anode resistances are kept down to something in the neighbourhood of 100,000 ohms, or even lower, then the cut off on the higher frequencies is not noticeable, and may even be an advantage for gramophone reproduction, since the scratch is not accentuated.

Turning to Transformers

Turning now to transformer coupling, there is no doubt that vast strides have been made in the design of transformers, and to those who desire to get absolutely the last ounce out of their valve stages then I would recommend this method; but, generally speaking, for ordinary purposes it is very rarely necessary to use more than one good transformer stage with a modern pick-up.

(*Please turn to page* 264.)

PICK-UP HINTS and TIPS

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

By A. BOSWELL.

THE fall in the price of gramophone records will make a lot of difference to the radio-gram enthusiast. Three shillings for six minutes (three minutes a side) was quite enough to pay for our favourite Jack Payne item, or a couple of songs by Maurice Chevalier, and now that the price is reduced to 2s. 6d. I expect a great many more records will be sold.

Where the Money Goes

I am often asked where all the money goes. Well, a certain amount—a matter of a few pence in most cases—goes as royalty to the performer, a certain amount has to be deducted from profits by the recording company against cost, not only of material and labour, but of recording and research, then a certain percentage is profit.

But, and here is where the consumer sits up and takes notice, 33⅓ per cent of the selling price is pocketed by the recognised *dealers*. So a 3s. record is bought by the dealer for 2s.; the profits of the gramophone concern being made in that 2s.

Of course, the dealer has to carry big stocks, so that he has quite a lot of capital tied up in his business, and he runs certain risks of breakages, and of having stock left on his hands, though I believe the leading gramophone companies will take back a certain proportion of unsold records.

On the 2s. 6d. record I suppose the dealer will get only 10d., but of this figure I am not sure, and other arrangements may have been made.

Shop-Soiled Records

By the way, talking of dealers, I wish something could be done to ensure that *all* records sold were unused. In many places—I will not say all—when you buy a record it is quite a toss-up whether you are the first to hear the record "played over" or the twentieth or fortieth. If you decide to have it, then it is more likely than not that you will take away with you a very second-hand record.

Ruinous Treatment

This is not always the case, I know, but if you want a record specially for quality pick-up reproduction it is very difficult to insist on the dealer ordering you a new one when he will protest that the one he is selling you is unused. It may be, but I have my doubts in most cases.

SUGGESTED RECORDS.

Light Orchestral.
Reachin' for the Moon
Sandler – – – – – – – – Col.
Old Friends' Medley
Mackay's Band – – – – – – Col.
Old English Medley
Sharpe Octet – – – – – – H.M.V.

Vocal.
Death of Boris
Chaliapin – – – – – – – H.M.V.
Fiddler of Dooney
Peter Dawson – – – – – – H.M.V.
That's Us
Harry Dearth and Raymond Newell – Col.

Solo Instrumental.
The Valkyrie
Organ – – – – – – – – H.M.V.
The Match Parade
Piano (Raie de Costa) – – – – H.M.V.

Dance.
Tango Lady
Jack Payne – – – – – – – Col.
Bweavin' on de Window
Jack Hylton – – – – – – – H.M.V.
Ho Hum!
Ambrose – – – – – – – H.M.V.

And what is more, it is not only definitely "used" in many cases, but has been maltreated. It is not exactly good for a record to be played with a sound-box that is badly out-of-track—*as many of the first-class gramophone sound-boxes are.* Such treatment is ruinous from the perfect pick-up reproduction point of view.

But perhaps I am particularly hard to please. I may be, yet surely that is the only way to reach perfection (or as near to it as we mortals may approach).

Clockwork Motors

That is why I have still got a clockwork motor in my radio-gramophone. (So, incidentally, has the B.B.C. in its record broadcast unit.) I have found several exceedingly good electric motors, and many more exceedingly bad ones, but I have yet to find a reasonably priced model (£6 6s. or under, so as to make it more or less competitive with the clockwork type) silent mechanically and electrically, and *free from vibration.*

Recently I have been using a very silent and fascinating little unit, and one with which I was perfectly satisfied from an electrical point of view. But after a few weeks' operation I became conscious of a very faint ripple behind the music.

I am hypercritical, I know, but on shoving my head within a couple of feet of the speaker, when the record was on—but "playing" on the leader grooves—I could hear this ripple. It was caused apparently by vibration transferred from motor to spindle and turntable and thence to the pick-up needle. I am now back to the clockwork type, which is vibrationless.

H.M.V. at Olympia

Though not strictly a "hint" or "tip," I should like to draw readers' attention to the fact that at the forthcoming radio exhibition at Olympia, the Gramophone Company (H.M.V.) are not showing in the main hall. Instead they have taken a large hall opposite where a special exhibition of new instruments will be shown.

"His Master's Voice" originally intended to exhibit at Olympia and applied for space in the ballots. Unfortunately it was not possible to obtain space large enough to do justice to the extensive range of new H.M.V. instruments that are to be released in the autumn.

The exhibit probably will be called "His Master's Voice" Modern Hall of Music, and should be considerably larger than that of any other single firm exhibiting at Olympia. The hall will be constructed by H.M.V.'s own Display Department in consultation with a well-known architect.

The New D.C. Valves

By the way, I have been trying out some of the new D.C. valves in radio-gram circuits. The H.L. and the D.C. Pen. make an excellent combination, and I hope to be able to give you more details about these valves in radiograms later.

AS WE FIND THEM

NEW APPARATUS TESTED

"Parafeed" Transformer

MESSRS. RADIO INSTRUMENTS, LTD., of Purley Way, Croydon, the well-known manufacturers of R.I. components, have produced a new transformer called the "Parafeed," which, as the name implies, is designed for use only in circuits utilising the resistance condenser method of connecting.

CONCENTRATED EFFICIENCY

The R.I. "Parafeed" transformer is remarkable for its extreme compactness and its excellent response curve.

The first thing that strikes one about the instrument is its extremely small size. It is, in fact, one of the smallest transformers we have seen. This exceptional compactness is rendered possible by the use of a nickel-iron core containing a high percentage of nickel. In consequence increased permeability is obtained and the number of turns on the windings reduced, while at the same time retaining a high primary inductance.

It is possible to employ the instrument as a standard transformer (parallel fed) having a ratio of 1-3, as a 1-4 ratio auto transformer, or as a 1-2 auto transformer.

The N.P.L. response curves are remarkably good. For instance, when the instrument is connected up as an ordinary resistance-condenser feed 1-3 ratio transformer, with a feed resistance of 30,000 ohms and a condenser of 1 mfd., the response curve is straight to all intents and purposes from 25 to 2,000 cycles. At this latter figure the characteristic commences gradually to rise and continues to do so up to about 8,000 cycles.

This slight increase in the amplification of the upper musical frequencies is a definite advantage, since it tends to counteract any falling off on the higher notes that may be produced by the high-frequency amplifying stages, or other amplifying valves in the set. With an L.610 in series with the feed resistance the average amplification is approximately 25, rising to a little over 30 at 8,000 cycles.

When used in conjunction with the values and valves specified by the makers we found this transformer to give excellent reproduction, and in view of its extremely moderate price, namely, 8s. 6d., we feel sure that it will achieve considerable popularity.

Wavemaster Extenser

Messrs. Webb Condenser Co., Ltd., 42, Hatton Garden, London, E.C.1, the makers of the "Wavemaster" condensers, have submitted a model of their ·0005 Extensers for test.

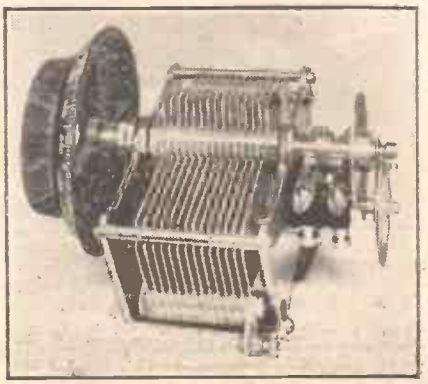
This Extenser is equipped both with direct drive and slow-motion control. The slow-motion is perfectly free from backlash. The cam operating the Extenser contact is positive in action, and since there is some slight rubbing of the contacts these are therefore self-cleaning. A valuable feature of this Extenser is the provision of a stop, which permits the vanes to travel just the 360 degrees and no more.

Connection to the moving vanes is made via a coiled brass spring, a method which is thoroughly dependable in practice. The component is very well made and is an excellent job both mechanically and electrically. We therefore have no hesitation in recommending it for use in any set incorporating Extenser tuning. The price is 15s. 6d., complete with slow-motion knob and dial.

Ingenious Indicators

Messrs. Frank Pitchford & Co., Ltd., of Well House, Well Street, Jewin Street, London, E.C.1, have sent us two very ingenious gadgets. The first, which is called the Willis Time Indicator, is a compact cardboard

GOOD WORKMANSHIP



The Wavemaster Extenser incorporates a stop to prevent the moving vanes from turning through more than one complete revolution.

As We Find Them—*continued*

chart, which by simply rotating a dial gives the exact time from London in any part of the world.

The price of this indicator is 1s.

The second gadget takes the form of a double-sided wheel and tells you at a glance nine important facts about each of 76 of the best-known British and Continental stations.

There is also a space opposite the station chosen for the listener to insert his own dial readings. The price of this device is also 1s.

Lewcos Frame

Messrs. Lewcos are now marketing a very attractive frame aerial of the wave-change type. There are two separate windings, one for the medium waves and one for the long wave-band. Wave-changing is carried out by a switch at the base of the frame, and the whole assembly is exceedingly neat.

The wave-range covered is 235–550 metres on the medium wave-band and 1,000–2,000 metres on the long wave-band; these wave-ranges being given when the aerial is tuned with a ·0005 variable condenser.

The Lewcos frame looks efficient, and is efficient, and those who are contemplating the purchase of an aerial of this kind will be well advised to bear this frame in mind.

Heayberd Mains Units

Messrs. Heayberd, of 10, Finsbury Street, E.C.2, are now marketing an all-electric mains unit suitable for

AN ALL-PURPOSE UNIT

This is the latest Heayberd A.C. mains unit for H.T., L.T., and trickle-charging. It has a current output of 25 m.a. and a maximum voltage of 150.

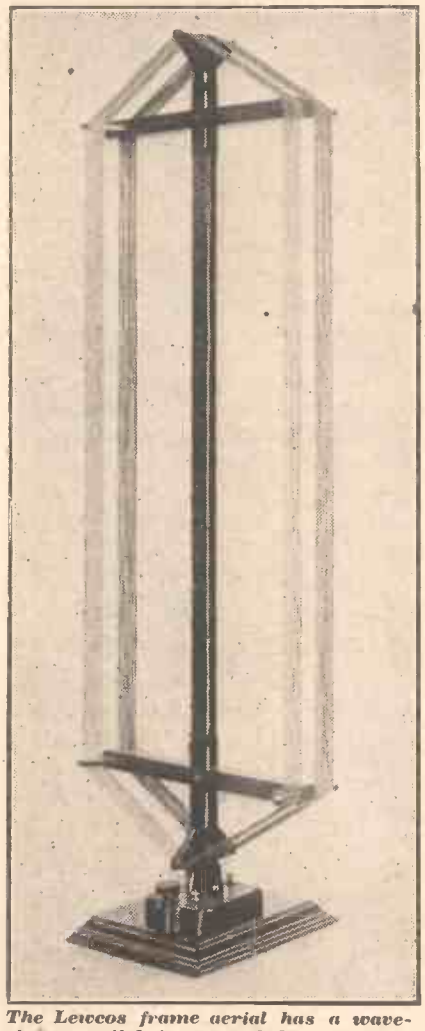
H.T., L.T., and trickle-charging. This unit, which is known as the Model E, is designed for A.C. mains of voltages between 200/250, 50 cycles.

It employs Westinghouse metal rectifiers, and comprises three H.T. tappings—namely, a variable one from 60/80 volts, and two others giving 120 and 150 volts respectively.

The L.T. supply is 4 volts 4 amps. for A.C. indirectly-heated valves, and also 2 volts for trickle-charging. The output is 25 m.a.

A point of interest in this unit is the inclusion of a pilot lamp on the panel, which glows red when the mains are switched on. Also on the panel are

VERY ATTRACTIVE



The Lewcos frame aerial has a wave-change switch incorporated in the base. The price is 32s. 6d.

two switches, one for H.T. and one for L.T. charging, which automatically indicate whether the switches are in the "on" or "off" position.

The model E.150 is a good mains unit and retails at £6 15s. 0d. Messrs. Heayberd also supply a larger unit called the E.200 which has a maximum voltage of 200 and an H.T. output of 30 m.a. The price of this unit is £7 10s. 0d.

It is interesting to note that the makers give a two years' guarantee against breakdown with every unit supplied.

SIMPLE WAVE-CHANGING

This intervalve unit can be "ganged" with the Varley band-pass filter and the wave-changing carried out with one knob.

Varley Intervalve Coil

Messrs. Oliver Pell Control, Ltd., Kingsway House, 103, Kingsway, London, W.C.2, have now brought out an intervalve coil for use in conjunction with the constant square peak coil which we reviewed last month. The inductance of this intervalve tuning unit has been so arranged that the coil can be "ganged" with the square peak coil with ease, and we ourselves had no difficulty in carrying this out during our tests of a three-valve set embodying the two units.

This intervalve unit is suitable either for tuned-grid or tuned-anode coupling, and incorporates a reaction winding. The wave-change switch is situated near the top of the coil, so that it can be linked up with that of the constant square peak coil, thus enabling wave-changing to be carried out by means of one knob.

When used in a receiver comprising the square peak coil and no reaction, high degrees of both selectivity and amplification were obtained.

The price of this coil is 8s. 6d.

The P.O.'s GIANT

We are so used to hearing of powerful broadcast stations that it is easy to imagine they have the most powerful apparatus in the world. But they are as "fly-power" transmitters when compared with the station-of-many-call-signs described here.

By Our Special Correspondent.

RECENTLY I was permitted to see this huge station at Hilmorton, and to examine the several transmitters.

It is really surprising on how many wave-lengths Rugby can be heard. On the very long waves it carries out communication with American commercial stations and gives messages, news bulletins and so on to ships.

On the Short Waves

The lowest wave-length possessed by Rugby, I understand, is 16·01 metres, and it is interesting to note that different call-signs are available for various wave-lengths in order to prevent confusion.

For example, the transmissions on 16·01 metres are from G B U, and 16·54 metres from G B W, and on 16·38 metres from G B S—which has no connection with the famous dramatist!

A whole range of call-signs is possessed by Rugby, and this is advisable because there are so many separate transmissions, and for schedule work it is advisable to keep each transmission log separate. The station works on 36 metres with the call G 2 A A, and, as keen "DX" listeners well know, this resembles an amateur call-sign.

Some Amateur!

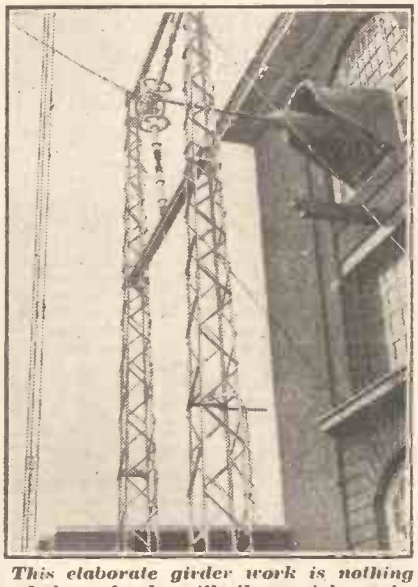
I believe it is a fact that many amateurs who have had strong signals from G 2 A A have been very disappointed to find that there are several kilowatts behind them, and that it is not a pukka amateur station!

There is an equally wide range of transmissions on the very long waves, but it is the short-wave apparatus at Rugby which is most interesting.

In a separate part of the building are the newly-erected short-wavers, which at any time of the day can be in constant touch with America, Australia, South Africa, and with many ships at sea. There are some seven panels in this room, which carry the apparatus needed for the various transmissions.

Each transmitter is in a separate box, some 10 ft. high and 4 ft. wide. All the valve gear is protected by means of screens and switch doors, which cut off the power when they are opened.

JUST THE LEAD-IN!



This elaborate girder work is nothing whatever to do with the aerial masts, but is merely a support and anchorage for the main aerial's down lead.

A "Nobby" Affair

At the front are panels carrying meters in every grid and anode circuit, and subsidiary controls for adjusting filaments and so on.

The engineers are rather proud of a large newly-erected panel carrying the comparatively small transmitter which is used for regular England-Australia work. This is rather an impressive affair, because there are some 35 dials on the front and approximately 40 knobs!

It is certainly not an amateur job to tune it in. Unlike the other panels, the valves for this transmitter are accessible from the front, and through glass doors the large bottle-shaped glowing valves can be seen.

Provision is made for a current of air to run behind the panel to keep all the apparatus cool, but at the same time it is interesting to note that this part of the building is very well heated with radiators.

Accurate Wave Keeping

Thus, even in the coldest weather, the short-wave apparatus is working at a fairly constant temperature.

The Post Office engineers have special arrangements which keep the short-wavers exactly on their wave-lengths, and a large part of the work at Rugby is in the checking of the

The P.O.'s Giant—*continued*

radiated frequencies. The special telephony methods used for trans-Atlantic communication necessitate exact adherence to the proper wave-length, and as the wave-length of some of the Rugby transmitters are given to one-hundredth of a metre—16·01 metres, for example—this is not an easy matter.

The long-wave apparatus is in another part of the building and is equally interesting, but, of course, is several years older. There is a main transmitter hall for the long-wavers which cover Europe and Asia.

"Ship to Shore" Service

At one side are the valve panels, while facing these is a large switchboard which "remote-controls" the generators in another room. A control desk carrying tape recorders and transmitting keys is between these two panels, while the main transmitter control panel is at the end of the room.

One of the control panels which has just been installed is connected to the long-wave 'phone transmitter working with liners crossing the Atlantic, and by means of which anyone may take up a telephone and be connected up with a passenger on board ship. I understand that at certain times of the day the short-wave transmitters are used for this service, but generally these ship-to-shore transmissions are carried out on a very long wave-length.

At the front of the control panel are Morse keys, one of which the operator uses when first establishing communication with a ship. Metres on the panel show the depth of modulation, volume and so on, just as in ordinary broadcasting practice, and as a final check the operator can plug in a pair of 'phones and listen in to the conversation.

The generator room is an impressive sight, and I am told that three of the generators are the largest ever made by the particular engineers concerned—a very well known British engineering firm.

To get at these generators one has to walk between rows of heavy steel netting. The reason for this is obvious when you are told that some of the converters transform the local available power up to 7,000 volts for the anodes of the transmitting valves.

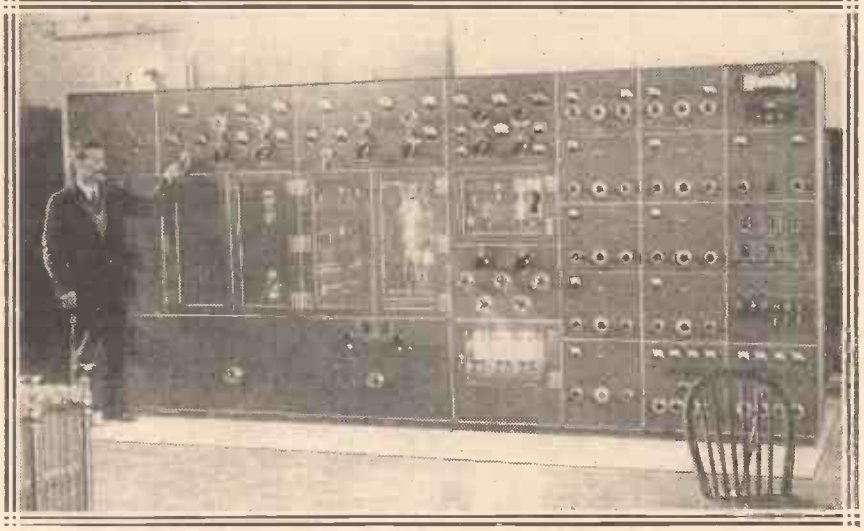
A large switchboard between two of the generators controls the primary input, while control is also possible from the transmitter panels in the other parts of the building.

Bigger Valves for Rugby!

Power is led from the generators to the transmitters by long covered cables which are supported on stand-off insulators from the walls and gallery of the generator room. Indeed an impressive sight!

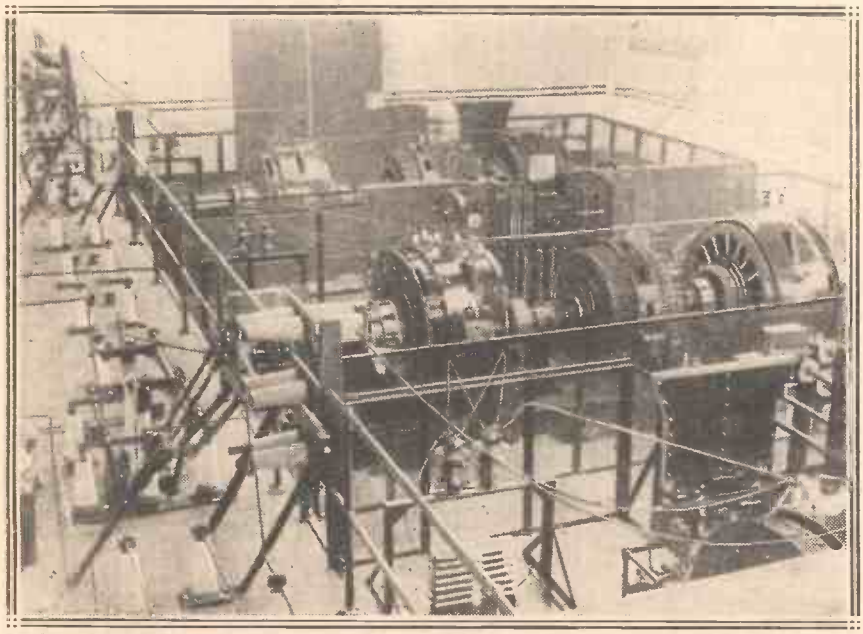
An interesting thing is a bank of huge water-cooled 100-kilowatt valves which have been specially made in a British valve factory and are being put to experimental tests at Rugby. This is the first time a British firm has ever tackled so large a valve as a 100-kilowatter, and the Post Office engineers are constantly making tests on this bank of giant valves to see how they behave.

ENGLAND TO AUSTRALIA VIA THIS PANEL



The short-waver which is used for telephony communication with Australia. There are some 35 dials on it, and about 40 knobs have to be adjusted.

A RELIABLE HIGH-TENSION SUPPLY



In this photograph of a section of the power-house, two 7,000-volt D.C. generators can be seen. These supply the anode current for some of the huge valves that are employed.

IT is pretty hard lines, I think, that I am never allowed to write those jolly little answers to correspondents. I mean, if there is one thing more than another that I do pride myself on it is my gift of putting things so plainly and clearly that any ass can understand them.

How Radio Works

Only the other day a chappie came up to me and said: "I don't know anything about wireless, would you please mind telling me just how the voice in the studio is reproduced by the loud-speaker?" So I said: "Well,

"HIGH RESISTANCE!"

". . . writes to complain that his local dealer gives very poor prices for his worn-out high-tension batteries."

the loud-speaker is attached to the receiving set, which is full of what-nots, thingmejigs, and so on.

"At the studio there is a thing exactly like it only just the opposite, if you follow me, and when a fellow talks or sings in the studio his vocal whatyoumaycallems vibrate and the sound waves set the what'sitsname vibrating too, and then the thing just like the receiving set only just the opposite gets to work and pushes it out through the aerial.

"Then your aerial starts vibrating and your receiving set does its job and the loud-speaker loud speaks."

A Batch of Letters

Could anything be simpler or more lucid, I ask you? Well, this month I have managed to get hold of a batch of letters, and I am jolly well going to answer them.

In future, if you are writing in and you want a good, straightforward, clear answer, just add a special request for "Wayfarer" to deal with your epistle. Now then, all ready? Good, then off we go.

"My set will not work," writes "Puzzled" (Penzance). "Can you tell me what is the matter with it?"

My dear "Puzzled," thank you and thank you again for your concise way of putting things. *You* don't waste lots of time by describing the circuit in detail and sending a diagram drawn all wrong. Nor do you strive to perplex me with horrid symptoms.

Quite Simple

You just go straight to the point, and so will I. Outside your window is a little switch which is now in the "safe" position. Turn it over, switch on the filaments, and there you are. Or, if the switch is already turned over, all you have to do is to connect up the aerial and earth leads to the set.

"Old Hand" (Aberdeen) writes to complain that his local dealer gives very poor prices for his worn-out high-tension batteries. The last one he offered to this dealer he says was practically as good as new, since it had been in use barely two and a half years.

Yours is a difficult case, "Old Hand," and I have given a good deal of thought to it. You would, I think, do much better financially if you made use of your old H.T. batteries instead of selling them.

Old Battery Uses

Just inside each you will find a greenish-grey messy paste, whilst farther in is a bag thing full of black stuff. Extract the paste and put it into small ornamental jars. Make up the black stuff into neat packets. Then start a beauty parlour, selling the sticky stuff as face-cream and the black stuff as eyelash improver. You should do a roaring trade.

"Please tell me what to do with my husband?" writes "Indignant" (Mudbury Wallow). "Whenever I have to give him a little lecture for his own good he puts on head telephones provided with huge rubber pads and doesn't hear a word."

Yours is a sad case, dear lady. Reading between the lines I should say that yours is the kind of husband who would make a very good widower. Why not write to the B.B.C. suggesting that you should give a series of topical talks on "How to Manage Husbands," choosing times when you know that your husband will be listening in?

Treating Old Valves

"Dissatisfied" (Little Puddleton) writes to ask what is the matter with one of his valves. He bought it as recently as 1924 and now it seems as if it will not function.

The cure in this case, my dear "Dissatisfied," is perfectly simple. Lay the valve gently upon the kitchen table, taking care not to jar its delicate interior. With the right hand take up a flat iron and hold this 2 ft. above the valve. Release the

"APPROACHING" OSCILLATION!

"My set squeals whenever I go near it."

grasp, allowing the iron to fall. Then go out and purchase a new valve, as you jolly well ought to have done long ago.

"Hopeful" (Little Pigsley-in-the-Pound) writes me a most interesting letter, or perhaps I should say, to be more correct, I have pinched a most interesting letter from "Hopeful" of Little Pigsley, etc., etc. "I have just worked out a single-valve circuit," he writes. "On an indoor aerial it gives loud-speaker reception from sixty-seven Continental stations. All the home stations can be heard without any aerial at all. Do you not think that there is money in my invention?"

Heaps and heaps, dear "Hopeful," but probably not for you. If you can find a lineal descendant of Ananias

In Lighter Vein—*continued*

to advertise it for you, and somebody with a Highland name such as Isaacstein or Mossbaum to put up the necessary capital, it will probably sell like hot cakes, and you won't lose more than all the money you have got, and possibly your shirt, when you come to fight your capitalist in the courts for your share.

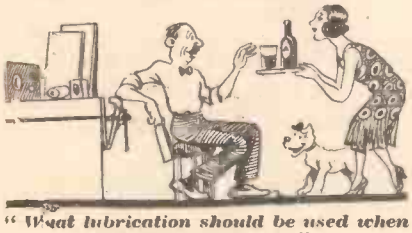
"What am I to do?" inquires Despondent (Mudville-about-two-miles-from-the-Sea). "My set squeals whenever I go near it."

Hard luck, old man. Your set must be extremely sensitive. I can strongly recommend a simple and distinctly expensive course of beauty treatment at Madame Golddigger's beauty parlour in Bond Street. Neither your face nor your bank balance will know itself when Madame has finished with you.

Just a Slight Error

"My set has gone wrong," says P. Fish (Mangley-cum-Wurzel). "I cannot understand why. It was working perfectly until two nights ago, when on connecting up the batteries I made a momentary trifling error. Owing to my short sight I mistook H.T. for L.T., and vice versa. I quickly rectified matters. Surely no harm can have been done?"

"THE RIGHT LUBRICANT!"



"What lubrication should be used when sawing hard steel?"

How nice of you to write in, my dear chap. By the way, the "P" doesn't stand for "poor," does it? You tell me that yours is a seven-valve set; the damage then is in all probability relatively trifling, involving as it does no more than six or seven inches of fine wire. This wire is inside the bulbs of the valves and you may have some difficulty in replacing it. Silly—isn't it?—that valves should be such delicate things.

"What lubrication should be used when sawing hard steel?" queries Optimist (Peacehaven).

The problem of lubricants is a very deep one, and a great deal of patient research work has been done on this problem by me and others. Impress upon your better-half that the keynote of wireless is to bring out the Bass. When she visits you every half hour or so with supplies of lubricant bearing a red triangle on the label you will find your labour greatly lightened.

No Room for Portable

"I have a portable set and a baby car," writes Tidy (Surbiton). "Both are quite excellent. My only trouble is that when all my family are in the car it is difficult to find room for the portable. Can you suggest anything?"

Of course I can. That is what I am here for. First of all, though, have you considered how lucky you are to have a portable set and a baby car? Some of us have portable babies and imaginary cars. Personally, I have a baby set and a portable car which I bought at Woolworths' for sixpence.

There are several ways out of your difficulty. One is to put the family through a course of slimming. You can make this compulsory by reducing the weekly housekeeping cheque and dining out yourself. Another suggestion is to fit the set with a pair of pram wheels and the handle thing off the lawnmower. You can then trail it behind the car quite comfortably.

Clearing the Aerial

"I badly need your help," writes Worried (Slough). "My neighbour's pigeons will sit on my aerial wire and coo. The noise is most disturbing. Can you offer a ray of hope?"

First of all, Worried, I have often been embarrassed when driving through your delightful town. You have notices outside which say: "Please Drive Slowly Through Slough," which always tie my tongue in knots when I try to repeat them.

I mean, the other day when I was stopped by a policeman I explained that I had been doing my best to drive sloughly through Slow. Please use your influence to have something done about it.

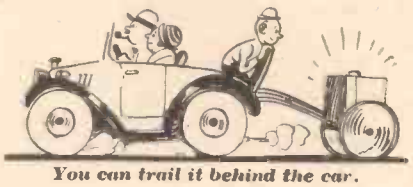
As regards your little trouble, I think I can offer a helpful suggestion. You can buy an air rifle for a few shillings and pigeon pie is by no means to be despised. Or, again, you might adopt the method used at Moorside Edge for warming the aerial. Arrange a special transformer connected to the mains for an output of about 50 amperes at 10,000 volts. Whenever the pigeons start their cooing, switch on and the wily electron will do the rest. A cat on hot bricks is nothing to a pigeon on a hot aerial.

"Why are accumulator refilling places called charging stations?" asks Curious (Southend).

Just look at your quarterly bill, old chap, next time it comes in, and you will understand.

Novice (Mugtown) asks a very interesting question. "On my two-valve set," he says, "there is a little knob called reaction. This I find *most* useful. With a little careful

ATTACHED TO THE "GRID"



You can trail it behind the car.

work I have frequently been able to tune-in stations such as Belgrade and Bucharest in a couple of hours at most.

"Most people do not seem to know how easy tuning is. All that you have to do is to turn the little knob as far as you can to the right, and then to begin your search for foreign stations. You can always tell when you are on to a foreign station by the quite delightful little squeal of joy that the set makes when you pick one up. Why, though, do my neighbours refuse to speak to me on the 8.2 a.m. up to Town?"

You are the victim of circumstance, Novice. In your neighbourhood, apparently, people cannot appreciate the beauty of the chromatic scales that you play on your set.

Friends or Foreigners?

Some people are never pleased. Little cat-calls of the kind which you broadcast improve, to my mind, B.B.C. transmissions of ultra-modern music. Your best way of making your ex-friends on the 8.2 a.m. speak to you again is to turn the reaction right over to the left and then to remove it altogether. You won't hear so many foreign stations, but you will have a lot more friends.

A PRACTICAL MAN'S CORNER

In this section, which is of special interest to the set-builder, many valuable hints on construction and the handling of tools are given.

By R. W. HALLOWS, M.A.

LOOKING round a toolshop the other day I came across the neat and effective little drill which is illustrated in Fig. 1. Having examined it, I asked the price, and was surprised to find that it was only six shillings. I have had it in use now for some days for light work, and I must say that I find it an excellent addition to my workshop.

Money Well Spent

The pillar is 10 in. in height, and the bracket carrying the gear wheels and the chuck can be moved up and down this, being fixed in the required position by means of a thumbscrew. The greatest distance between the chuck and the table is just over 4 in., and the horizontal distance from the pillar to the centre of the table is 2 in.

The drill can be mounted on the workshop bench in the ordinary way if desired, since holes for fixing screws are provided. Many home constructors, though, would prefer to use it on the dining-room or kitchen table, and this is easily done, for a table clamp is supplied with it. It can therefore be set up for work or removed in a jiffy.

The feed is automatic, the chuck moving downwards as the crank is turned clockwise, and travelling upwards to withdraw the drill when the crank motion is reversed. This is a point which will appeal to the home constructor who, with drills of the hand-feed type, too often finds that as he only has two hands he must get somebody else to help him.

Automatic Feed

Without automatic feed one seems to require frequently three hands! One to hold the work, another to turn the crank, and a third to regulate the feed. With the automatic drill the left hand holds the work on the table whilst the right hand turns the crank.

Splendid for Light Work

This drill is not, of course, suited for any kind of heavy work, though its chuck will take drills up to ¼ in. I would certainly not recommend the straight-away drilling of ¼-in. holes with it, even in ebonite; it is better to make a pilot hole first of all with a smaller drill.

The chuck is of the three-jawed type, and it is quite a good one. Naturally, precision work can hardly be done with a low-priced tool of this kind; but for most ordinary purposes it will do all that is required, and I am sure that readers will find it most satisfactory.

It is important, by the way, to keep a drill like this properly oiled. The teeth of the gear wheels, for instance, mesh very closely, and unless they are well greased they will soon show signs of wear.

There are two small tools which always live in my waistcoat pocket. One is the tiny four-bladed screwdriver seen in Fig. 2, the other is the midget adjustable spanner shown in Fig. 3. The screwdriver costs sixpence, and the spanner, if I remember rightly, fifteen pence.

Two Handy Tools

Over and over again they have proved their worth and saved a visit to the tool drawer when some small adjustment had to be made, or a loose screw or nut tightened up.

The screwdriver, as might be expected at its low price, was rather crudely finished when first purchased, the smaller blades being rather too thick. A few minutes' work with a file, however, soon put matters right, and one or other of the blades is now an excellent fit for all the screws likely to be used in wireless constructional work.

It is surprising to find how much force one can exert on a screw with this little tool. I would, of course, recommend that proper long-handled screwdrivers should be kept for general use, but this miniature tool is excellent in emergencies. The spanner should never be used for any but small nuts, and it should be treated as a light tool for delicate work.

At one time or another you must certainly have been puzzled by the behaviour of solder which has

FOR THE WORKSHOP

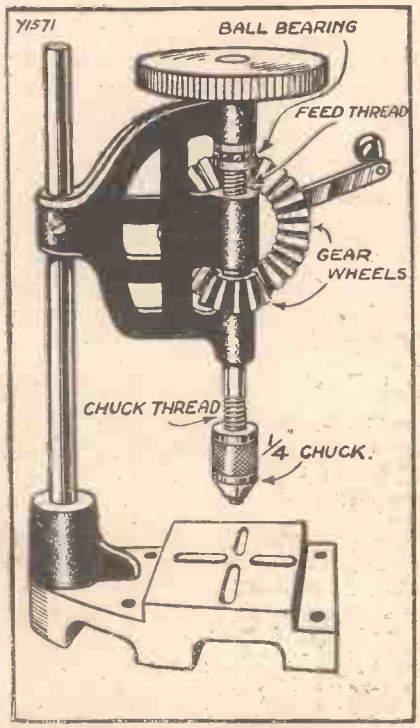


Fig. 1. With this drill you will not feel as though you need a third hand, for it automatically lowers itself as it goes through the material.

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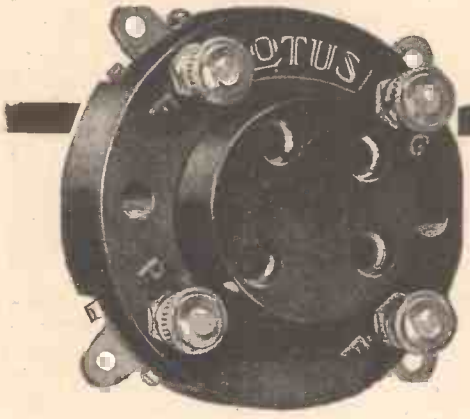

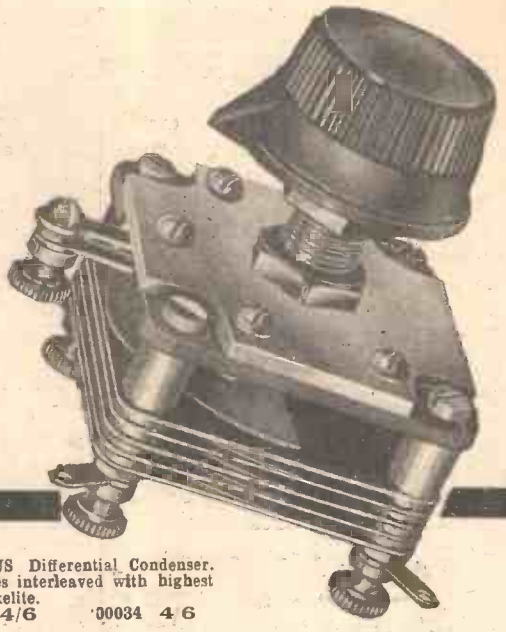

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A Practical Man's Corner—*continued*

absolutely refused to run on to a metal surface that you desired to tin. Nothing is more exasperating. Instead of flowing, as a friend of mine puts it, "as easily as butter on to hot toast," the solder insists on forming wretched little blobs, or in behaving as water does on a greasy surface.

Of one thing you can be absolutely certain, and that is that unless you do get the solder to flow properly a "dry" joint, or at any rate an untrustworthy one, will result. What is to be done when the solder proves recalcitrant? The first thing to discover is why it is misbehaving.

"Dirty" Soldering Irons

In nine cases out of ten it does so because the iron or the surface to be tinned is dirty. The first thing, then, is to make sure that your iron is perfectly clean and properly tinned. Some people imagine that once the point has been tinned it lasts for ever and ever. It may last a long time if you are a very skilled workman, never overheating the iron and never allowing its point to become dirty.

Most of us, though, would do much better work if we re-tinned the bits of the soldering irons more frequently. One great point is that pits are apt to form in the copper underneath the tinned surface. This is, I believe, due to electrolytic action. We have a close contact between copper (which even in the best of bits is sure to contain metallic impurities) and solder, which is itself an alloy.

SMALL BUT USEFUL

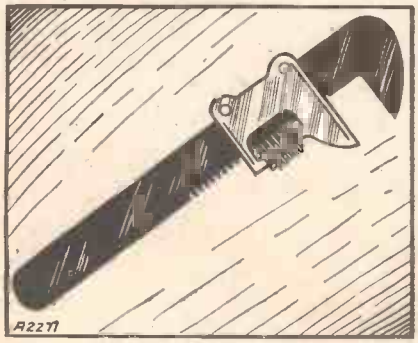


Fig. 3. A tiny adjustable spanner is a very handy tool to have on one, and will often save a trip to the tool box when some small nut or the other requires tightening up.

Almost all fluxes have an acid reaction, so that in the soldering iron, especially as it is being constantly heated up, the stage is fully set for such deterioration of the surface.

When pits do form they become filled with the oxides and chlorides of the various metals. As soon as the iron is brought to a temperature sufficient to make solder run, these impurities float to the surface of the liquid metal and prevent it from falling properly on the surface to which it is applied.

A Monthly "Turn To"!

My own dodge is to have a grand re-tinning evening of all soldering irons about once a month. They are thus kept in perfect condition, and the little extra trouble involved is very well worth while.

Here is a good method of dealing with the iron. Heat up the bit until the solder is liquid on the point, then wipe off all that you can on a piece of rag. If there are pits, you will be able to see them. Supposing that there aren't any, lay the iron aside for the moment and go on to the next. When you find one that is pitted let the bit cool, then place it in a vice and get out an old file.

Don't use a new file, or you will clog it hopelessly with both solder and copper. File away the point of the bit until all the pits are removed, and you have a clean, shining copper surface on all faces. I advise you, by the way, for wireless purposes, to bring the points of your small bits to an edge about as sharp as that of a screwdriver suitable for 4 B.A. screws.

Now go back to the Bunsen burner or spirit lamp, and proceed to re-tin the bits, whether they are found unpitted or required touching up. The best tinning tool is one that I have described previously. It consists simply of a 4-in. length of No. 16 tinned copper wire with a handle formed by an ordinary bottle cork.

Well Worth It

Heat up the first bit, placing it so that the point is not actually in the flame (even a Bunsen flame is not perfectly clean). When warm enough, wipe it on a clean rag, hold one face horizontal, and take a little blob of solder on to it.

Now dip the tinning tool into whatever flux you use, and proceed to "butter the toast" by spreading the solder over the face of the bit. Treat each face in the same way. Put on a rather thick coating and re-heat the bit. Now wipe each face on your rag until all surplus solder is removed, and a thin, even coat remains on the point. If you have not previously tried this method you will be surprised and delighted to find how beautifully an iron will work that has been so treated.

FOR THE POCKET

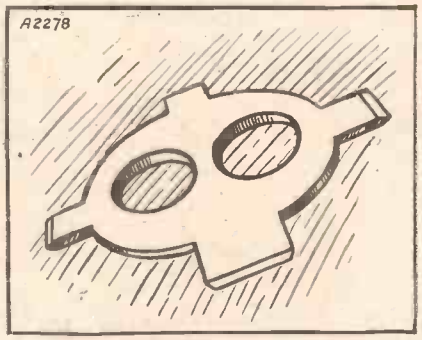


Fig. 2. A handy four-bladed screwdriver which can be carried about quite conveniently in the waistcoat pocket.

So much for the soldering iron. If the bit is beyond reproach and solder refuses to run, then the surface of the work is to blame. Have you cleaned it properly? The slightest trace of grease or dirt is sufficient to make solder misbehave. The best way, I think, of cleaning small surfaces is to scrape them with the edge of an old table-knife, a tool which every wireless constructor's drawer should contain.

Cleanliness Essential

A good scraping and the application of a small amount of flux will generally ensure that solder runs properly, unless the metal on whose surface you are working happens to be one of those which solder, so to speak, does not like. Nickel is one of the most notorious of these, and, for some reason which I have never been able to fathom, not a few makers have the parts of their components intended for soldered connections nickel-plated.

I won't say that it is an impossibility to solder satisfactorily on to nickel, but I am sure that the odds against doing so are very long indeed, and that "dry" joints result in the great majority of cases. The only method is to remove the nickel-plating with a file, and then tin the copper or brass surface so exposed before attempting to make the joint.

(*Please turn to page* 262.)

WATCHING VALVES WORK

Are you a "blind" listener? Or are you in the happy position of being able to watch your set work? Radio is full of fascination, and much vital interest can be added by the use of a few meters, as described below.

By G. W. EVANS.

A RADIO set is a funny thing, so lifeless in appearance yet at the same time just teeming with movement. Millions and millions of electrons are racing round the various circuits, and through the valves, but giving no indication whatever of the "life" within, except, perhaps, by a small spark when a circuit is broken or a shock off the H.T. battery if you happen to put your fingers across it, or again in the lighting up of the valve filaments should the valve be so constructed that you can see its filament.

Handy Metres

No sign—that is, unless instruments are used to detect the presence of these electrons. The loud speaker is sensitive to a certain extent to electron flow, and will transform their energy into sound, but apart from this the average wireless set gives no indication at all that anything is happening within it, and the ordinary listener depends upon his ear and his loud speaker to tell him whether or not the set is working.

If programmes will not "come through," and reaction seems unavailing, then the usual thing is to remove and replace the H.T. positive plug and listen for a click in the loud speaker. If there is a click, then the set is said to be "alive"; but if there is no sound, then it is "dead."

Measure Your Milliamps

That is a very rough-and-ready way of carrying out a test, but in these days of comparatively cheap meters there is little excuse for the enthusiastic listener or home constructor not having at least two such meters (a voltmeter and a good milliammeter) in his possession. The voltmeter will tell him what pressure is applied to his valves (both the L.T. and the H.T. if a double-reading voltmeter is used), and the milliammeter will tell him what sort of use the valves are making of the power supplied to them.

"Digging Out" Distortion

The milliammeter especially is a fascinating and valuable instrument, for not only will it tell if or not the valve is working, but the state of health of the valve, and whether or not distortion is occurring in any particular circuit.

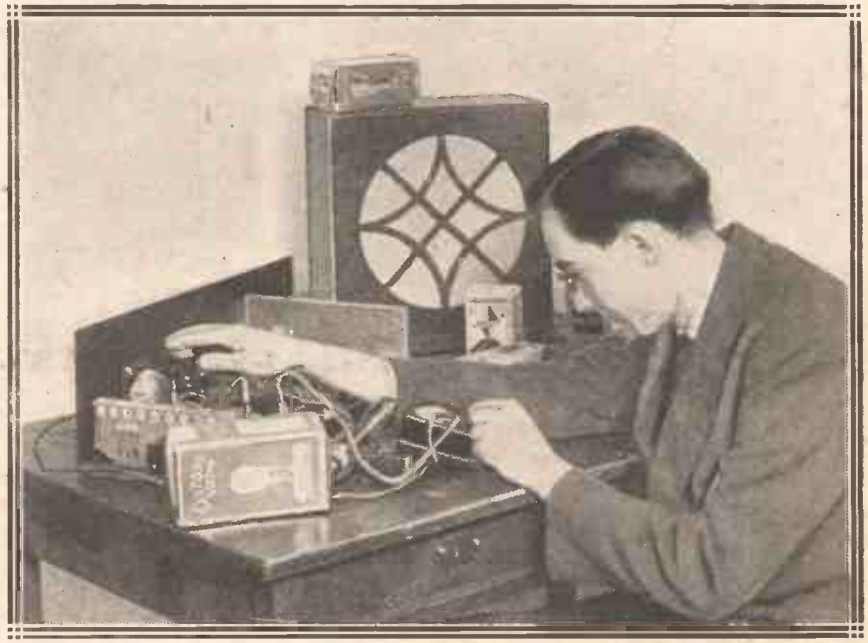
With a good sensitive milliammeter quite a minute amount of musical distortion will show very clearly. If any valve is losing emission due to age or due to having the grid bias wrongly set, or to using too much H.T., the milliammeter in its anode circuit will show whether it has the right grid bias, and whether it has the right H.T.—in fact, whether or not it is being over-run or under-run—and, as I said before, by the kicks which the needle will make on loud passages it will tell if the set is overloading.

A milliammeter should be dead steady (or very nearly so), even on the loudest passages, otherwise a certain amount of distortion is occurring, whether or not we hear it as distortion in the loud speaker.

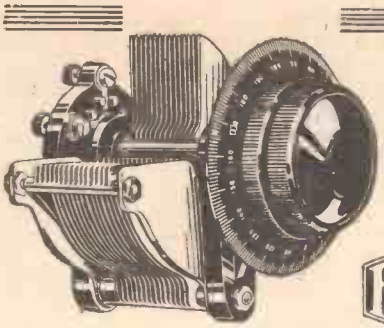
In the Negative Lead

There is no need to have a milliammeter in the anode circuit of *every* valve. One in the negative H.T. supply is as good a place as anywhere, and that will tell the total current the valves are taking; and by pulling

SAVE TIME AND TROUBLE BY SYSTEMATIC TESTING



If your set does not seem "up to scratch" with its programme pulling powers it is a good plan to test the valves for emission to see whether or not they are worn out. Slight loss of emission is not easily noticed unless a meter is used.



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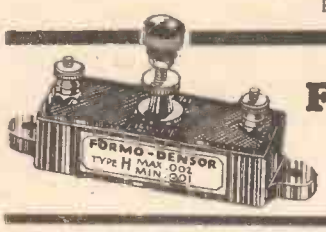

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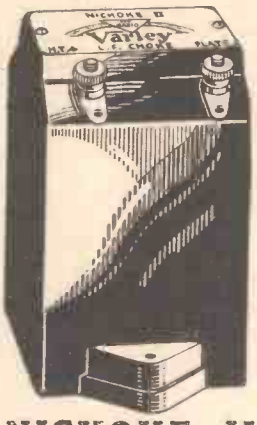

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Watching Valves Work—*continued*

one valve out at a time, or, better still, by putting one valve in at a time, we can see exactly how much current each valve takes, without having to bother about moving the milliammeter from anode circuit to anode circuit in order to see what is happening.

Detector Current

By means of a milliammeter we do, in fact, "see our valves working." We see the effect, for instance, the incoming signal has on the detector. If we have a sensitive milliammeter reading up to, say, five or six milliamps., put it in the detector anode circuit and tune in a signal, we shall see that the reading will vary as the station is tuned in, and will reach a minimum reading when the station is fully tuned in.

That is, of course, because the incoming signal makes the grid more negative and therefore less anode current is taken. This occurs only with leaky-grid rectification. With anode-bend rectification there will be an increase due to the fact that the mean anode current has been increased owing to the heavy swings in input voltages to the right-hand side of the rectification point on the grid voltage-anode current curve.

Any voltage "to the left" of that point will mean no change in the anode current, but any signal swinging to the right of that point will make the grid less negative and so increase the anode current, the amount depending upon the signal strength.

Prevent Overloading

Now this may seem a pretty sort of story, but it is a valuable fact for all who want to build a quality receiver for local station operation.

It is well known that in order to load up the receiver properly one should always give the L.F. valves exactly the same input, and they should be set correctly for that input, and also care must be taken not to overload or underload a detector.

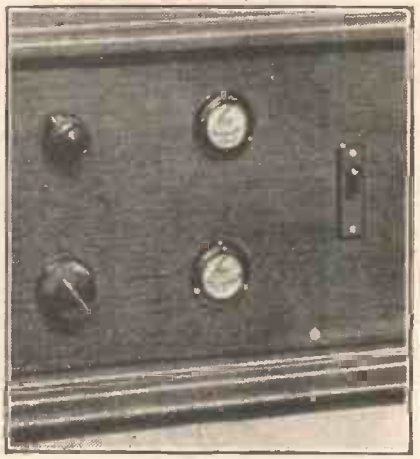
A detector valve has what is known as a threshold point below which it does not rectify in such a good manner as it does when the threshold point has been reached or passed.

BEFORE THEY REACH THE LISTENER

This young lady is very busy testing valves at one of the famous British factories. All responsible manufacturers test their products very thoroughly before selling them to the public.

On the other hand, if too much input is given to a detector it will overload and cause distortion. So one has really two limits, a minimum and a maximum, and the detector input should always be kept between these limits. It is difficult to do this unless

ON THE PANEL



Two meters — ammeter and milliammeter—used on a D.C. set to check the operation of the valves.

a meter is used, and a milliammeter serves admirably, for all one has to do is to tune in a station to such a degree that one keeps the milliammeter needle in exactly the same position no matter what the station is. Then one knows that exactly the same input is being passed to the detector and then on to the L.F. valves.

Balanced Input

For instance, suppose we are tuning in the London National and our milliammeter reads a certain figure when we get good, clean, distortionless reproduction. Then we tune in the London Regional, and we tune that in *fully* as we did the London National, we shall probably find that if the London Regional is more powerful at our location that the milliammeter will read higher than previously. The thing to do in this event is to decrease the input by some pre-detector losing scheme (preferably not by detuning), and then we shall find we reach a point where the milliammeter reading is the same as in the case of the London National. Then we know that our detector is having exactly as much input as it requires to give pure, distortionless rectification, and to pass on just the right amount to the L.F. valve without overloading.

OUR NEWS BULLETIN

Relay Experiments

IT appears that the General Electric Company have recently taken a good deal of interest in a new relay wireless system. The company has been responsible for a series of experiments and, according to the press, the Directors visualise the time in the not too distant future when its relay stations, especially in the Midlands, will be able to select the best items from the B.B.C. programmes for their clients as well as alternative programmes from other stations.

A Coventry Scheme

Anyway, Coventry Corporation has given the G.E.C. permission to wire 800 houses on its Radford Estate, if the householders wish to take advantage of the G.E.C.'s new system. I understand that Birmingham City Council have also shown interest in the scheme.

Those Welsh Programmes

Wales is persistent in its demand for more and better Welsh programmes. In fact, another deputation will probably have interviewed Sir John Reith by the time this issue of the "Wireless Constructor" is on sale.

Licence figures in Wales, by the way, are extremely small.

* * *

The Welsh Nationalist Party complains that the B.B.C. is anglicising Wales, but the B.B.C. points out that Wales, despite all its complaints, is very well served.

Actually, Wales only contributes about £70,000 in licence fees a year to the licence revenue, and it is obviously impossible that Wales should have a broadcasting station all to itself for broadcasting programmes in Welsh.

The Western Regional

The projected high power Western Regional Station will probably please Wales a bit better, for we understand that a fair proportion of the programmes will be in Welsh.

In the meantime, the deputation to Savoy Hill will demand more programmes with a Welsh interest from the Daventry station.

Newcastle's Programmes

It seems now pretty well decided by the B.B.C. that the Newcastle station will not be closed when the B.B.C.'s scheme for fewer and more powerful stations is complete. We understand this decision is due to the fact that Newcastle occupies an important geographical point as the centre of a big industrial area, and it would not be to the interests of listeners in that area to discontinue transmissions from the station.

Gingering Up 5XX

We mentioned some time ago in these notes that 5 X X, the National

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OUR NEWS BULLETIN

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broadcasting station at Daventry, will shortly be reconstructed. It is as long ago as 1925 since Daventry came into service, and although at the time of its construction 5 X X was the premier broadcasting high power station in the world, so many improvements have been made since in radio technique that the station is now almost out of date.

The Western Site

Rumours are constantly cropping up about a decision made by the B.B.C. for the proposed site of the West Regional station, but we now hear something more definite and that is that the B.B.C. has decided to purchase a field of some 25 acres on the Williton-Minehead main road.

An important point about choosing a site for a Regional station is that at least ten thousand gallons of water must be available daily for cooling purposes at the station.

Those Armchair Critics

According to a correspondent in the "Daily Mail," the B.B.C. receives roughly 56,500 letters a year. Out of that number only 4,200 or so criticise. This seems an extraordinary small number in view of the fact that the B.B.C. to-day must have at least 20 million listeners in this country.

But it illustrates again the fallacy of the B.B.C. maintaining that its programme service is satisfactory because so few adverse criticisms are received. The truth of the matter is, of course, that these people simply can't be bothered to write critical letters.

Sets from the U.S.A.

The "Daily Mail" states that the biggest drive yet undertaken by the United States to secure the wireless trade of Great Britain has begun, and that American travellers are going the rounds of wholesalers and retailers throughout the country, and in one day recently three representatives of different United States radio firms called at one of the larger London stores.

One item is A.C. valves offered at 4½d. each. Similar valves here cost 15s. each.

Those Cheap Valves

Well—this need not worry British manufacturers. Valves at 4½d. will not capture the market in this country, where cheapness is not the only thing desirable in radio.

Dumping Delusions

Obviously, it is best to pay well for a really good component. And if there is one thing we fans can be certain of, it is that British radio goods beat the American products hollow. "Dumping" won't delude sensible set-builders this side of the Pond.

What He Thinks!

The radio gossip writer in the "Daily Herald" has been telling his readers "what he thinks." This kindly action resulted in the following expressions of opinion:

"I like Leonard Henry far and above all other B.B.C. comedians. I am not a Gillie Potter or Tommy Handley fan. I always think I can read leisurely, and better enjoy, this

(*Continued on page 260.*)

NEXT MONTH'S "CONSTRUCTOR"

The October "Wireless Constructor" is going to be a big autumn number full of good things, and if you want to be sure of it you should

ORDER NOW.

As it will be our

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there will be a big illustrated supplement full of interest alike to those who visit Olympia and those compelled to stay at home.

USUAL PRICE, 6d. ON SALE, SEPT. 15th.

OUR NEWS BULLETIN

—continued from page 258

sort of thing in the 'Passing Show.' Mabel Constanduros is marvellously consistent. No similar turn approaches her 'aunt.' Once upon a time I was prepared to wager that 'Auntie' was a person other than Mabel. Clapham and Dwyer's 'cow' I regarded as heavy and unpalatable, and I think I have managed to push her back into her shed where she belongs rather than in the studio."

Now you know what's what!

Licence Figures to Date

On July 1st, 1931, there were 3,719,594 licensed listeners in Germany, or 494,650 more than on July 1st, 1930. Included in the total are 168,560 war cripples, blind or unemployed persons, and others, who are given free licences. During May the licence figures in Gt. Britain showed an increase of 38,056, which is 10,914 more than the corresponding increase for last year. The total number of licences is now 3,780,594.

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 regular copy each week.

The King's Microphone

The Marconiphone Co. asks me to point out that the new microphone specially built for the use of H.M. the King was made by the Marconiphone Co. The microphone is not used for broadcasting, but is reserved exclusively for the use of the King when his voice is conveyed through a Marconi Co. amplifying system.

MAINS UNIT OUTPUT

BEFORE buying a mains unit a little thought on the matter of correct voltages and current would be well repaid.

The choice of voltages is quite straightforward, since the point can be easily decided from the valves used. It should be realised, though, that much greater latitude is permissible than with batteries.

The latter are, at best, expensive, and for this reason voltages beyond a certain figure are often out of the question. The cost of 150 or even 200 volts from the mains is almost negligible, so that valves can be worked at the maximum plate voltages specified by the makers; an important matter where pentodes or super-power work is desired.

A frequent mistake is to cut the current output too fine. For example, it might be thought that a unit giving a maximum current of 10 milliamps. should be perfectly suitable for a set of that capacity.

A Better Policy

A better policy would be to allow 5 milliamps. or so as a margin against overloading. An overloaded eliminator can be very unsatisfactory, and can easily be damaged. It is wise also to make provision for new valves that may be a little more "thirsty" in H.T.

H.R.

THE INTERFERENCE PROBLEM

THE Radio Association recently wrote to the Postmaster-General regarding the interference to wireless reception caused by trolley omnibuses in the London suburban area, and suggested a conference of interested parties to discuss the trouble.

A letter to the association from Mr. F. W. Phillips, Assistant Secretary at the Post Office, says:

"All complaints of interference with wireless reception are investigated by this Department's technical officers, and in the majority of cases this Department is able to suggest remedial measures. Usually the owners of the offending apparatus are prepared to adopt them.

Serious Cases

"The more serious cases of interference, however, arise from trolley bus and tram services, for which no universal remedy is available. A joint investigation is at present being actively pursued by the Post Office, the British Broadcasting Corporation, and representatives of the various bus and tramway undertakings with a view to finding a solution.

"The question of introducing further legislation on the subject of wireless will probably be considered when the results of the next International Radio Telegraph Conference, to be held in Madrid in the autumn of next year, are known."

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THE INTERFERENCE PROBLEM

—*continued from page 260*

Whether a solution of the problem will eventually be found is rather doubtful. Interference from trams, electric trains, etc., can hardly be eliminated, although possibly a good deal can be done to minimise the trouble.

G.E.C. PROGRESS

THERE will be many improvements in the General Electric Company's range for next season. The G.E.C. research department is constantly striving to achieve a still higher standard in its designs, both from the standpoints of technical efficiency and appearance.

Appearance counts when the receiver has to take its place as an article of furniture amongst the remainder of the drawing-room "make up," and listeners need have no fear of purchasing a G.E.C. set on this score.

For instance, the Osram constructor's kit now known as the "Music Magnet," and in future as the "Osram Four," has a handsome walnut cabinet with a panel to match. It can be obtained as a battery-operated design for £10 15s., or complete with A.C. valves and an A.C. conversion kit for £17 15s.

A Useful "Kit"

Incidentally, this conversion kit can be used for converting the existing Osram "Music Magnet" to all-mains A.C. operation, and the price of the unit by itself is £6 1s. 6d.

During a recent visit to the G.E.C. works at Coventry we were given the opportunity of hearing a number of the "Gecophone" sets and speakers working. We were favourably impressed by the G.E.C. Inductor Dynamic Speaker. It retails at £5 10s., complete with cabinet, and looks a very attractive proposition.

For the "de-luxe" listener there is the All-Electric Radio-Gram., retailing at 40 guineas. There is a one-knob tuning control, the illuminated tuning scale being calibrated in wave-lengths. The turntable is driven by an induction motor and is provided with an automatic motor-stop. The speaker is the G.E.C. Inductor Dynamic type.

Altogether it is a fine set, the cabinet-work being excellent.

A PRACTICAL MAN'S CORNER

—continued from page 250

There is one cause of "blobbiness" in solder that still remains to be mentioned. This is the use of an iron that is not hot enough to do the job properly. Sometimes the bit is too small for the work. All metals are good conductors of heat, and as soon as the bit touches them they draw heat out of it and radiate it away. Therefore, remember that the larger the work, the bigger must the bit be for good results.

One of the duties of the soldering iron is to heat up the surface to which solder is applied until the right temperature is reached. It cannot do this if it is too small or not hot enough. There are two useful ways of telling when the temperature of the bit is just right. The first is to watch it whilst it is in the flame.

When you see a distinct greenish tinge appearing in the flame the heat is probably just about right. You can make sure if you have a folded newspaper beside you. Lay the bit firmly on this for about a second; if the paper is singed slightly your iron is as it should be.

A Loud-Speaker Tip

The cones of most balanced-armature loud speakers are connected to the driving rod of the unit by means of two little metal cups, one inside and one outside. It often happens that these small cups are not perfectly shaped to the apex of the cone, and chatter may arise even when felt washers are used. This can usually be prevented by making washers not of felt, but of rubber.

Cut them out from a piece of an old motor inner tube, and make them quite a bit larger than the cups themselves. The rubber damps out any tendency to chatter, and much improves the performance of many loud speakers. Be careful, by the way, not to make the central holes in your washers too big.

THE "GANGSTER"

—continued from page 234

By comparing the practical and theoretical circuit diagrams you can follow out that "A" is the 60 tap on the first long-wave coil, and "B" the 30 tap. "D," "E," and "F" are the start and the 4th and 6th turns respectively of the P.J.2's primary.

In the case of the intervalve long-wave coil, "G" is the 60-turn tap (from the end of the coil), and "H" the 30-turn tap. Similarly, "K," "L" and "M" are the intervalve medium-wave coil taps, "K" being the start of the coil and "L" and "M" the 10th and 20th turns respectively.

There is just one more point to mention. As the detector's grid condenser is "end on" for a plan view of the baseboard, it does not make a very brave show. It is one of the tiny ones made by the T.C.C.

The top contact of it is connected to the white lead from the P.J.3 coil and to the fixed vanes of the second section of the variable condenser assembly, and the bottom is connected to the grid of V_2 and to a 2-megohm grid leak. The latter being partly hidden by the second coil quoit.

It is the type which has terminals at the ends for connecting-up, as it is doubtful if you would find room for an ordinary grid-leak holder. And now I think I've told you all there is to tell except for the accessories and the operating details.

Neither of these are complicated or require much exposition. Anyway, they are all given in a concise and convenient manner in the operating chart, which if you cut out and fix to the lid will just put a nice finishing touch to your receiver.

THE "EXTENSER" FIVE

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condenser to come into operation. Its capacity is increased as the knob is turned farther in a clockwise direction.

There is another component which in a way also has a dual capacity. This is the "on-off" switch, which, besides breaking the L.T. circuit, also breaks the H.T. circuit through the potentiometer which supplies the screening-grid of the first S.G. valve with high tension.

It Saves Your H.T.!

If this were not a three-point switch there would be a continual flow of current through this potentiometer when the set was switched off. The type of component to use here is similar to the switch generally known as a 3-point wave-change switch in which all the contacts are either joined together or separated.

Two other small component points concern the screens, and the grid leak of the detector valve. Two of the former must have holes in them for the S.G. valves to pass through. The holes should be about $1\frac{3}{4}$ in. in diameter, and be so placed that they come opposite the "horizontal type" valve holders.

With reference to the 2-megohm grid leak, you will agree that there is not room for a holder. So it should be the type with terminals or connecting wires already attached.

The Output Transformer

The final component to which I want to make special reference is the push-pull output transformer. The type to use here depends upon the resistance of the loud speaker you are going to employ.

If your speaker is an ordinary high-resistance type, the transformer specified in the list of components will be O.K., but if you have a low-resistance speaker of, say, the moving-coil type you should get a different ratio

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THE "EXTENSER" FIVE

—continued from page 263

transformer. In this case, tell the makers what your loud speaker is when ordering the transformer.

And now we come to drilling the panel. The Extenser assembly is naturally rather on the heavy side, and it is a good idea to make it rest on the baseboard, so that the whole of its weight is not on the panel.

Legs on Later Models

Although they were not present on the model I used, I believe later Extensers of this type will be supplied with "feet" at the back. Anyway, the thing is to remember to drill the holes for the fixing screws so that the assembly just rests on the baseboard.

The dimension on the front-of-panel diagram may not be exactly right for this, because you may have altered the height of the baseboard a little, as previously mentioned, or the position of the hole on the Extenser assembly may vary a little. So watch this point.

Perhaps you are a little surprised that such a dimension as $\frac{5}{16}$ in. should be given for the "on-off" switch. The reason for it is that there is only just room for the switch behind the panel, although another make might fit in easier.

Securing Spaghettis

While writing about under-baseboard matters, you will see that a number of connections have to be made here to Spaghetti resistances. This is accomplished by clamping the end of the Spaghetti to the wire by means of an ordinary wood-screw.

But you must be careful to use shortish screws in case they just pierce the top side of the wood and so make contact with the copper foil with which it is covered. As you can imagine, such a state of affairs would lead to all sorts of troubles.

The reaction condenser cum volume control is supplied with a 9-in. extension handle, and this should be shortened a bit to about $7\frac{1}{2}$ in. You can see that this extension rod protrudes just the right amount in front of the panel when screwing down the bracket to which it is secured.

The only remaining point about the mounting of the components is to mention that you must not forget that the S.G. valves have to be inserted. So don't put anything where it will come in the way. Actually the first S.G. valve has to be put in place before the long screen is secured.

Already Adjusted

Perhaps you may have been wondering why no mention has been made of adjusting the ganging of the double section of the Extenser. Well, the reason is that there is none to do.

The assembly is sent out guaranteed properly balanced, and the coils if wound according to directions will match up beautifully. In this connection, if you buy your coils, see that they are all the same make.

For those who want them, full details for using a pick-up with this receiver will appear next month.

To ensure that all the screens are in proper metallic connection, short flex leads, soldered to the baseboard foil and having a soldering tag at the other end, are used. These are clamped under one of the fixing screws of the vertical screens in each case.

With the aid of all those details, you will agree that the construction is not such a very difficult job, and all you want to know about now are the accessories and operation. These you will find conveniently set out in the usual operating chart.

WITH PICK-UP AND SPEAKER

—continued from page 239

For this reason, if the set is also intended for radio and incorporates two transformer-coupled stages it is better to insert the pick-up in the grid circuit of the first L.F. valve rather than to switch it across the grid and filament of the detector, unless adequate means of controlling volume are provided. By adequate means I have in mind a volume control actually across the pick-up itself, so that the input to the first valve can be cut down to prevent overloading.

Combined resistance-transformer coupling has many advantages, inasmuch as one can obtain high-quality reproduction with good overall amplification. Moreover, such a combination is very stable, and it doesn't need the careful treatment required by two transformer stages in order to overcome the possibilities of L.F. instability.

Intervalve Coupling

Summing up, therefore, in the case of an amplifier used only for pick-up work I am in favour of resistance-capacity coupling, especially since it is a method which gives better transient response than the other schemes.

On the other hand, if the amplifier has also to be employed for amplifying the radio signals, then I consider that a combination of resistance and transformer coupling, or even two transformers, are preferable, because it is not otherwise possible to obtain the necessary overall amplification to bring distant transmissions up to a strength sufficient to work a loud speaker.

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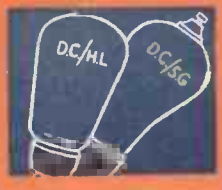

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