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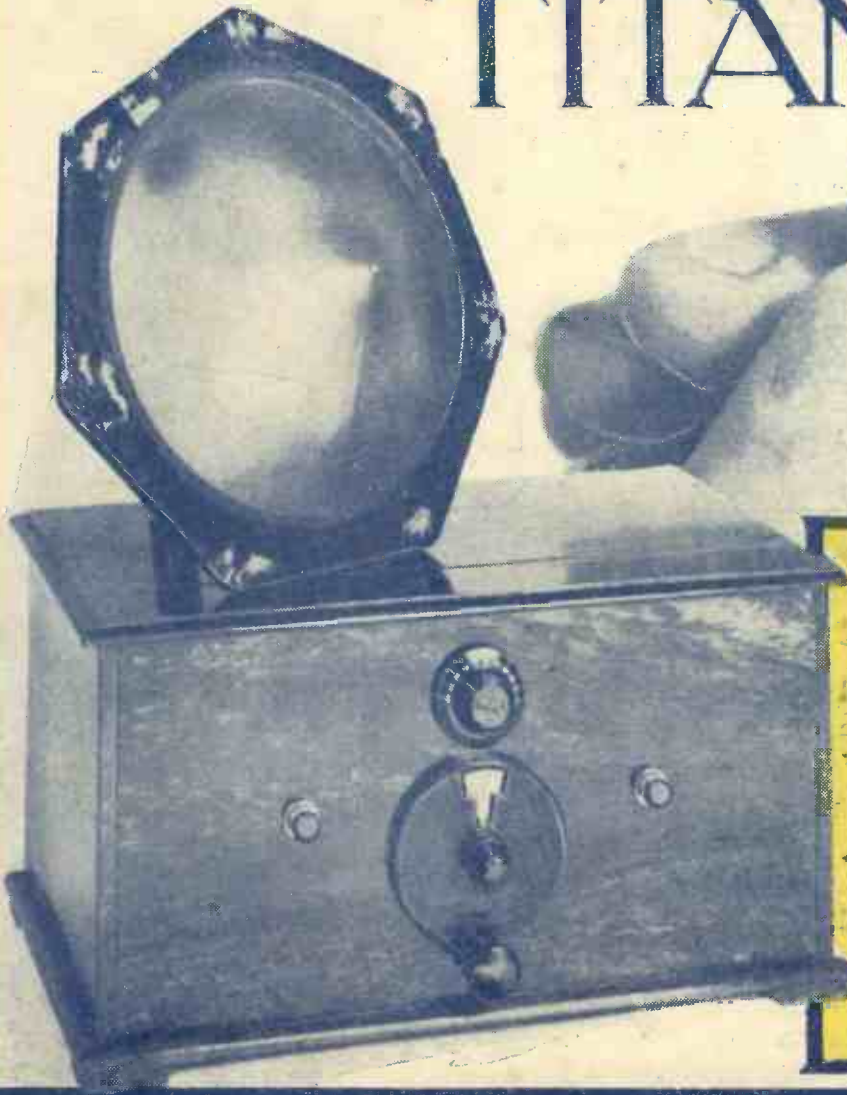
No. 353. Vol. XIV.

INCORPORATING "WIRELESS"

March 9th, 1929.

The "RADIANO" TITAN

*See
Inside*



Other Special Articles

Amateurs of N.Y.

More About

The "Titan" Sets

A Universal Output
Filter

Television Developments

"P.W." WHITE PRINT No. 14

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NEWS!**

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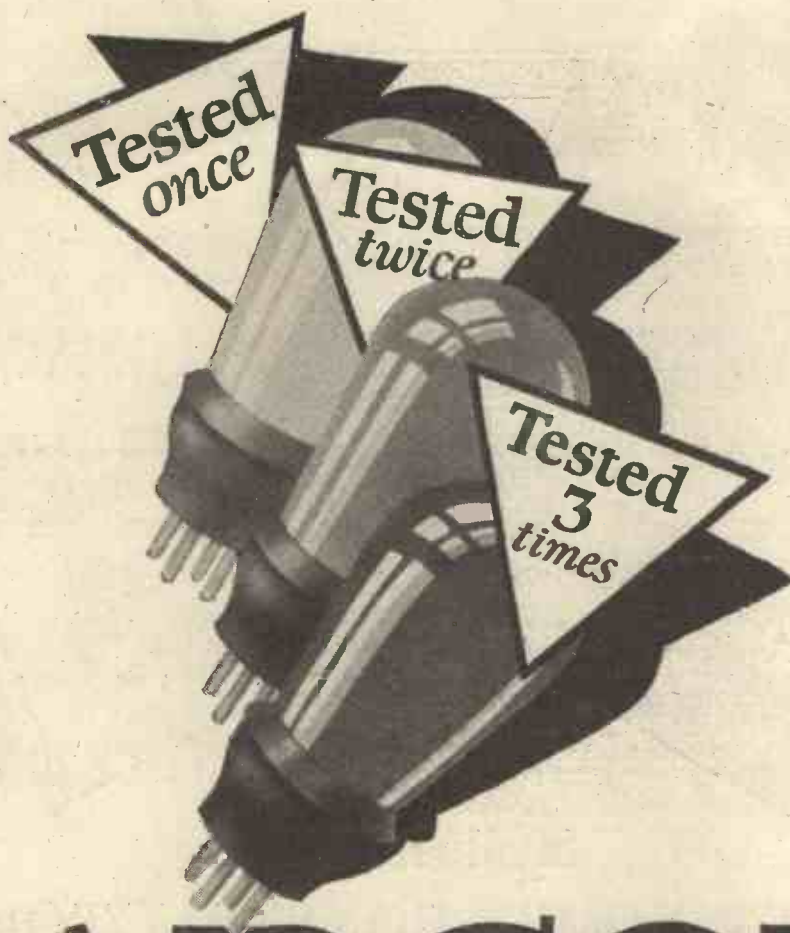
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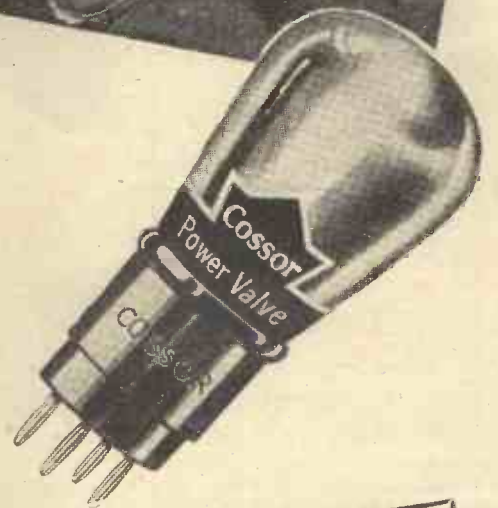
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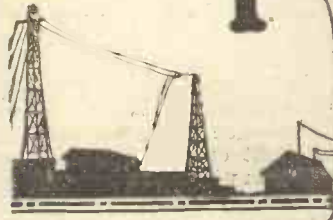
COSSOR **VALVES**



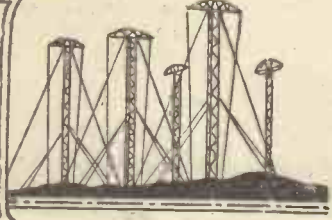
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It shows positions and gives wavelengths and dial readings of 200 European stations. It will double your Radio enjoyment. Write for it now, enclose 2d. stamp to cover postage. **Send at once!**

Popular Wireless



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RADIO NOTES AND NEWS.

Down with Trams—D.F. in the Antarctic—The Yellow Peril—The Campbells are Calling—Where Radio Booms—Broadcasting at a Loss.

Choosing a Name.

DOUBTLESS the Council of the B.B.C. have already selected a name for their new headquarters. Nevertheless the public are interested and, therefore, I will mention a few of the names suggested to me. W. F. K. (Hastings) has a list of seventeen, the two best being "Marconi Lodge"—(though this indicates a small house)—and "Faradio House," and the funniest, "Cat's-Whisker House."

Also Ran.

OTHER names put forward are, "Fleming Lodge," "Ethereal House," "Thermionic House," "Ariel House," "Chamber Music Chambers," "Talking Towers," "Melody Mansions," "Electron House," "Radiation Building," (ugh!) and "Circumvox House." Perhaps, after all's said and done we had better have a non-fanciful name like "Blogg's Rents" or "Brown House." It will be better for the postman.

That Detector Valve.

A FINCHLEY reader is cross with me because I "pulled the leg" of a Sunday paper, which misinformed the public to the effect that "the detector valve turns the oscillating impulses into sound waves." He says the Sunday paper was quite correct. I say it was quite wrong—and ye shall be my judges. Bless me, Finchley! You might as well say that the chicken makes the omelette because it makes the egg. Evidently, in his opinion, the telephone or loud speaker are unnecessary. He tells me such stuff is all right for the "man in the street." Well, "P.W." caters for that gentleman—and manages to combine clarity with accuracy.

The B.I.F.

THEY tell me that the Wireless Section of the British Industries Fair was of unusual interest and attracted a huge crowd of buyers. Having expended all my grandmothers many years ago I was unable to sneak half a day in order to visit the White City, but I learn that foreign opinion was generally the same as it has been for years about British goods, namely, second to none in quality and, though on the expensive side, worth the money. It does seem, however, that we might improve

our export sales methods. As a traveller I can confirm much that the Prince said on that score.

Down with Trams.

ALTHOUGH the abolition of the electric tram seems to be the only universal remedy for their interference with radio, it is of some comfort to know that the Post Office and the B.B.C. are co-operating in the work of finding devices to effect as much improvement as possible short of such a drastic move. Perhaps

the Post Office will take the advice of the Canadian Commission which is now visiting England to study broadcasting, for they make a speciality of removing similar interference in Canada, and are very successful.

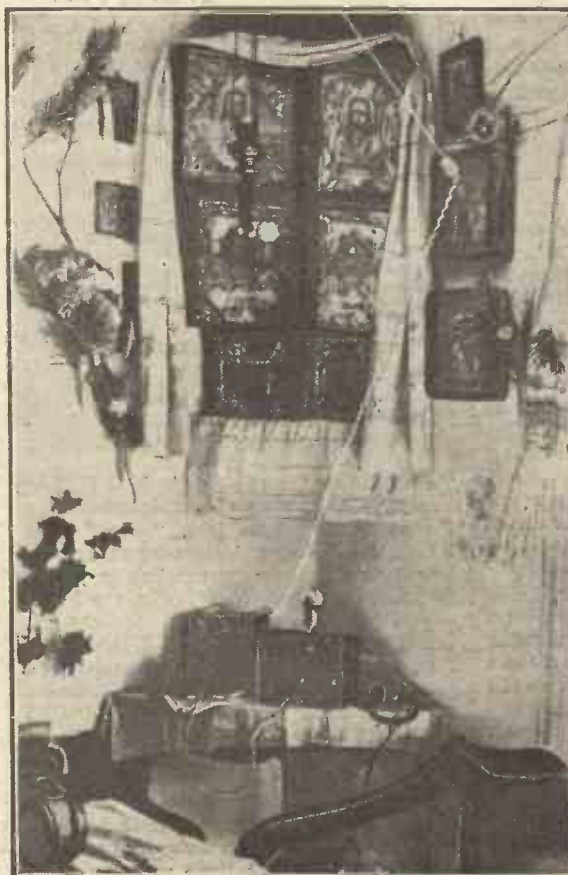
Oscillation Rampant?

I UNDERSTAND that about half of the B.B.C.'s enormous post-bag contains letters of complaint about interference by "howlers," a sad state of affairs, considering Capt. Eckersley's efforts and the general growth of technical skill and knowledge. No doubt a great deal of the trouble is caused by elderly listeners who really need entirely "fool-proof" sets, because they simply will not bother to learn anything about radio. Also, no doubt, much "oscillation" is done by inexperienced home-constructors in the process of testing the "very latest circuit." Time alone can cure this evil—or the prohibition of free reaction.

D.F. in the Antarctic.

I WONDER that there is not more interest shown by amateurs in the art of direction-finding by radio for, it really is a most fascinating thing and is not expensive to enjoy in a modest way. Even a frame aerial, a compass and a map in conjunction with a good set will give a new interest and unlimited occupation. Captain Byrd, who is in the Antarctic with an aeroplane and two ships, plus all kinds of radio gear, tells how the direction-finding equipment enabled him to find the whaling steamer "C. A. Larsen," at a time when the compasses of both of his ships were useless owing to the proximity of the magnetic pole.

HOME OF THE VOLGA BOATMAN?



A radio set, installed below an icon in a Russian house.

(Continued on next page.)

NOTES AND NEWS.

(Continued from previous page.)

Can You Beat It ?

KIND friends—I still have some despite my cruel jokes at the expense of "Sunday wireless experts"—make a point of sending me letters of interest from radio "fans" the world over. Here is a bit of one from someone in Bolivia. "Notwithstanding nevertheless, so to say, we here, the affectionates of the rado, we make gigantic efforts contact ourselves to those of Europe, listening with many valves, without to achieve much triumph for the many disturbances naturals that call themself 'the atmosphericals.'" I am sorry for some of those S. American countries. Only a special dispensation of Providence can give them decent radio-joy.

The Yellow Peril.

FROM Australian sources I learn that the Tokio broadcasting station devotes 25 per cent of its transmission time to economics, 40 per cent to educational matter, and 35 per cent to entertainment. That is, 65 per cent to "education," and 35 per cent to *joie de vivre*. And there are no complaints! This is ominous, and I beg the Chancelleries of Europe to take note of it. The cherry blossom means "business."

The Campbells are Calling.

AT Verneukpan, Cape Colony, where Malcolm Campbell found the Empire's best motor track there has been erected a short-wave radio station. Formerly, all his messages had to be taken a distance of 50 miles to the nearest telegraph office, but now it is hoped that Z S Z will succeed in making direct contact with Europe and the States. Wave-length about 40 metres. What a chance for a man to win a Valve Bartship.

I Wish

A NUMBER of nice readers have written to me about my recently-expressed wishes. With regard to getting a screw to stand up in a hole inaccessible to the hand a Chester man suggests a magnetised screwdriver, a good idea for which I thank him, though most of my screws appear to be of brass! E. J. M. (Hounslow) very kindly sends me a nine-inch length of bicycle-spoke at one end of which are soldered two tiny pieces of spring metal, joined at the bottom, and just parted at their top edges. You press the springs together, put them in the slot of the screw and gaily lower away. I think this solves the problem. Salaam, sahib!

Accumulator Joy.

I AM indebted to Lectro Linx, Ltd., for a sample of their "Clix" accumulator knob which certainly makes for a clean job. Instead of screwing this down on the wire the contact between wire and cell terminal is made by means of a plug which goes through the knob horizontally. The wire is fastened to the plug in a manner which quite meets my wish that wander-plugs would not wander away from their leads. These Clix knobs are made in 2 B.A., O B.A., and $\frac{1}{2}$ Whitworth threads, and extensions steins for countersunk type

batteries are made with 2 B.A., and $\frac{1}{2}$ Whitworth threads. Clix gets some of my money. Their list is worth perusal.

A Baird Secret Bared.

I UNDERSTAND that a £150,000 insurance policy has been taken out on the life of Mr. Baird, the television man. This is sensational, and puts him into the class which I may roughly describe as second-grade film stars. For consider! Gloria Swanson is insured for £400,000, and Mary Pickford for £200,000. And Mr. R. Wanamaker, a business man, is insured for £1,500,000.

You've Got to Take It !

I HAVE already remarked upon the fact that in a general way one can foretell what will be "on the air" at a given time, because the B.B.C. has as far as possible standardised its programmes.

SHORT WAVES.

RADIO PROGRESS.

First: "I think the set's gone wrong."

and
Final Stage: "Yes; the station must have broken down."—"London Calling."

Teacher of Algebra (to inattentive student): "Johnny, what is the result if I add minus A to plus A?"

Johnny (whose father is a wireless constructor): "I know; a short circuit."—American Paper.

A Brighton enthusiast writes to ask us how he can receive Ireland on his crystal set. Well, this is no easy task, but if he opens the window we should think he would get Erin.

A headline in a London newspaper recently asked us: "Have we wireless brains?"

We really don't know; but there are several old radio sets about containing a good many brainless wires.

PAPA SHOULD HAVE A PORTABLE.
Little Girl: "Mamma, are we going to Heaven some day?"

Radio Widow: "Yes, my dear—at least, I hope so."

Little Girl: "Wouldn't it be nice if Papa could go along, too?"

Radio Widow: "Why, my dear, why shouldn't he?"

Little Girl: "Oh, no, mamma, he couldn't leave the radio."—"Radio News."

Although headphones are dying out of favour to a certain extent, we understand they are still very popular in many large families. It is so difficult to listen to a loud speaker when a family of eight or more are taking soup.

BEFORE AND AFTER TELEVISION.

Radio Wooer: "You used to be the apple of my eye, sweetheart; and now you are the flicker of my neon tube."—"Radio News."

"Foundations" at 6.45; Bach at 5.45 on Sunday, etc. But now I have found another B.B.C. trick. There is a "play" from 2 L O, which does not attract you, and so, like a good listener, you switch to 5 G B. But you don't get off so easily, my friend—you've got to have it, for the next night it is transmitted from 5 G B. When, therefore, you switch from one to the other you generally find such a poisonous item that you must either take the "play" or shut down.

Rigorous Transformer Test.

AS a result of the Holborn gas explosion the basement of a certain building was submerged in water for two days, and in the basement there were an A.F.5 L.F. transformer, an O.P.I. output trans-

former and a B.1 choke, all—as the theatre programmes might say—"by Ferranti." When the amplifier was fished up it was found to function perfectly. And yet, with a modesty which does them credit, Ferranti's say that their transformers are not claimed to be fire and flood proof!

The Bengal Club.

THE Radio Club of Bengal have sent me a copy of their official journal, "Radio Jottings," an interesting little thing, though it contains absolutely no trace of "constructional" matter. The Editor remarks that the question of finance is causing anxiety. No doubt every secretary of a radio club in Britain will thrill in sympathy—but will lick his chops when I state that this journal comprises 26 pages, including cover, of which 12 are full of advertisements! One page is blank, except for a "To Let" sign. Another page is quite blank—representing the ether, I suppose. Bravo, Bengal!

Where Radio Booms.

IT is reported from the U.S.A. that there are in that country about 7½ million sets in operation, which works out to about 29 sets per hundred homes. The State which boasts the highest number of sets per hundred homes is Minnesota, with 69 per cent; New York has only 38 per cent; while New Mexico comes bottom, with 6 per cent. As a sidelight on these figures comes the news that the Radio Corporation of America made a profit of £3,796,000 in 1928; not all made out of broadcasting sets but a large proportion, no doubt.

Kindly Shoulder Arms.

THE War Office is warming to the idea of educating the Army by radio, even though it is bound to give many a sergeant the apoplexy. I am sure our Army will welcome "talks" on plum-and-apple and the vitamine value of bully beef. And the thought of drill being taught by B.B.C.-trained speakers raises many humorous thoughts. "Bay the raight—adjust your alignment." "Shoulder—hape." Oh, that we could hear the boys in the canteen passing judgment on the day's lessons!

Broadcasting at a Loss.

IN view of B.B.C. finance it is interesting to learn that the National Broadcasting Company, which serves about 58 stations in the U.S.A., had an income in 1928 of £2,200,000. Unfortunately, the expenses were £58,000 in excess of that amount, and that is without any provision having been made for depreciation. It is stated that the Company spent a million sterling on "performers and lecturers." As Americans like lectures of all kinds—except from John Bull—one supposes that the listening public got the best of the year's luck.

"Foundations of Wireless."

PLANS for the celebration in 1931 of the centenary of Faraday and Clerk Maxwell are already being discussed. The work of these men meant a great deal to wireless, for Faraday was the pioneer of electro-magnetic induction and the "spark," and Maxwell interpreted Faraday's ideas, gave them mathematical form, and evolved his famous electro-magnetic theory of light. The apparatus with which Faraday made the first "electric spark" is to be seen at the Royal Institution.

ARIEL.



AN INTERVIEW WITH OSCAR M. SHERIDAN.

“SO long as the present-day wireless programme remains of the obvious character it generally is, broadcasting will not become the perfect entertainment,” said Sir Nigel. “You will find that the popularity of many an item broadcast is due to the fact that it is something unexpected. Everything about a wireless programme should be unexpected; the result would be, then, that the listener would pass through a gamut of emotions, from curiosity to surprise, and I think you will agree with me, surprises in this form generally lead to pleasure.

Programme Secrecy.

“The lengthy and explanatory announcements that precede a wireless entertainment, either in the Press or over the microphone, to my mind, give less point to what one is about to hear. There should be more secrecy about wireless programmes. It is rather like explaining a riddle, before the actual question is asked.

“But that does not mean that I know anything about wireless,” he said to me. “I am, in fact, rather shy of answering questions on something I know so little about. Anyway, I will have a shot at telling you what you want to know. . . . Naturally I am interested in that ever-absorbing question of the radio play. The choice of radio plays has always been a difficult thing, and, as far as I can see, it is likely to remain so until a very definite policy is decided upon.”

New Technique Needed.

Then Sir Nigel gave me his opinions of the dramatic side of wireless. His great experience as a producer of plays will, no doubt, be of value to Mr. Val Gielgud, the new Director of Productions at Savoy Hill. Mr. Gielgud is a young man; he has written some plays and some books, and his experience of wireless matters will be put to great test in the coming months. His is a responsible position, now, and how capable he is of holding it will have to be judged, not by what he's done, but by what he can, and will, do.

“The radio play,” added Sir Nigel, “as a radio play is nonexistent. It has to be manufactured specially for its purpose, otherwise it falls short of what is desired of it. Ninety per cent of the plays, one act or full-length,

that are produced for the legitimate theatre or music-halls, are worthless in a studio. A play that can only be heard and not seen, differs very greatly from one that is not deprived of its chief advantages.

“If I had anything to do with the broadcasting of plays I should see that they were all written specially for the microphone. There are special occasions, of course, where plays that have been produced in public are suitable for broadcasting. I do not think, though, that these are the best.

“To my mind, one of the best plays ever broadcast (and I do not say this because I had the pleasure of producing it) was ‘Danger,’ by Mr. Richard Hughes.



Sir Nigel Playfair—a recent portrait.

“Here was something that was written for wireless only; the scene was in a coal mine, and was meant to be heard and not seen. If this play had been produced in a legitimate theatre the stage would have been in total darkness; the players and the action, would remain unseen. It was, therefore ideal for broadcasting, and probably not so good for use in a theatre. In fact, I think it gained by being broadcast, as a sense of

distance for such a setting was an inducement to the right atmosphere.”

Sir Nigel Playfair does not believe in the outside broadcasts which, in the past, have lent themselves to much criticism. Several of his plays at the Lyric Theatre, Hammer-smith, have been relayed to wireless audiences, and he feels that a broadcast from a theatre loses a lot. The two plays I remember hearing—“Lionel and Clarissa” and “Riverside Nights”—certainly did not seem the same, even from only a dialogue and musical point of view, as when I saw them at his theatre.

“An Admirable Thing.”

“I agree with you,” said Sir Nigel, in reply to my expressed opinion. “I think, though, that if the company and effects had been transported to the studio, there would have been a great improvement in the broadcast.

“I am in favour of the suggestion that famous authors should write specially for the B.B.C. Mr. Compton Mackenzie is not only having ‘Carnival’ broadcast, but he is also playing in it. To me that seems an admirable thing.

“Musical shows do not suffer the same disadvantage, as they generally contain several popular tunes which are already known to the listening public, and the dialogue is of an obviously funny nature.

Sir Nigel Smiles!

“As I said before, it is no easy matter to find good wireless plays; I suppose it is almost impossible. That is why, in my opinion, they should be always written specially for the B.B.C. Too many dramatists keep the visible stage in mind when they are writing for the wireless and that, of course, is catastrophic.”

Sir Nigel then went on to say that he thought, despite all the criticism to the contrary, that the B.B.C. are maintaining the standards of their programmes.

Sir Nigel does not like the mechanical reproduction of music on the wireless or the gramophone. In his opinion broadcasting has not, and will never, become a substitute for the theatre. That it serves its purpose this well-known actor-manager agrees, but the idea that it will overrule everything else, leaves him (as I left him) smiling good-humouredly.

MORE ABOUT THE "TITAN" SETS.

So great is the interest in the "Titan" sets that the designer of the "Titan" coil—upon which they all depend—here takes the opportunity of covering some of the interesting questions raised by readers.

By G. P. KENDALL, B.Sc.

VARIOUS interesting points have arisen in connection with the "Titan" series of sets and units, and we think it will be helpful to deal with some of these in the notes which follow. First of all, however, we must clear off certain details concerning the H.F. unit for which space could not be found last week. These are mainly a matter of operating instructions, which follow.

Selectivity is controlled on the ordinary wave-band by the tapings on the primary winding, and you will find No. 8 or No. 12 will suit most purposes, with 5 for extra high selectivity and 16 for small aeriels.

Try them all, however, and see which suits your aerial best. Remember that the higher the tap the better the strength as a rule, but the lower it is the better the selectivity.

Variations of Selectivity.

On long waves the selectivity control is the flex lead from the E terminal on the coil unit, which will be connected to the "25" or "60" terminals on the loading coil. The same rules as to the position of the tapping apply here also.

Now as to the connections of the unit. Battery leads and the aerial plug we have already dealt with, but there remains the question of the "output" lead. This, by the way, should be kept short and well away from all others, particularly the aerial.

Normally you should take it across to the old aerial terminal on your set. This arrangement gives good selectivity and as much amplification as you generally need. A little more amplification can be got (at a sacrifice in selectivity, however) by taking the lead direct to the "upper" (i.e. grid) side of the tuned-grid circuit in your set, and this is worth trying.

To get the best results try varying what used to be the aerial coupling in the set itself. You will generally find that it pays to make this rather tighter than when it was actually aerial coupling. The magnification goes up and selectivity will usually still be good.

Next there is the question of reaction. There are two ways of getting this, and it depends on other factors which should be used. If you connect up the unit in front of your set and want to have the one-dial tuning feature of the original "Titan" circuit you will use the small condenser on the H.F. unit panel.

For One-Dial Tuning.

To get this one-dial tuning scheme this is what you must do: Take the output lead from the unit direct to the side of the grid condenser in your set which is remote from the grid.

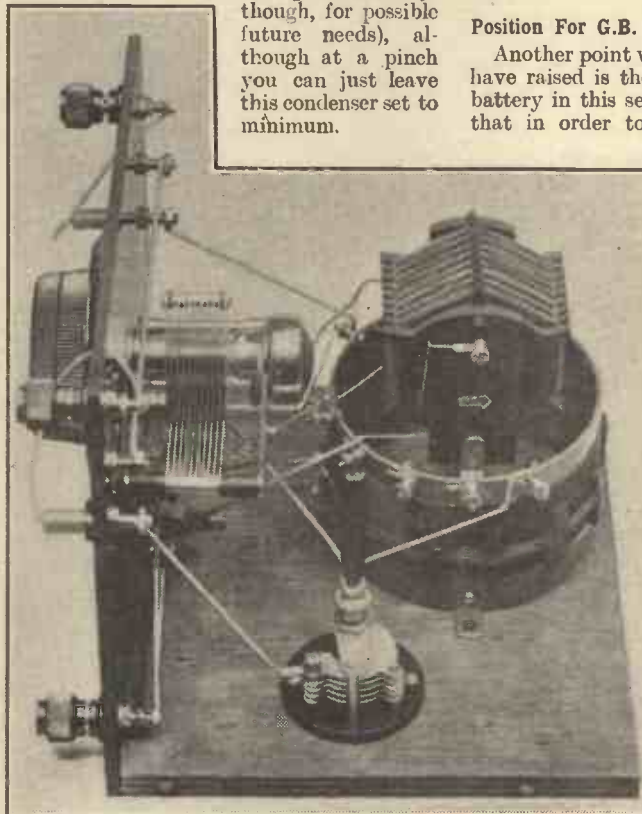
Remove all other leads from this terminal of the grid condenser and see that your grid leak is connected straight from grid to filament positive.

That is all, and you then have to tune only on the dial on the unit, the ordinary

tuning circuit being cut out, likewise the reaction circuit on the set. This makes the outfit delightfully easy to handle and the selectivity will be much better than you would think possible with only one tuned circuit.

If you are prepared to handle two dials you can, of course, get better selectivity still, and in this case you should connect the output lead to the aerial terminal on your set as previously mentioned. You should then tune on both dials (set and unit) and use the ordinary reaction control on the set.

In this case it is best to disconnect the small reaction condenser in the unit by just undoing one of the leads and leaving it free (keep it handy, though, for possible future needs), although at a pinch you can just leave this condenser set to minimum.



Among the advantages of the "Titan" coil unit are its compactness, ease of mounting, and simplicity of wiring.

Next there is the question of volume control with the "Titan" Three on the local station. Of course, the easy and obvious way of solving the problem would be to connect the usual type of high-resistance potentiometer across the L.F. transformer secondary, but we did not do this in the original set for two reasons.

First of all, we wished to keep down the cost of the receiver as much as possible; and secondly, there are a number of simpler and easier ways of achieving the desired end with this set. For example, if one detunes by turning the dial the volume of the local will

go down to any desired amount, but this alone is not quite enough.

Merely detuning is liable to bring in some other station, so in addition one must take steps to reduce the sensitivity of the set as much as possible to prevent it from happening.

It will usually be sufficient to put the aerial clip on the lowest tapping (5) on the primary winding of the coil unit and set the reaction condenser at minimum, but on very good aeriels the sensitivity may still be high enough to bring in foreigners faintly. In such cases the aerial series condenser should be brought in, and will usually do the trick quite easily, even with the aerial clip a little higher up.

Another scheme for cutting down the sensitivity of the set is to reduce the H.T. on the H.F. valve. As the voltage on H.T. +3 comes down you will find the volume falls off rapidly, and this alone may give a sufficient control if the local station is not too near. In other cases this method may be used as a supplement to one of the others. One or other of these schemes will be sure to suit your own particular requirements, and it is a very simple business really.

Position For G.B. Battery.

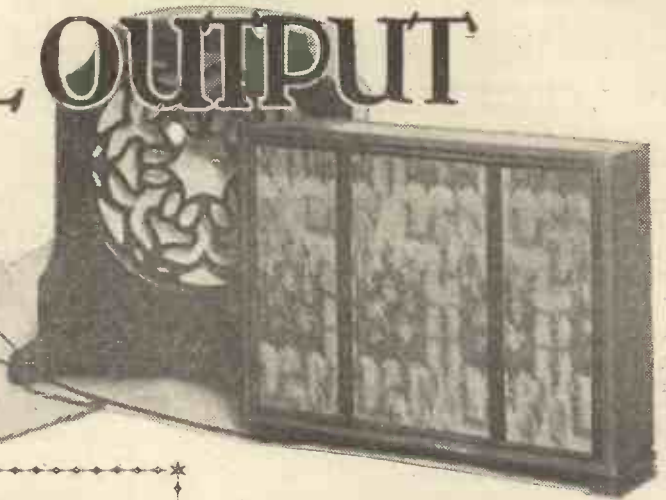
Another point which a few correspondents have raised is the placing of the grid-bias battery in this set. It should be explained that in order to secure the compactness which so many people desire no space was left for this on the base-board, but instead it was intended that this little unit should be attached to the back of the cabinet near the right-hand end. For this purpose special clips can be obtained from most dealers. In the case of some types of batteries, too, you will find they are provided with a special cardboard flap for fixing in this way.

We shall be dealing also in a later issue with such matters as the use of a pentode valve, gramophone pick-up, and so on.

These points will apply to the "Titan" Three, so it may be helpful to go into the matter of a pentode valve in the "Titan" Two here. Well, there is really very little to be explained, because in a medium-sized set like this it is such a simple matter. All that you do is to put the pentode in the second socket of the set, adjust the grid bias to the figure given by the makers for the amount of H.T. you are using, take a lead from the terminal on the valve base out to the H.T. +2 terminal on the set, and finally take certain steps about what is called the output circuit.

This last is just a matter of providing a suitable output transformer, and there are several of these on the market specially designed for this valve which are suitable (more about this point later).

A UNIVERSAL OUTPUT UNIT



AN output-filter unit is one of the handiest devices that the "quality enthusiast" can build. Modern super-power valves take a fairly heavy anode current, and in circuits which utilise such valves a filter unit is extremely beneficial.

A filter has several advantages. In an ordinary straightforward circuit the loud-speaker is joined directly in series with the last valve. This means that the whole of the anode current to this valve flows through the speaker windings.

With this most useful unit you can safeguard your loud speaker and facilitate the running of extension leads, and compare one loud speaker with another or switch in telephone receivers.

Designed and Described by the "P.W." RESEARCH DEPARTMENT.

to the speech and music, via a condenser. This is what a choke-filter output unit actually does. The choke must be one of very high quality, otherwise when a heavy current is passed through it the inductance will drop and signal strength will fall. Also the bass reproduction will suffer. A good

COMPONENTS REQUIRED.

- 1 Insulating panel, size 7 in. x 6 in. x $\frac{1}{8}$ in. or $\frac{1}{4}$ in. ("Kay-Ray," Resiston, Becol, Trolite, etc.).
- 1 Cabinet to fit, with baseboard 9 in. deep (Camco, Bond, Lock, Pickett, Arcraft, Caxton, Raymond, etc.).
- 1 Heavy-duty L.F. choke (see text) (R.I.-Varley, Ferranti, Burne-Jones, British General, Pye, etc.).
- 2 2-mfd. condensers (Dubilier, Lissen, T.C.C., Mullard, Ferranti, Hydra, etc.).
- 1 Stud-switch, 3 point (set of parts for panel mounting: Bowyer-Lowe).
- 9 Terminals (Belling & Lee, Burton, Eelex, Igranic, etc.).
- Screws, bare wire and Systoflex, or Glazite, etc.

Since it is the usual procedure these days to use a super-power valve in the last socket if anything like full speaker volume is required, the delicate windings are under a pretty severe strain when one considers that the current may be as great as 15 milliamperes or more.

In addition to this, the direct current resistance, i.e. the ohmic resistance of the average loud-speaker winding, is between 1,000 and 2,000 ohms.

Some of the cones on the market have a value as low as 750 ohms, but these are usually slightly less sensitive than the higher resistance types.

Unavoidable Resistance.

Now this resistance (the D.C. resistance) cannot be avoided, because it is essential that the windings should have a very large number of turns in order to get the required magnetic field, and thick wire cannot be employed owing to limitations of space.

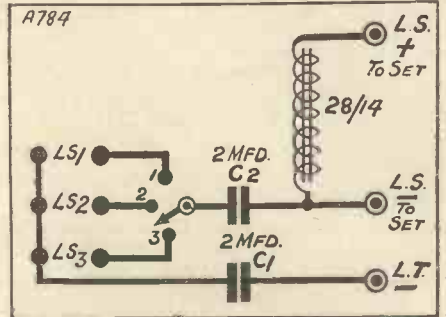
We have already said that when the speaker is joined directly in the anode circuit of the last valve, the whole of the anode current to this valve is flowing through the windings.

By Ohm's Law there will be a voltage drop or loss across the windings owing to their resistance. If the resistance of the speaker is, say, 2,000 ohms, and the anode current is 20 milliamps, this loss in voltage will be 40 volts.

This means that the H.T. voltage actually applied to the plate of the last valve will be 40 volts less than the H.T. voltage at the terminals of the set. Hence it will be seen that it pays to keep this D.C. resistance as low as possible.

Suitable Chokes.

Since this cannot be done while the speaker windings are in circuit, the alternative is to insert a choke of low resistance, and high inductance, supplying the speaker with the pulsating currents due



choke should have a heavy iron core and a low D.C. resistance of about 300 ohms.

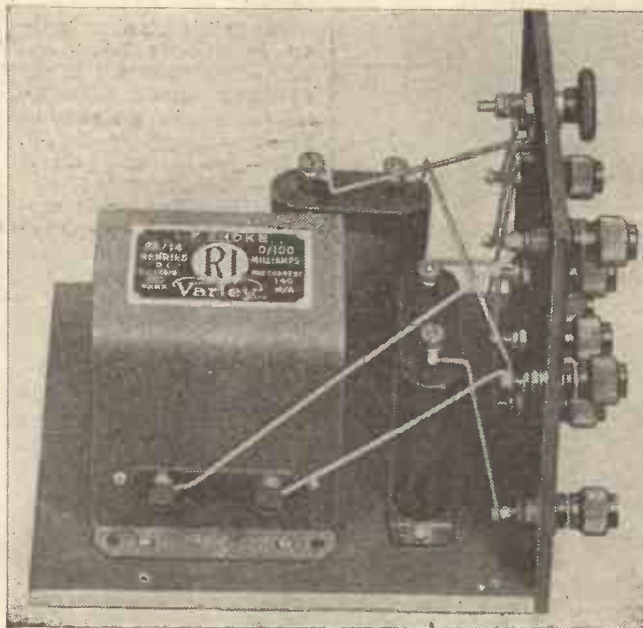
Then there is another advantage which a filter-output unit gives us.

It isolates the loud speaker from any high voltages which may be applied in cases where mains units are used, and thus a certain element of danger is removed. Of course, one can still obtain shocks from the speaker terminals, because there are the pulsating speech currents to be considered, but the chief point is that the instrument is isolated from the mains.

Motor-boating.

A further advantage concerns "motor-boating." It is now quite well known that if a battery develops a high internal resistance, and also with certain types of mains units, L.F. troubles are likely to occur.

The more efficient the set, the greater is the possibility of "motor-boating."



The unit is designed so that you can safely employ it with a mains receiver or a set using a mains unit for its H.T. supply.

(Continued on next page.)

A UNIVERSAL OUTPUT UNIT.

(Continued from previous page.)

If we isolate the speaker from the anode circuit by inserting a choke, taking the L.S. terminals to one side of the choke and L.S.—, we reduce the tendency for the set to give trouble through any external effects in the H.T. circuit.

This is partly because we have separated the steady anode current from the speech and music pulsations.

Thus the unit is also an "anti-mobo" device in itself, and it is well worth using it for this purpose alone, apart from any other advantages it may possess.

Suppose we now turn our attention to the actual unit under description.

If you look at the theoretical circuit you will see that the device consists of a choke, two condensers, and a stud switch.

The Switching.

The H.T. supply passes through the choke winding to the anode of the last valve and the loud speaker is completely isolated by the two 2-mfd. condensers—one in each lead.

There are three sets of L.S. terminals. This is a refinement which is particularly beneficial when it is desired to compare different "speakers," or to switch over from speaker to 'phones.

The loud speakers or 'phones are connec-

ted up to the terminals L.S.1, L.S.2, etc., and the stud switch is simply rotated to bring the required instrument into circuit.

Alternatively, one can connect a speaker to one pair of terminals, a pair of 'phones to the second, and a Fultograph to the third, and thus change over from speaker to 'phones for long-range work, or to the Fultograph for the purposes of picture reception.

The construction of the unit is very simple. First drill the panel to the dimensions given, and place the stud-switch and terminals in position. You will get a template with the switch, hence this part of the work will present no difficulties.

It is as well to mention at this point that if the contact studs are placed fairly close together, the arm will make contact with two at once when it is desired, and one may thus place two loud speakers in parallel for experimental purposes.

This is a good point, and very useful in practice.

Connecting Up.

The baseboard arrangement is too well shown in the diagram to need any explanation.

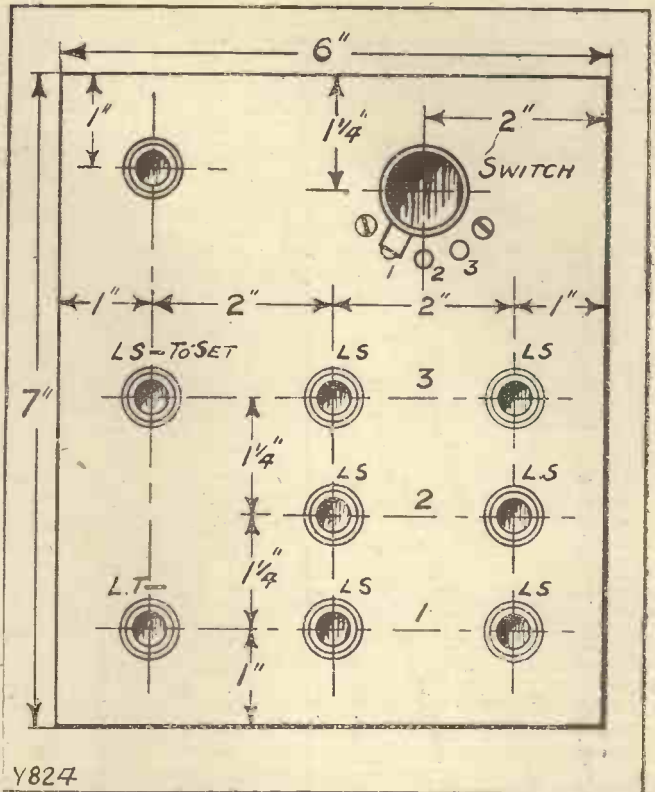
The wiring can be carried out with 16-gauge tinned copper wire and Systoflex tubing, or with Glazite. It is better to use insulated wire, since this reduces the chances of damage if the leads are accidentally brought into contact.

The unit is joined up to the set as follows: L.S.+ and L.S.— are connected to the equivalent terminals on the set, L.S.+ being the terminal which is joined to H.T.+ L.T.— on the unit goes to L.T.— on the set.

The loud speaker is connected to any of the pairs of terminals, L.S.1, L.S.2, and L.S.3, and the stud-switch is placed in the position which controls the pair of terminals chosen.

If you are using the mains with more than 200 volts H.T. on the last valve, C₁ and C₂ should be high-voltage condensers, but for ordinary H.T. values in the neighbourhood of 120 volts the standard type Mansbridge condensers are quite O.K.

By the way, going back to the question of D.C. resistance and voltage drop mentioned at the beginning of the article,



Y824

It should be clearly understood that the loud-speaker magnet windings do not consist of wire specially chosen because of its high resistance for a given length. The resistance is unavoidable, but it serves no useful purpose. Copper is the best conductor of electricity, if we consider matters purely from the practical or commercial standpoint, and is, therefore, utilised for such purposes as transformers, telephones, and loud speakers, etc. It is employed because of its low resistance. It is space principally which decides the gauge of wire one can employ, since it is essential to wind on the maximum number of turns. Space being more or less the deciding factor, one has naturally to use a thin wire, otherwise the required number of turns could not be wound on.

The thinner the wire the greater the resistance for a given length, hence the relatively high resistance of the average sensitive speaker.

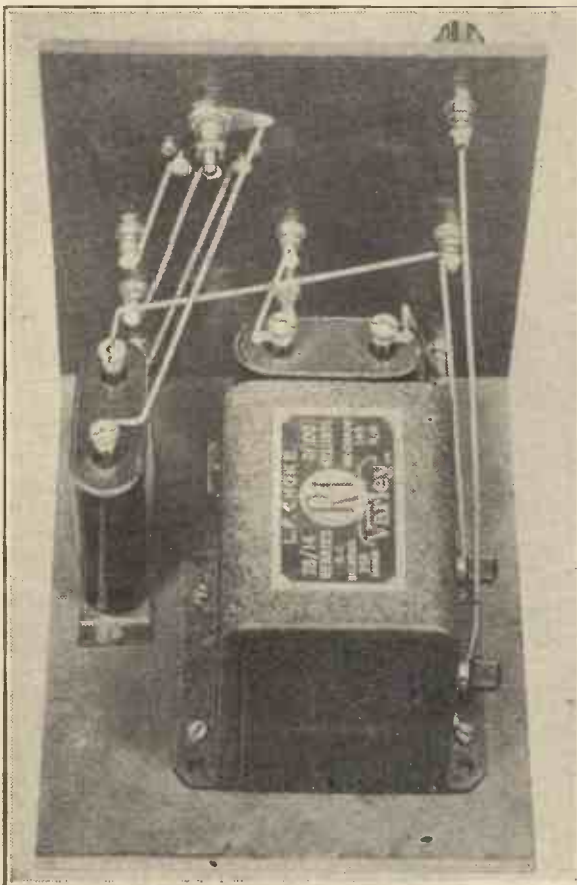
Low Resistance.

Now, if we use a choke in place of the speaker windings, it is possible to reduce the D.C. resistance, because there is ample space available for a winding consisting of a very large number of turns of thick wire. Thus, not only are we enabled to obtain a low resistance, but we also get greater mechanical strength. This is an important point when it is remembered that the turns themselves tend to move under the influence of the speech and music impulses.

This movement produces a rubbing together between the turns, and sometimes breakages occur. With thin wire the risk is much greater than with thick wire, hence a filter choke is not so liable to break down under stress.

Speaker windings, on the other hand, do sometimes give way in spite of the care taken by the makers. Of course, this would only occur if the volume the speaker

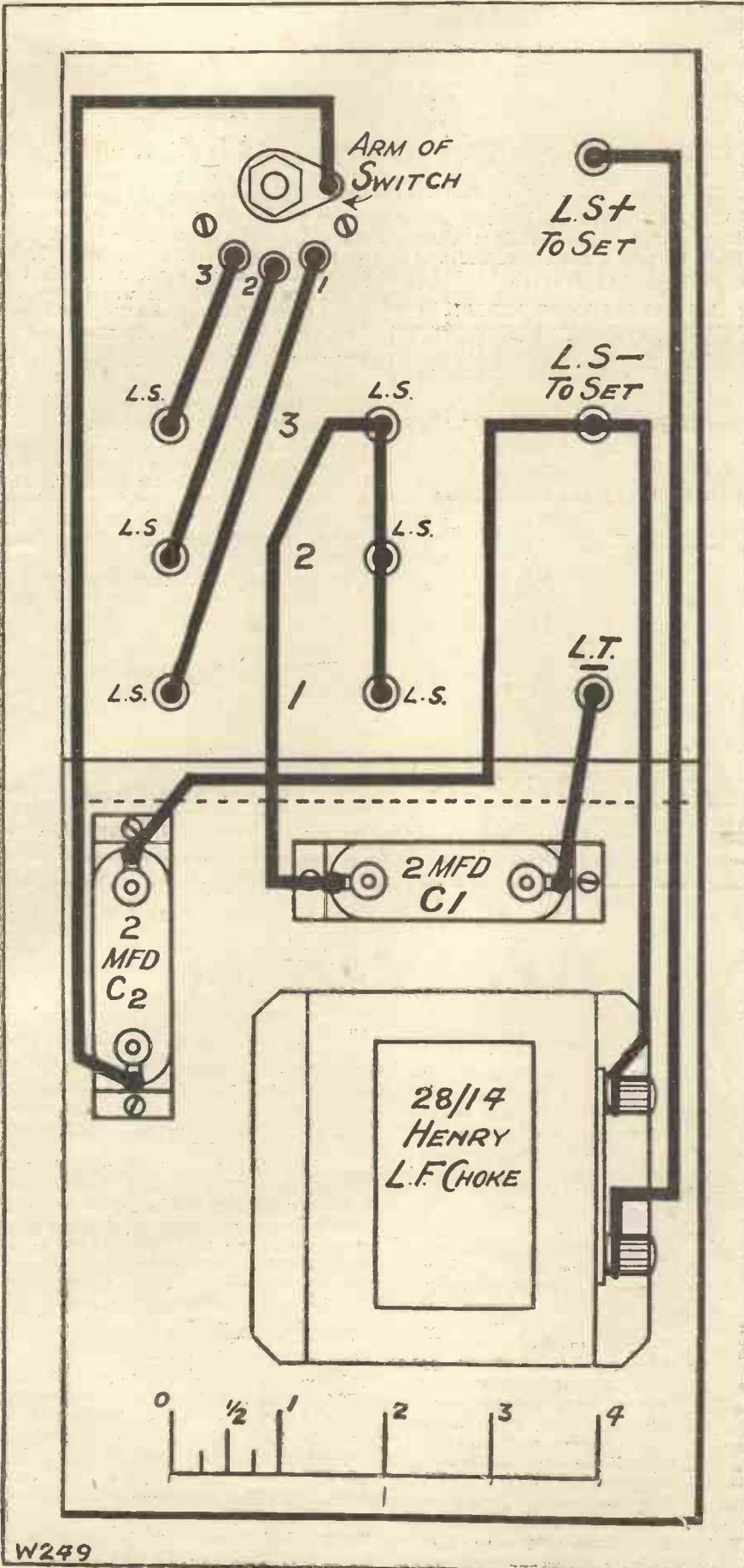
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The introduction of a "heavy-duty" choke makes the unit capable of handling the output from a power or even super-power valve if necessary.

A UNIVERSAL OUTPUT UNIT.

(Continued from previous page.)



was handling happened to be big, but it is in these cases that super-power valves are used, and this is where a filter choke is so useful.

When you are purchasing your choke you want to get the largest and heaviest one you can afford. Weight is a very good indication of quality, provided it is not due to an excessively heavy case. The more iron in the core the better. Also, a large heavy core usually means more space for the winding, and in consequence a higher inductance and thicker wire.

Complete Isolation.

The reader may ask why two Mansbridge type condensers have been used in this filter unit when in many other instances only one is employed. Well, the reason is to ensure complete isolation of the loud speaker for mains-operated receivers.

You know that if you use an eliminator you often have to insert a condenser in series with the earth lead of the set, as a precautionary measure when you do not know which side of the mains supply is earthed.

If you did not do this there would be a danger of "blowing" the mains fuses and possibly causing damage.

Now, the insertion of this series condenser in the earth lead places the set and loud speaker above earth potential.

If the speaker is not completely isolated by two condensers just think what happens if you place your hand on the loud-speaker casing or terminals. Your body may be earthed, since you may be standing in a spot where your feet are making moderately good contact with a metal object or with some portion of the floor which is at a lower potential than the set.

If so, you are very liable to receive a nasty and perhaps dangerous shock.

A Single Condenser.

Your only safeguard would be to stand upon a platform insulated from earth and to refrain from touching any earthed object.

By inserting a condenser in each loud-speaker lead, however, the instrument is completely isolated from everything except the pulsating speech or music currents.

The only case where it is reasonably safe to employ a single Mansbridge condenser is where dry batteries or accumulators are used for the H.T. supply.

Readers will, therefore, appreciate that the extra cost of the second condenser is justified and very necessary if the filter is to be employed in conjunction with a high voltage mains unit.

It is interesting to note that filter output devices are exceedingly valuable when it is desired to run loud-speaker extension leads to some other room in the house.

With long leads and no output device it is probable that in most cases the set will go into L.F. oscillation, and howl or distort. With a good filter unit, however, this tendency is greatly reduced, provided the set is reasonably stable in the first place.

LATEST BROADCASTING NEWS.

THE BOAT-RACE
BROADCAST.

SIR HENRY WOOD AT BIRMINGHAM—SCOTTISH CUP SEMI-FINAL—HULL ON THE AIR—NEW DRAMA AT GLASGOW.

Grand National and Boat-Race Broadcasts.

IT almost goes without saying that listeners will always expect the B.B.C. to broadcast running commentaries on the Grand National and the Boat Race. There would inevitably be a big fuss were any attempt made to stop these vivid descriptions of these great sporting events which we have, in the few years since they began, grown accustomed to looking forward to as some of the finest items in the wireless programmes.

This year the Grand National will be run on March 22nd, and the Boat Race on the following day. Mr. R. C. Lyle, Sporting Editor of "The Times," will describe the race at Aintree, and with him will be Mr. W. Hovviss, also a well-known sporting journalist, who assisted Mr. Geoffrey Gilbey in the broadcast of the race last year.

The commentary on the Boat Race will be carried out in the usual way—that is, from a launch following the crews—communication with Savoy Hill being effected by wireless link with a spot on the bank, from where a land-line will be in touch with the London control room.

Unfortunately, the state of the tide necessitates the race taking place at the time when many people will be unable to listen—namely, approximately at mid-day—but this is not quite so inconvenient as last year, when it was rowed much earlier in the day. The names of the commentators have not yet been decided, but it is probable that those who acted a year ago will again undertake the arduous half-hour's work.

Sir Henry Wood at Birmingham.

Sir Henry Wood pays his third visit to the Birmingham studios on Saturday, March 23rd, to conduct the weekly Symphony Concert for 5 G B listeners. The programme will include works by Beethoven, Gopak, and Herbert Howells. Brahms' "Pianoforte Concerto No. 2 in B Flat" will be played by Johanne Stockmarr.

A Nottingham Appeal.

Several instances have been given of wonderful responses to charity appeals, and mention should be made of one recently from 5 G B by the Lord Mayor of Nottingham on behalf of the General Hospital in that city. The amount raised was £200, not a large sum compared with the £25,000 raised by Lord Knutsford for the London Hospital, yet it included donations from people living on the Ligurian Alps, a trawler on the North Sea, Barcelona, and up-country on the banks of the Nile.

Hallé Pension Fund Concert.

London and 5 X X listeners, as well as those living in the "musical North," are to hear this year's Pension Fund Concert of the Hallé Orchestra which is fixed for Thursday, March 21st. The fund, which has been in existence for twenty-six years, has for its object the provision of pensions for members of the orchestra on attaining their sixtieth birthday. The orchestra and artistes naturally give their services for the concert, and this year soloists include Clyde Twelvetrees, Charles Collier, Alfred Barker, William Gezink, Edward Stansfield, and Alfred Scott. Sir Hamilton Harty will conduct.

AN AEROPLANE'S AERIAL.



The new Imperial Airways liners are fitted with permanent aeriels, affixed to the wings, and not of the type shown above, which has to be "wound-in" when nearing the ground.

Scottish Cup Semi-Final.

One of the semi-final ties in the Scottish Football Cup will be the subject of a running commentary for Glasgow listeners on Saturday afternoon, March 23rd. The commentator is Mr. Masson Roberts.

Lady Bailey at Bournemouth.

Lady Bailey, the well-known airwoman who has recently become Vice-President of the Hampshire Aeroplane Club, is to broadcast a talk from the Bournemouth studio on Tuesday, March 19th, in which she will describe some of her air journeys in different parts of the world. Lady Bailey has already given a talk in the London studio, but this was missed by many South Coast listeners, as Sir Oliver Lodge was speaking from Bournemouth at the time.

Hull on the Air.

Speeches at a banquet in the Guildhall, Hull, on Monday, March 18th, to mark the progress of that seaport in world trade development, are to be broadcast from stations in the Manchester grouping. The speakers include the High Commissioner for New Zealand (the Hon. Sir Christopher J. Parr), the Lord Mayor of Hull (Councillor B. Pearlman), and the President of the Hull Chamber of Commerce (Major A. J. Atkinson).

New Drama at Glasgow.

A play by a new dramatist, Mr. T. M. Watson, entitled "Diplomacy and the Draughtsman," will be performed in the Glasgow studio during a Scottish programme on Tuesday evening, March 19th, by the Scottish Labour College Players, who will be making their first appearance before the microphone. These players, who are an enthusiastic body of amateurs, only took up dramatic work less than a year ago.

TECHNICAL NOTES.

By Dr. J. H. T. ROBERTS, F.Inst.P.

H.F. LEAKAGE

THE PRACTICAL RESULT—DANGER OF DAMP WALLS, ETC., ETC.

H.F. Leakage.

ONE of the commonest causes of poor reception, particularly from the point of view of volume, is the leakage of the high-frequency currents between the aerial and the set, and although amateurs are continually advised to take special care with the lead-in of the H.F. current, it is surprising how often apparently minor faults are overlooked, all of which, of course, have their ultimate effect upon the strength of the reception under given conditions.

The Practical Result.

Many beginners imagine that it is quite sufficient to have a piece of ordinary insulated wire, run along the wall, carrying in the H.F. currents. As a matter of fact, this idea is really quite in error. Although a wire may be perfectly well insulated for ordinary low-tension direct-current, or even for low-frequency currents, the insulation may be quite inadequate where the H.F. currents from the aerial are concerned.

Perhaps I ought to express it in a slightly different way and say that the conserving of

the H.F. energy is not a matter merely of insulation, but also of the proximity of the conductor to other earthed conductors, such, for example, as a damp wall or a metal pipe.

The practical result of these observations is that the lead-in wire—whatever form it may take—should not only be very well insulated at the points at which it has to be supported, but also should be kept as far away as is reasonably possible from other conducting or even slightly conducting objects which may cause a leakage of the energy to earth.

Danger of Damp Walls.

I have already mentioned the question of a damp wall. In the ordinary way you would say that a brick wall, even though slightly damp, was scarcely an electrical conductor. If, however, you have a wire tacked along such a wall—especially if the wire is not heavily insulated with rubber—then the wall may prove quite a serious cause of leakage of the H.F. currents in the

(Continued from page 1357.)



AMATEURS OF N.Y.

BEING in New York for Christmas, and having nothing to do one afternoon just preceding that festival, I decided to look up one of the friends I had made during the two years I was in Labrador installing short-wave radio stations for the Grenfell Mission there. I accordingly visited Mr. Runyon, of Yonkers, New York, the owner of Radio W 2 A G, with whom in Labrador I had had many interesting "contacts," especially at the time of the transatlantic flight of the German plane "Bremen." W 2 A G had handled most of the bulletins we sent, whilst the intrepid aviators were marooned on Greenley Island off the frozen Labrador coast, which bulletins were immediately published in the "New York Times."

A Marvellous Receiver.

We had lots to talk about, and after lunch we naturally gravitated to the Radio Room, where we tried to get into touch with N E 8 A E and N E 8 W G, two of the stations I installed in the heart of Labrador. Mr. Runyon has a fine short-wave outfit, crystal-controlled transmitter working on all the amateur bands, whilst his receiver was a marvel to operate, even though it embodied one stage of screened-grid H.F. amplification.

So well designed and constructed was it that the tuning dial of the screened-grid stage could be swung through resonance, without altering the beat-note frequency more than a few cycles. There was no tendency towards instability whatever, whilst the reaction was constant over the whole range. How many of us could build a receiver like that? In addition his transmitter was remote controlled, and it was possible to use break-in, so that it was certainly a pleasure to operate that station.

Major Armstrong at Work.

We failed, however, to establish contact with Labrador, and were just conversing when the telephone bell rang. It appeared that Major E. H. Armstrong, the well-known inventor of reaction, super-regenerative, super-heterodyne and many reflex circuits, was testing out a new transmitter, and wanted Runyon to listen for it. We

Upon returning from Labrador, where he had been installing short-wave stations for the Grenfell Mission, our contributor visits some of the more prominent amateur stations in New York, and during his stay in that city meets Major E. H. Armstrong, of reaction and super-het. fame. In this article he describes these visits for the benefit of "P.W." readers.

By F. DEARLOVE.

did so, and found a wonderful crystal controlled note, sending V's on 20 metres.

Various adjustments were made, and the Major even heard his own transmitter back through the 'phone. He then invited us over to the Columbia University, and we naturally accepted with alacrity. Arrived at that famous seat of learning we made our way to the basement, where Major Armstrong was experimenting in the Research Laboratories. What a sight met our eyes!

There were rows of tables, in each of two small rooms, full of radio apparatus of every description, whilst along the walls were high cupboards with glass doors, all full of apparatus—some modern, others first models of instruments in use to-day. We passed through these to a much larger room, again surrounded by cupboards full of delicate measuring instruments and early models, whilst down the centre of the room ran a wide table on which was the set the Major was building.

Behind this table was the generator, giving about 2 kilowatts at 2,500 volts. At the end of this room was a huge alternator, which I judged from its size must be at least a 100-kilowatt machine. (This was covered and did not run whilst I was present.) Before the table were two men, one in street attire, the other working in his shirt sleeves.

The former was Mr. James Grinan, with whom I had worked from Labrador at his station, N J 2 P Z, in Jamaica (and whom we henceforth addressed as "Johnnie"), whilst the latter was Major E. H. Armstrong himself.

Introductions being over we turned to the beautiful piece of work on the table. It appeared that Major Armstrong was constructing this set for Johnnie to take back to Jamaica with him, and a wonderful thing it was.

Crystal Controlled.

A 160-metre crystal, through frequency doublers and power amplifiers, controlled a single 750-watt screened-grid transmitting

(Continued on next page.)



Mr. Nathan Pomeran (2 A P D) is one of the most enthusiastic amateurs in the New York district.

AMATEURS OF N.Y.

(Continued from previous page.)

valve, feeding a full wave voltage fed Hertz antenna, known sometimes as a Zeppelin antenna, from the fact that it was first designed to be dropped from dirigibles. Although this valve was rated at 750 watts its actual input was almost double that power without the faintest sign of trouble.

Replying to a question of mine as to the voltage on the screen, the Major said:

"There are 500 volts on the screen and 2,500 on the plate. By varying the voltage on the screen a particular voltage is found where the screen draws no current, whilst a deviation from that voltage either up or down will cause the screen to draw a load. The no-load adjustment is correct."

Accurate Adjustments.

Showing us the advantages of eliminating any chance feed-back, due to stray capacities, by using perfect screening together with screened-grid valves, the Major purposely misadjusted several of the dials in the circuit. Nothing beyond a lessening of the output occurred, all valves ceasing to take a load, and none showing any tendency to heat up. It is almost safe to say this could not have been done with any other transmitter in the world, as any wireless amateur will agree. Just ask one to let you twiddle the dials whilst the full 2,500 volts are applied and see the look of horror on his face; but that is what I did with that transmitter after being invited to do so by the Major.

Showing us how a "Zeppelin," or voltage-fed Hertz antenna should be adjusted, but very seldom is, Major Armstrong shorted



Station 2 D S, operated by J. W. Holland, carried out many important tests with the MacMillan Arctic Expedition.

the antenna feeders, just on the aerial side of the variable condensers, and absolutely no difference was apparent on the two meters, thereby indicating the circuit was as perfect as it well could be. I asked the Major a question as to why an aerial worked at the second harmonic was inefficient, due theoretically to a tendency to radiate at its fundamental?

He replied, after consideration: "Well, I don't know so very much about it, but there is absolutely no method known to science of frequency-halving; we can double the frequency but not halve it. If we could

we should certainly have accomplished something!" Note the modesty of that reply. If he didn't know anything about it certainly no one else did!

Major Armstrong and Johnnie Grinan were, by the way, two of the men who built and operated 1 B C G* during the transatlantic tests in 1921. "There were 2 kilowatts in the aerial then," said Major Armstrong with a twinkle in his eye. Just imagine it; 2 kilowatts in the aerial! He also stated that 1 B C G employed, for the first time in history, the principle of frequency doubling, utilising a master-oscillator.

Some Early Models.

Before leaving, the Major showed us the actual original models of both the super-heterodyne and super-regenerative receivers, which he brought out from one of the cupboards in one of the smaller rooms. I was very surprised to note that neither of these models was a bulky affair as one might associate with first models, but compared favourably with present-day receivers.

After dinner, we visited another of the 1 B C G boys, and many were the stories which were told of that time. It appeared that generally about twenty people would be crowded into this room, which held enough apparatus to put those "2 kilowatts" into the aerial, all very keen enthusiasts, though bound to get into each other's way, as the Major went around with the long stick he used for making the tuning adjustments.

One story was of the time when the first sets were coming on the market for wireless receiving utilising the Major's invention, the reaction coil. The Major and Johnnie Grinan, with two or three others, were in one of New York's large stores when an enterprising salesman tried to sell Johnnie a 2-valve set employing the new reaction coil.

"That's no use to me," said Johnnie. "I wouldn't know what to do with it."

"Now look here," said the salesman, "I'll explain it to you; and there is an absolute layman"—pointing to Major Armstrong—"he doesn't know the first thing about radio. If he understands, you ought to." He then proceeded to tie himself into knots in his efforts to explain the new oscillating valve, and his hearers were silently convulsed with barely controlled hilarity when the salesman enquired of the Major: "Now, sir, did you understand that?"

The Major, smiling faintly, replied: "Well, I'm sorry,

but I hardly grasped the thread of your remarks."

"Well," said the salesman pityingly, "perhaps it is a little beyond you, but do let me sell you one of these sets with this book of full instructions, and I am sure you will be able to work it."

After this: Johnnie could keep silent no longer, and said: "Oh, by the way, let me introduce Major E. H. Armstrong." This bombshell caused the salesman's eyes

* 1 B C G was the station that made history in the first transatlantic tests.

almost to pop from his head as he turned and fled!

Unfortunately it was now getting a little late, and as I had a train to catch I had to leave these very cheerful friends, but not before promising them another visit when I next chanced to be in New York.



W H P P is said to be the smallest amateur broadcaster "on the air." Situated in the Bronx, New York, it is owned by Herman Rubin, who is only 16 years of age.

TIPS AND TECHNICALITIES.

If you are using a 6-volt accumulator its voltage should not be allowed to drop below 5.4.

A discharged accumulator should never be allowed to stand aside, but it should be recharged as soon as possible.

It is sometimes advisable to change the grid-bias battery every time the high tension is changed, but in most cases it is possible to use one grid-bias battery to every two high-tension batteries.

If a grid battery is allowed to run down it will often give rise to very bad quality of reproduction.

The running down of a grid battery not only means that reproduction will suffer, but also that more current than is necessary will be taken from the high-tension battery.

CRACKLING NOISES.

Almost any loose connection in a set will give rise to crackling noises.

Never attempt to listen-in during a thunder-storm.

When it is not in use the aerial should be earthed by means of a switch outside the house.

Where a mains unit is employed for the high tension always switch it off and remove the plug from the mains before interfering with the internal wiring of the receiver.

Ether waves travel at the rate of 300,000,000 metres per second.

A wave-length of 300 metres is equivalent to a frequency of 1,000,000 cycles per second.

The natural wave-length of an aerial is about four times its overall length.

CONGRATULATIONS RECEIVED from CELEBRATED RADIO ENGINEER

Mr. Percy W. Harris, Editor of "The Wireless Constructor," finds fascination in the Fultograph



Above are reproductions of pictures broadcast from Berlin and received by Mr. Harris on his Fultograph.

Any set capable of moderate loud speaker reproduction will work a Fultograph and receive the pictures broadcast daily both from this Country and the Continent.

COMPLETE KITS OF PARTS £16

Send for illustrated leaflet for details of complete kits and picture receiver components.

WIRELESS PICTURES (1928) LTD.,
DORLAND HOUSE,
14/16, REGENT STREET, LONDON, S.W.1

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22-23-24/25 METRES.
P.W.H.P.E.

PERCY W. HARRIS,
29, SOUTH RIDGEWAY PLACE,
WIMBORNE,
LONDON, S.W.19. TELEPHONE
WIMBORNE
1747.

30th January 1929.

Messrs. Wireless Pictures (1928) Ltd.,
14-Regent Street,
LONDON. S.W.1.

Dear Sirs,

I find the Fultograph as easy to operate as a gramophone and very much more fascinating. Apart from the Daventry (5XX) transmissions, I regularly get pictures from Berlin and Vienna and must congratulate Captain Fulton and your company on producing such a clever and simply operated piece of mechanism. To use a much overworked phrase - "a child can use it!"

"Picture hunting" is now added to the older hobby of "station hunting" on a wireless set, with the added advantage that you can prove your claims to have received a particular transmission!

Yours sincerely,
Percy W. Harris
EDITOR... THE WIRELESS CONSTRUCTOR.

Fultograph

PICTURE BROADCASTING IS INTERNATIONAL

THE "TITAN" THREE.

The Editor, POPULAR WIRELESS.
 Sir,—I have just completed the "Titan" Three and feel that I must congratulate the "P.W." Technical Staff on producing such a fine set. The results are simply wonderful and tuning is simplicity itself.

Foreigners roll in at loud-speaker strength without a touch of the reaction condenser.
 It is undoubtedly the cheapest and best screen-grid receiver yet designed.

Wishing you further success,
 Yours very sincerely,
 CHARLES H. RAWLINS.

Lincoln.

SHOULD EXECUTIONS BE BROADCAST?

The Editor, POPULAR WIRELESS.
 Dear Sir,—You have published recently a correspondent's reply to the article by Commander Kenworthy on the broadcasting of executions. Your correspondent has evidently missed entirely the spirit in which the original article was written. Commander Kenworthy, like millions more in this country, loathes the idea of capital punishment, and the article was a sincere effort to stir the people of this country out of the apathy in which they allow anything so horrible to take place.

Knowing that he is so horrified with the whole business it is reasonable to assume that he would be even more revolted if such a broadcast took place, but so would millions more, and the immediate result would be the abolition of hanging. The remarks on Limehouse, hospitals, etc., are beside the point and prove nothing. We maintain a police force to prevent Limehouse brawls, no good result could come from their being broadcast. When a person has to undergo an operation which he knows is for his own benefit, he usually schools himself to face it by avoiding all thought on the subject. No doctor prepares a patient for operation by informing him of all that would take place, he knows that the immediate result would be to make the patient a nervous wreck. Consequently, if operations were broadcast, hundreds would probably die rather than face an operation after hearing it. In divorces, the case concerns usually three people, it is no one else's business, and once again no good would result from a broadcast.

In executions it is different. The state murders a man, every member of the state is responsible and every member has a right to know what is being done, and the responsibility he is asked to assume. When every single person knows what goes on public opinion will very soon show whether it prefers butchery or civilisation. I will not pursue the subject here as to why capital punishment should be abolished, the arguments are well known and unanswerable, whereas every article ever published in favour of executions has been immediately proved to be full of fallacious conjecture. The fact is well known that not one argument can be raised in favour of executions which will bear examination.

Yours sincerely,
 C. C. S.

Rock Ferry.

A NASTY SNAG.

The Editor, POPULAR WIRELESS.
 Dear Sir,—This week-end I struck a very nasty snag in my receiver and as it was of a rather obscure variety, my experiences may be of interest to you and —perhaps— to your readers.

I am aware that your space is limited and, if a condenser really does condense, I will endeavour to act as much like a condenser as I know how.

Ordinary Det.-2 L.F. set; 1st L.F. transformer-coupled; 2nd L.F. choke-capacity coupled; milli-

CORRESPONDENCE.

THE "TITAN" THREE

SHOULD EXECUTIONS BE BROADCAST?—A NASTY SNAG —"CHITOS" AND LONG WAVES—RE "PROGRAMMES."

Letters from readers discussing interesting and typical wireless events or recording unusual experiences are always welcomed; but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—EDITOR.

ammeter in H.T. circuit; current consumption 8 milliamps. Perfectly stable, with splendid results.

Much to my surprise, on switching on recently I found the set was taking 20 milliamps instead of the usual 8. On investigation, I found the power valve was taking the excess current. Reproduction was coming through as well as ordinarily, but the milliammeter was swinging badly in the region of 20 milliamps, showing that the power valve was overloading. I immediately suspected the grid circuit, of the power valve (long years of "P.W." teaching behind me). So far, all seemed simple; but I couldn't find the fault.

I may mention I am using a 100,000-ohm wire-wound resistance as a grid leak to the power valve, with —14 grid volts. Well, firstly I tested the vander plugs in the G.B. battery sockets—O.K.; then I tested the voltage of the G.B. battery—O.K.; then I tested the wire-wound grid-leak resistance and all connections in the grid circuit; once more O.K. In other words, although the milliammeter showed that the grid circuit was at fault, every single component and connection in that circuit was beyond reproach. I was distinctly puzzled.

After a good deal of investigation, I found the fault was as follows. The grid pin of the power valve was not making a proper connection in its socket in the valve holder. It was—to a certain extent—making connection, otherwise the audio-frequency pulsations through the coupling condenser could not have reached the grid of the valve; but the connection was not good enough to pass the grid-bias voltage. On splaying out the pin with a penknife, the anode current at once dropped to normal and everything was again bright and happy. I did not test the valve pins in my preliminary investigations because, when a valve is passing current in both grid and plate circuits, one naturally takes it for granted that the valve pins are making connection. At least, I did. That was my mistake.

I think this incident tends to show the very great advantage accruing from the use of a milliammeter in the H.T. circuit. The loss of current might have continued for some days and ruined two new super-power high-tension batteries, besides not doing the power valve any good.

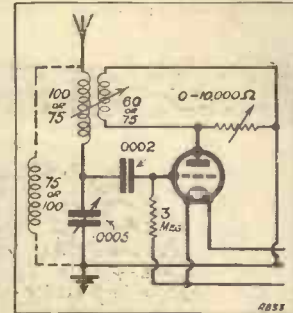
With best wishes to yourself and to "P.W." I remain, sir,

Yours sincerely,
 EDWARD ALLNUTT.

Worthing.

"CHITOS" AND LONG WAVES.

The Editor, POPULAR WIRELESS.
 Dear Sir,—Those of your readers who have experimented with the "Chitos" circuit, and have found difficulty in adapting it to the long wave-band, may like to know of a simple arrangement which I have devised to overcome the difficulty. A fixed coil holder is shunted between aerial and earth, and when it is desired to receive long-wave stations a 75 or 100 coil is plugged in. A glance at the diagram will show that the "Chitos" idea disappears, and in its place is found an ordinary parallel-tuned grid coil with an aerial tapping about half-way. The aerial tap gives a certain amount of selectivity, of course, which is very useful on the long waves.



The "Chitos" was a receiver designed by one of "P.W.'s" readers some years ago. The name given to the circuit was the result of a mistake in the reading of the designer's name, which was Childs. The "Chitos" has proved to be one of the most popular over-variables ever designed.

To revert to the "Chitos" for the medium waves, the loading coil is simply withdrawn. No switching is required, and it will also be appreciated that if the operator is supplied with a 75 and a 100 coil the loading coil is the one not actually being used for the "Chitos" circuit, whichever that may be. In other words, a total of 175 turns should suffice for the long waves.

B. WALKER WATSON.

Sutton, Surrey.

RE "PROGRAMMES."

The Editor POPULAR WIRELESS.
 Dear Sir,—I read with consternation in the otherwise valuable article by Lt.-Com. J. M. Kenworthy, M.P., the suggestion that plays should be kept out of the programmes of the B.B.C. as much as possible. I am convinced that this is not the opinion of the majority of listeners, on the contrary, no items of the B.B.C. programmes are more popular and more keenly enjoyed than the sketches and plays which are presented from time to time. If a referendum were taken I feel sure that the general consensus of opinion would be in favour of more plays rather than more music, for after all variety is the spice of life and there is a great sameness about the musical programmes of the B.B.C. It is the plays that so far have provided the thrills, and not the musical items, with very few exceptions. Nothing could have been more delightful than the two sketches by W. W. Jacobs: "The Grey Parrot" and "The Monkey's Paw," and "R.U.R." by Capek held us all spellbound! Pray, therefore, do not agitate for less plays, but rather for more, please Com. Kenworthy!

Yours faithfully,
 (Mrs.) M. CONSOLE

S.E.23.

SHORT-WAVE NOTES.

By W. L. S.

reader who has been receiving this regularly on a crystal.

His experience coincides with mine and suggests that there is some connection with this station and P C L, although I have heard the female announcer give the call sign as H G J. The same reader used to receive P C J very well on his crystal set. Why not try for 2 X A D, "H. R. K."?

A Yorkshire reader asks which of the many "Nauens" it is that works with Sydney, 2 F C, at 7.30 a.m. or thereabouts. "World Radio" gives two Nauen stations, A G J on 56.7 metres and A G C on 17.2 metres. A G J, as a matter of fact, is now D H E, and works with a badly spreading I.C.W. note on about 41 metres. I think

the Nauen station with which Sydney works is the old A G B, but what his present call-sign is I cannot say.

"G. C. A." passes on some interesting notes, and incidentally was good enough to mention the two new South American prefixes that I have already given at the beginning of these notes. He says that the station signing F Q-P M is a Presbyterian mission in the Cameroons, and also mentions that the Hobbs Expedition in Greenland, N X-1 X L, is still in existence and putting out good signals on occasions.

From Timbuctoo.

Incidentally, I have heard a station coming through at terrific strength and giving the call-sign F V-M 2, describing himself as a motor-car crossing the Sahara, near Timbuctoo. I took it as a leg-pull at first, but have since ascertained that all is in order and that the French Military authorities have something to do with it.

The operator of the French station F 8 K F is in charge. At last, the amateur transmitter's dream of getting into touch with Timbuctoo is capable of being realised!

I HAVE three official additions to make to the list of new nationality prefixes that was published in a recent issue; they are C A, Chili, L U, Argentina, and X, China. Only about three delinquents now remain to prevent the publication of a complete list.

When Captain Campbell sets forth on his actual attempt to lower the world's speed record at Verneuk Pan, Cape Colony, short-wave enthusiasts will have a good opportunity of being the first to tell the world the result. Up till now communication with Verneuk Pan has been by fifty miles of shocking roads.

P C J on a Crystal.

A station working on about 40 metres, with the call-sign Z S Z has, however, been sanctioned and is being finished off at present. Probably it will be found possible to establish direct communication with the United States, and it should certainly be quite reliable with Europe.

I have had a very interesting letter in connection with my remarks of late on the Dutch telephony station from a Bath



SPECIFIED FOR



THE RADIANO TITAN



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INDIGRAPH KNOB and DIAL**

THE IGRANIC INDIGRAPH DIAL

is specified for first-class sets because it is a first-class component—handsome, accurate and reliable. It gives velvet smooth movement, free from backlash and is so soundly made that it cannot get out of order.

Special readings can be marked in pencil on the dial and easily erased. All metal parts are insulated, preventing any possibility of shock with H.T. voltages.

Reduction ratio 8 : 1.

6/-

IGRANIC WIRE-WOUND SHIELDED RESISTOR

Specified because it is essential for silent and satisfactory operation in the Radiano Titan. It is accurate in construction and constant in value. A special feature is the enclosing shield to prevent interaction.

Ask for No. 2234/12 (50,000 ohms)

4/-

RESISTOR HOLDER for the above is a bakelite moulding carrying two contact springs, terminals and tags.

1/6



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RESISTOR**

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HOLDER**



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**Get better tone
from your Set...**

use this wonderful new

Cossor Transformer

**It gives amazingly
pure reproduction of
all notes ... from the
lowest to the highest**



Whatever type of Set you own you can improve its tone with the Cossor Transformer. The Cossor Transformer can be fitted to any Receiver in a few minutes. Its terminals are clearly marked. It is compact. It is only 3" long, 3" wide (over terminals) and 2" high—the illustration above is actual size. There is now no need to use bulky iron-cored transformers. In the Cossor Transformer the core is made of an entirely new alloy. This alloy not only enables the core to be made small but gives it enormous efficiency—much higher than that of the clumsy old-fashioned type. Get a better tone from your Receiver. Fit a Cossor Transformer—you can get one from your Dealer. **Price 21/-**

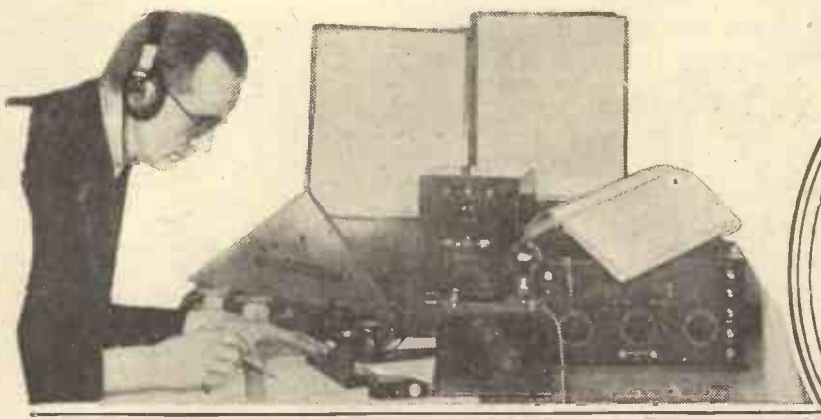


COSSOR Transformer

FREE! Double your Radio enjoyment—get the Cossor Broadcasting Map. It gives positions, wave-lengths and dial readings of 200 European stations. And it tells you how to identify them too! Write for it at once, enclose 2d. stamp to cover cost of postage, etc.

Send at once!

Adv. A. C. Cossor, Ltd., Highbury Grove London. N.5



FOR THE SET BUILDER

SOME L.F. HINTS.

The great advantage of resistance-capacity low-frequency coupling is that it tends to amplify equally well at all frequencies.

The disadvantage of the low-frequency choke as a coupling unit is that its reactance is too low at low frequencies compared with its reactance at the higher frequencies.

One advantage of the use of a low-frequency choke for L.F. amplifying is that it has a comparatively low D.C. resistance and therefore is easy on the high tension.

There are two advantages in low-frequency transformer coupling, these being low D.C. resistance and voltage step-up.

Distortion is often caused by the presence of high-frequency voltages in the low-frequency circuits.

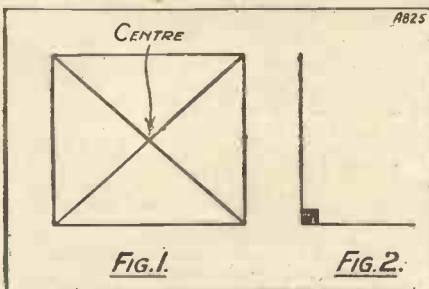
A common method of preventing H.F. impulses from upsetting the L.F. reproduction is the use of a by-pass condenser.

A CONE-SPEAKER CHASSIS.

The following chassis was originally made for the "Blue Spot" movement, but could quite easily be adapted for other units. It is very easy to make, and costs only a few pence.

- The materials required are:
- 1 piece 16 in. x 14 in. plywood.
 - 1 " 16 in. x 8 in. "
 - 2 pieces 16 in. x 3/4 in. x 1/2 in. white wood, or deal.
 - 2 pieces 12 in. x 3/4 in. x 1/2 in. white wood, or deal.
 - 2 pieces 4 in. x 3/8 in. x 1/2 in. white wood, or deal.
 - 1 pair shelf brackets (4 in.).
 - Wood screws.

The baffle shown is 16 in. x 14 in., but it may, of course, be necessary to modify all measurements to suit the constructor's choice of size.



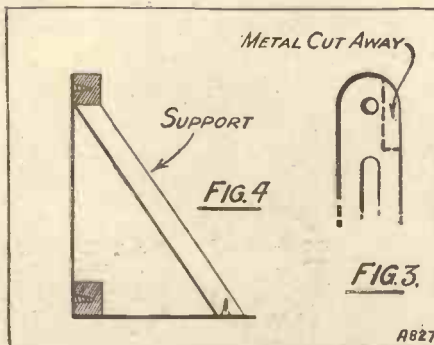
Take the 16 in. x 14 in. plywood and draw diagonal lines to find the exact centre (Fig. 1). Using this point as an axis, draw (with a pair of compasses) a circle slightly larger than the cone to be used, leaving sufficient space for the suspension material.

Carefully fret out the circle and suspend the cone, following the directions given in previous numbers of POPULAR WIRELESS. This completes the baffle.

Making the Supports.

Now turn to the smaller piece of plywood, and fix to the baffle, using one of the 16 in. lengths of wood to make a good joint (Fig. 2). Should the constructor prefer to use a heavier board, he can dispense with the square section wood, but must, of course, allow for the extra thickness when fixing the wooden portions of the movement supports.

The next step is the construction of these supports, which consist simply of the brackets screwed to the edges of the heavy wood. The movement should now be bolted to the ends of the free sides of the brackets. It will probably be found necessary to cut away a small piece of the metal to allow



The holes in the unit to register with those in the brackets (Fig. 3).

Finishing Touches.

You now have a small unit consisting of two wooden blocks and brackets joined by the movement and, taking care to keep everything square, place this on the baseboard so that the reed enters the cone without drag. A small piece of cardboard can be used, should the height be insufficient, or should the reverse be the case, the wood blocks can be reduced.

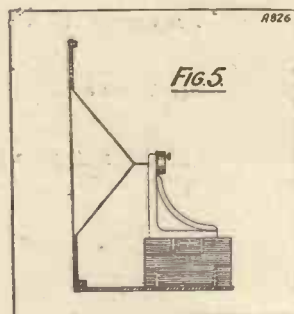
When you are quite certain that you have the correct position, mark the baseboard and, after removing the movement, screw the supports firmly down. Replace the

movement and bolt the reed to the cone. The speaker can now be tested.

The whole can be enclosed in a cabinet, if desired, but should this not be done it is advisable to support the baffle to prevent

the plywood from warping. This is best done by first screwing a length of wood flush with the top of the board, and using the remaining lengths as brackets (Fig. 4).

The front of the baffle can be fitted with ornamental beading if desired.



SOME MORE USEFUL TIPS.

A grid-leak detector is much more sensitive than the anode-bend type.

When anode-bend rectification is used it is necessary to choose the detector valve very carefully.

The best valves for anode-bend detection are those of the high impedance types.

With resistance-capacity coupling the value of the anode resistance should be high compared with that of the valve itself.

The value of the grid leak following an anode resistance should be at least four times the value of the preceding resistance.

The grid biasing required for low-frequency amplifying valves is approximately equal to the value of the high-tension voltage divided by twice the magnification factor of the valve.

In America the low-tension battery is termed the "A" battery.

The American name for the high-tension battery is the "B" battery.

The term "C" battery is used to denote the grid-bias battery in America.

Television Developments

Some details of a sensational new claim reported from Berlin, due to the Hungarian inventor, Denés von Mihaly.

By THE EDITOR.

AMATEURS were a good deal interested last week by the announcement in the Daily Press that Denés von Mihaly, the Hungarian television experimenter, had made remarkable advances in the perfection of television apparatus. Mihaly, in fact, now claims that a moving film can be sent out from broadcasting stations and picked up by listeners possessing the necessary apparatus which, however, he states is simple and costs only a few pounds.

According to the Berlin correspondent of the "Daily Telegraph," a demonstration was recently held, which he attended, where experiments were made with two receivers of different sizes. One receiver gave a picture 3½ in. x 4½ in., and, according to the inventor, would cost about £5. The other receiver gave pictures 8 in. x 9 in., and the price in this case would be about £20.

It is reported that the operation of the receiver is quite the simplest thing in the world; that all one has to do is to turn a knob until the picture focuses itself out from the reddish glow from the neon lamp shining on a ground-glass screen.

It appears that Mihaly's new apparatus is a considerable improvement on that of Karolus, which costs £50 to £75, and which has been more than once described in POPULAR WIRELESS, and in our contemporary "Modern Wireless." Judging by all accounts, it is still uncertain whether Mr. Mihaly's new television apparatus, which he calls the "Telekino," will appeal sufficiently to make it a practical commercial utility proposition.

The Number of Elements.

One thing is certain, however, and that is that the improvements are substantial. The pictures transmitted at the recent experiment and demonstration were those of comparatively simple subjects and actions. One was the dignified movements of an elephant; another was a lady trying on a hat, and third picture was of a man drinking a glass of beer.

Mihaly's new improvements are due, it is said, to his discovery by experiment that it is not necessary for the telegraphic transmission of pictures, as was hitherto considered essential, to send 10,000 elements per second. Mihaly now finds that 900 to 1,400 will suffice, "suggestion" supplying all the deficiencies. It is admitted, however, that when it is desired to show more

than one person in a radio picture with the Mihaly method, 1,400 elements have to be considerably exceeded.

Further details regarding the technical merits of the invention, and as to its practicability from the broadcasting point of view, are not yet to hand, but we hope to be able to supply our readers with more satisfactory details very shortly.

Britain's Place in Radio Race.

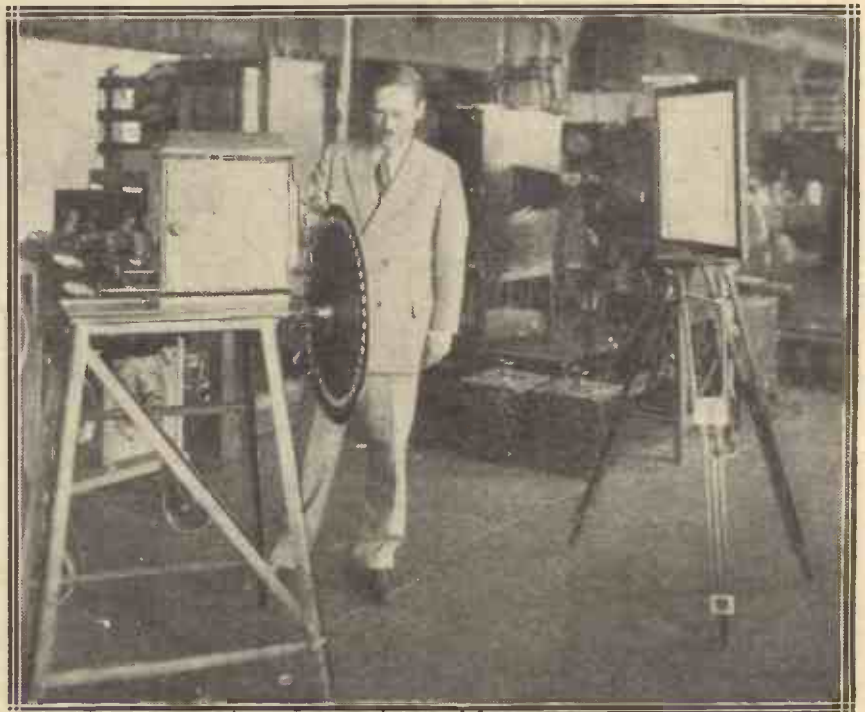
In a recent interview, a leading official of the Radio Manufacturers' Association told a reporter that England has fallen behind in the struggle to capture the world's wireless markets.

According to the official of the Radio Manufacturers' Association, it will be found that the value of England's wireless exports comes to about one million a year; they have certainly not gone back in these figures, but they have not increased, despite the fact that during the last three years the price of apparatus has dropped greatly.

This shows that, although the value has not gone up, the actual quantity of goods of a wireless nature sent abroad has increased. The Germans have made very steady and persistent efforts, and have certainly overhauled us in the matter of capturing a good deal of the export trade.

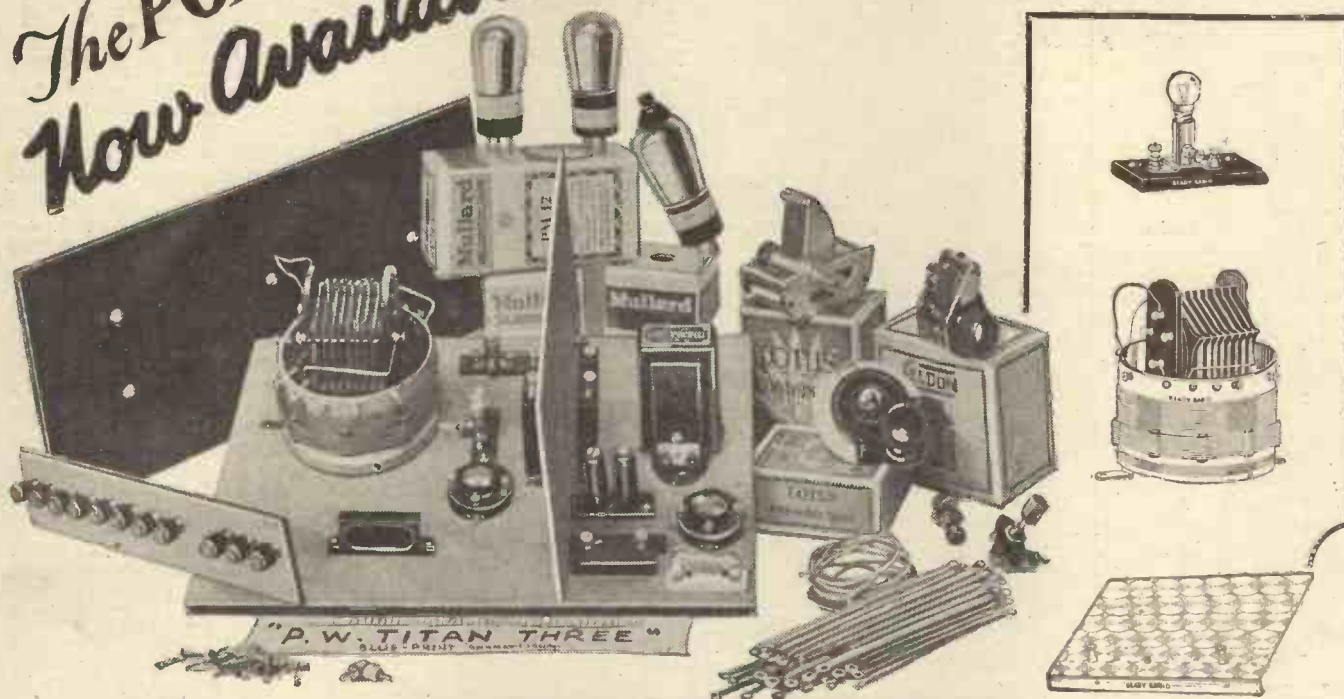
The R.M.A. official puts this down to the fact that, in his opinion, Germany is recovering from the effects of the War much more quickly than we are, and of course our prices, as compared with the German ones, are rather high. The explanation here, of course, is that our goods are better.

But the final verdict that only three years ago, in the race for the world's markets, England was a very good second in the export of wireless goods, and that to-day she has become a third-rate third is certainly an exaggeration which is not borne out by the facts of the case. We are not moving as fast as we should, and Germany looks like passing us if we don't wake up, but the position is by no means desperate.



Dr. Alexanderson, the American Television expert, with his new projector.

A triumph in design —
The POPULAR WIRELESS "TITAN THREE"
Now available in complete kits of parts



READY RADIO "TITAN THREE" KITS

APPROVED BY "POPULAR WIRELESS"

- Kit A** Complete, valves excepted **£4.7.0**
- Kit B** Complete with Detector, Screen Grid and Power Valves **£6.12.6**
- Kit C** Complete, with Detector, Screen Grid and Pentode Valves **£7.5.0**

All kits include special connecting links which **OBVIATE SOLDERING**. Official blue print and full instructions are also included.

LIST OF APPROVED PARTS

	s.	d.		s.	d.
1 Baseboard	2	0	2 Dubilier Mansbridge condensers, 1 mfd.	5	0
1 G.E.C. transformer	17	6	1 Lissen 2-meg. grid leak	1	0
1 McMichael H.P. choke	4	0	1 Grid leak holder	0	6
3 Lotus valve holders	3	9	1 Ready Radio mounted terminal strip with 11 Belling-Lee terminals	4	0
1 Drilled panel	6	0	Wire, flex, screws, and wander plugs	2	3
1 Lotus '0005 variable condenser	5	9	1 Screened grid valve, 12	22	6
1 Lotus slow motion dial	4	9	1 Detector valve	10	6
1 Cylidon micro condenser and knob	7	0	1 Power valve	12	6
2 Ready Radio fuses	2	0	1 Pentode valve Mullard	25	0
1 L.F. switch	1	0	All components supplied from stock. Cabinets supplied for this set:		
1 Wave-change switch	1	6	Polished solid oak	22	6
1 Ready Radio screen	2	6	Polished solid mahogany	27	6
1 Ready Radio Titan coil unit	15	0			
1 Lissen fixed condenser, '0002 mfd.	1	0			
2 Lissen fixed condensers, '0003 mfd.	2	0			

Any of above parts can be supplied separately if required.

IMMEDIATE DESPATCH!

READY RADIO SUPPLY CO.

Tel. No.

Hop 5555

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

(Three minutes from London Bridge Station.)

'Grams

Ready Hop 5555
 London

No set has met with such stupendous success as the "Popular Wireless" "Titan Three." Its great popularity is due to the remarkable efficiency of the designer's method of employing the screen-grid valve, the small number of parts required, the genuine simplicity in construction, and the resultant low cost.

Write, wire, or phone your orders. Inland post free. Overseas orders carefully packed and insured, charges forward.

See page 1358 for further announcement with price list of components for "Radiano-Titan Three."

Our complete, cartoned kits with all baseboard components mounted for the "Titan Three" are approved by the Editor of "Popular Wireless," and are available as shown on left. Blue print supplied.

READY RADIO Components specified in "TITAN THREE."

"TITAN" COIL UNIT **15/-**

"P.W." SCREEN **2/6**
 H.T. FUSE **1/-**

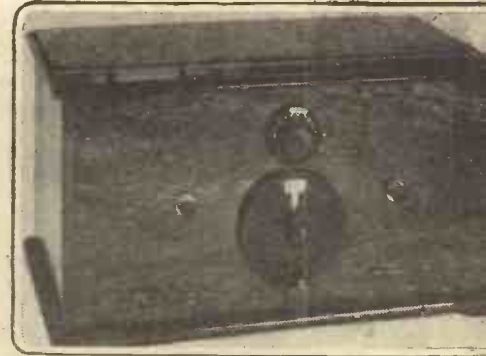
Every Radio need supplied. Write for our 144 pp. illustrated catalogue, price 1/- post free.

See page 1358 for further announcement with price list of components for "Radiano-Titan Three."

TWO years ago I realised that there must be thousands of keen wireless enthusiasts who read with avidity the numerous articles on how to build your own wireless receivers, and yet do not tackle the home construction of a set for fear that they will make a mess of the soldered connections. Actually the art of soldering a

only dispense with this method and confine ourselves merely to terminals the task would certainly be simplified!

Accordingly I set to work to devise a scheme which would dispense entirely with the necessity for soldered connections, while at the same time simplifying other constructional work, and the result was the



wire according to a template, we have the two disadvantages that, firstly, the wire must be bent very exactly to shape, otherwise it will either not reach or will extend too far, and secondly, any templates given are accurate only for one particular component. This is all very well for the firms who want to sell particular components, but the responsible wireless journals take the view that the reader's choice should be as free as possible. Transformers, for example, of equally

All radio enthusiasts will know of the famous "Radiano" system which makes set wiring so simple. The "Radiano Titan" has been designed by Mr. Harris in accordance with his novel scheme and it incorporates a "Titan" Coil Unit.

good performance, vary considerably in arrangement of their terminals, and in my mind the ideal solderless scheme should enable the builder of the set to choose his own components within a fairly wide range of good quality parts, or even to change one make for another during his experiments without a lot of re-wiring.

No Soldering At All!

The "Radiano" solderless system has always used flexible rubber-covered wire, giving the home constructor a latitude of at least an inch or so in the length of any one lead, thus saving him a good deal of trouble otherwise necessary in bending stiff leads to an exact shape. Secondly, if, for example, one desires to change the make of low-frequency transformer, variable condenser, coil holder, etc., after the set has been built, the flexibility of the leads will enable the change to be made without new leads being cut.

True, the use of flexible rubber-covered

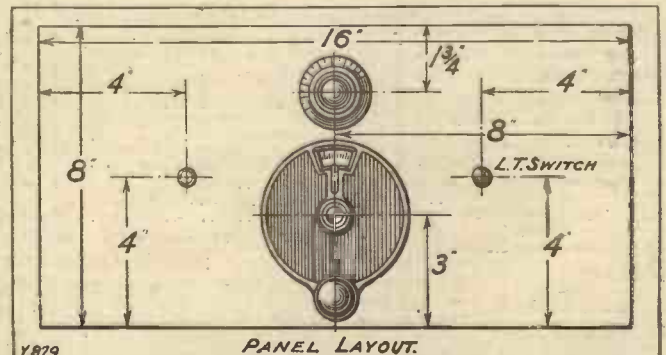
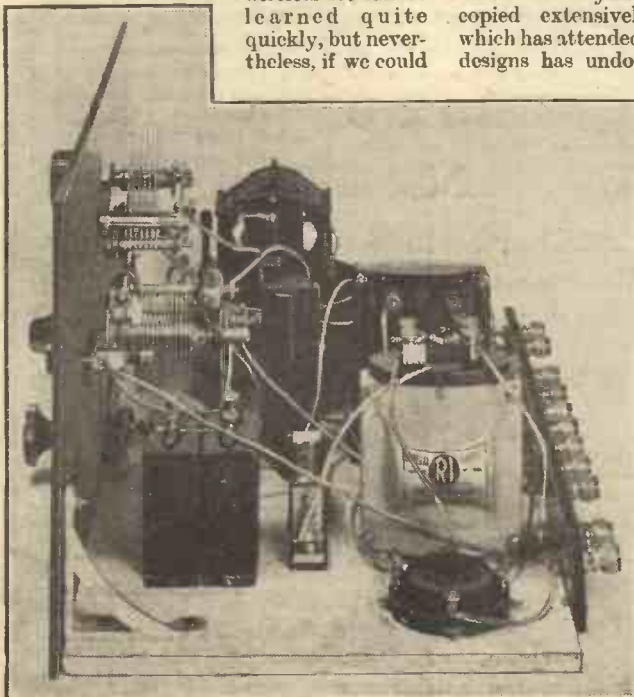
LIST OF COMPONENTS.

- 1 Cabinet, 16 in. x 8 in., with 9 in. baseboard (Raymond, Camco, Aircraft, Caxton, Bond, Pickett, Gilbert).
- 1 Panel, 16 in. x 8 in. (Ripault, Resiston, Becol, "Kay-Ray," Trolite, etc.).
- 1 Titan coil (Wright & Weaire, Paroussi, Burne-Jones, Ready Radio, Goltone, Peto-Scott, etc.).
- 1 Variable condenser, .0005 mfd. (Lissen, Lotus, J.B., Utility, Dubilier, Burton, Cyldon, Igranic, Formo, Ormond, Pye, Colvern, Raymond, etc.).
- 1 Variable condenser, .0001 mfd. (Cyldon, J.B., Burton, Ormond, Bowyer-Lowe, Igranic, Utility, Ormond, Lissen, etc.).
- 1 Vernier dial (If condenser chosen does not incorporate a slow-motion dial). (Igranic, or other good make to suit condenser.)
- 1 Three-point push-pull switch (Bulgin, Wearite, Ormond, Pioneer, etc.).
- 1 On-and-off switch (Bulgin, Lotus, Lissen, Benjamin, Igranic, Burne-Jones, etc.).
- 2 2-mfd. fixed condensers (Dubilier, Lissen, Mullard, T.C.C., Hydra, Ferranti, etc.).
- 1 50,000-ohm. wire-wound resistance (Ferranti power type in set. One of the ordinary wire-wound anode resistances could also be used, e.g. Lissen, R.I.-Varley, Dubilier, Mullard, Igranic, etc.).
- 1 High-frequency choke (Lissen, R.I.-Varley, Igranic, Lewcos, Cosmos, Bowyer-Lowe, Climax, Burne-Jones, Dubilier, Wearite, Climax, Colvern, etc.).
- 1 Fixed condenser, .0003 mfd., with clips or separate holder for lead (Lissen, Igranic, T.C.C., Mullard, Dubilier, Burne-Jones, Goltone, Clarke, etc.).
- 1 2-megohm grid leak (Lissen, Mullard, Pye, Igranic, Dubilier, etc.).
- 1 Fixed condenser, .0002 mfd. Burne-Jones, Mullard, T.C.C., Igranic, Lissen, Clarke, Goltone, Dubilier, etc.).
- 3 Valve holders (Lotus, Igranic, Pye, W.B., Benjamin, Formo, Ashley, Burton, Redfern, Bowyer-Lowe, Wearite, Burne-Jones, etc.).
- 1 Low-frequency transformer (Ferranti A.F. 3 in set. See below).
- 1 Low-frequency transformer (R.I. General-Purpose in set. Any good makes, e.g. Lissen, Igranic, Mullard, Brown, Philips, Marconiphone, etc., in addition to those quoted. It is safest to use transformers of two different makes.)
- 2 Panel brackets (Burne-Jones, Camco, Ready Radio, Peto-Scott, Raymond, etc.).
- 1 Terminal strip, 13 in. long (or 14 in. to fit standard slot).
- 11 Indicating terminals (Belling & Lee, Burton, Eelex, Igranic, etc.).
- 1 1/2-megohm grid leak (Pye, Lissen, Dubilier, Igranic, Mullard, etc.).
- 20 feet stranded flexible rubber-covered wire for "Radiano" wiring.

wireless set can be learned quite quickly, but nevertheless, if we could

"Radiano" system. The scheme has been copied extensively—in fact the success which has attended the various valve makers' designs has undoubtedly been largely due to the fact that they followed similar lines.

All solderless schemes, however, are not necessarily simple or easy. For example, if it is necessary to bare the ends of stiff wire and bend them into loops, shaping the



Here on the right you have the panel diagram of this latest "Titan," while on the left is a side view of the completed set, clearly showing the L.F. stages.

The RADIANO TITAN

By PERCY W. HARRIS, M.I.R.E.,
Editor of the "Wireless Constructor."

wire has the disadvantage that the leads are rather "floppy," but this disadvantage is more apparent than real, for in the "Radiano" designs the length and disposition of the leads has been carefully worked out to avoid any possible electrical inefficiency through this "floppiness." There is, of course, no reason whatever why the reader, if he so desired, should not wire up this or any other "Radiano" design with stiff wire, but for the beginner

The "Radiano Titan" is a magnificent loud-speaker set embodying the most attractive features of two vastly popular systems. Wave-changing by means of a simple panel switch, immense volume with stability and purity, and simplicity of construction are but a few of its outstanding advantages.

there is no question that the flexible rubber-covered wire scheme is by far the simplest of all the solderless schemes so far put out.

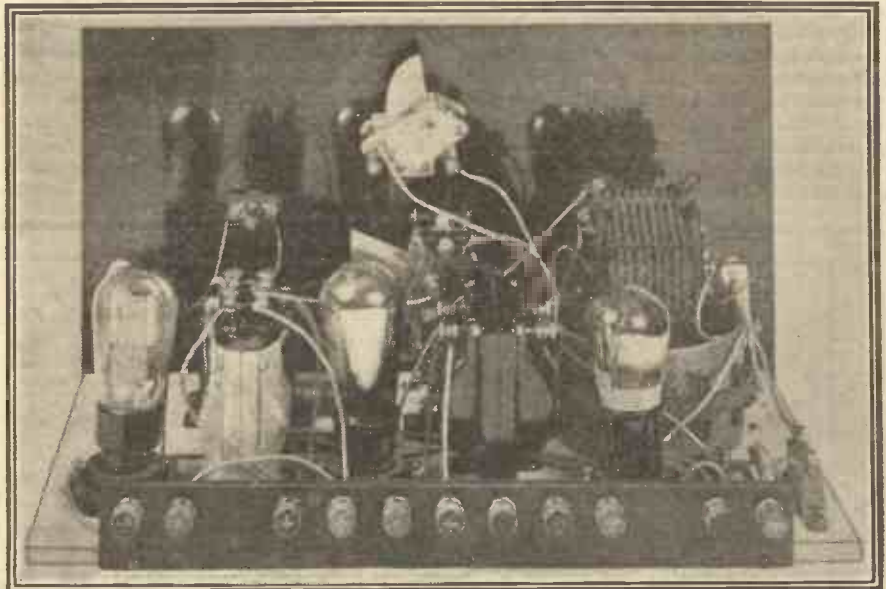
Loads a "Super-Power" Valve.

The great success which has attended the "Titan" coil and the wide interest shown in this ingeniously designed component led the Editor of "P.W." to suggest that I should work out a three-valve "Radiano" design utilising this coil so as to make a very powerful, selective and simply operated "Det. and 2 L.F." Accordingly after a number of tests and experiments I have been able to produce the "Radiano Titan" illustrated in the present article, and can recommend it to readers with confidence as an extremely powerful set for the reception of the ilocal, the alternative station 5 X X, and quite a number of others.

It is not intended to compete with the first "Titan" Three receiver published in this series, which, it will be remembered, used a stage of high frequency, a detector, and one stage of low frequency. The distance-getting powers of the H.F. type of receiver are remarkably good, and it will get more distant stations than this "Radiano

At the same time it must not be thought that this receiver will not get a number of stations—in this direction it is remarkably good also, but it has not quite the distance penetrating powers of the original "Titan" Three.

So far as the theoretical circuit is concerned, this can be seen below.. We



The "Radiano Titan" complete with valves. The terminals, reading from left to right, are: L.S. Minus, L.S. Plus, G.B. Minus Two, H.T. Plus, L.T. Plus, G.B. Minus One, L.T. Minus, H.T. Minus, G.B. Plus, E. and A.

Titan," but on the other hand, the "Radiano Titan," using two powerful low-frequency stages, both transformer coupled, will provide bigger volume from the local and alternative stations, loading up a super-power valve to its limits with great ease whenever required.

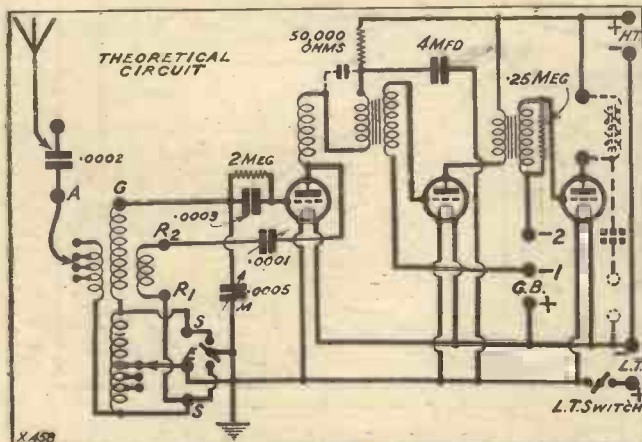
Terrific Volume.

Which of the two sets you will choose to build depends, of course, on your particular circumstances and taste, but certainly for the man who wants the greatest possible volume from three valves for the local or alternative station, the "Radiano Titan" should be his choice.

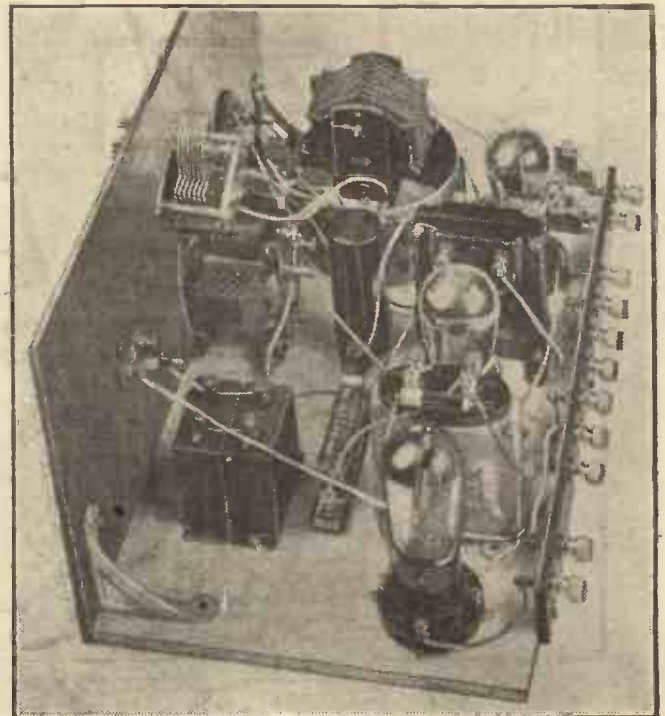
have in the aerial a fixed condenser of a value of .0002 mfd—not often necessary, in view of the excellent arrangement of tappings on the coil to provide the varying degrees of selectivity, but useful in extreme cases where it is desired to push up the selectivity still further.

It is also useful with bad and heavily

(Continued on next page.)



The reaction control is placed just above the tuning condenser, a novel arrangement which considerably facilitates the handling of the set.



**THE
"RADIO" TITAN.**

(Continued from previous page.)

damped aerials such as those where the lead-in has perforce to be taken for many yards close to a wall before coming into the house. In any case try the effect of this condenser with your own aerial, and if you find that it improves results leave it in the circuit. In the "Radiano" scheme of connections it is a very simple matter to take the aerial lead either to this condenser or direct to the coil.

The coil itself is, of course, of the standard "Titan" type. The detector is of the grid-leak and condenser type followed by two stages of transformer-coupled low frequency. Reaction is provided by the windings of the coil itself and is controlled by the .0001 variable condenser placed immediately above the tuning condenser.

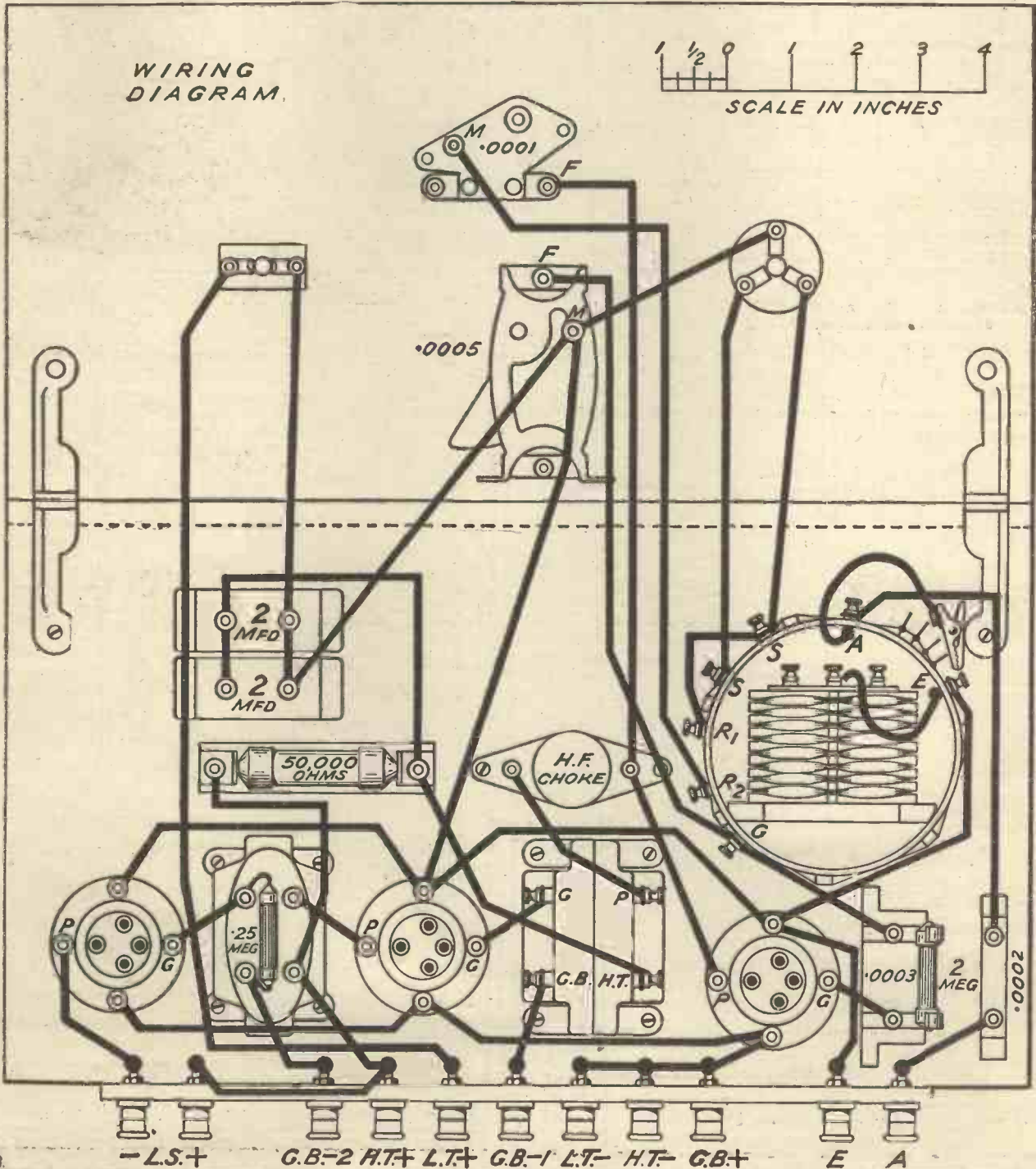
Condenser Values.

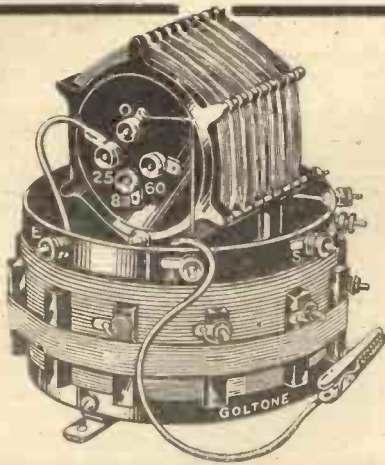
Do not use a larger condenser than .0001 maximum, as this provides ample capacity for either range, and in fact a .00005 would be sufficient here. Between the plate of the detector valve and the primary winding of the first low-frequency transformer we have a radio-frequency choke, and between

the high tension terminal of the transformer and the high-tension terminal of the set we have a series resistance, of the wire wound variety, shunted on the transformer side to earth by 4 mfd. condenser.

I would draw particular attention to this value here, as 2 mfd. is the generally adopted value. A series of experiments recently undertaken in my laboratory, with the object of finding the best method of preventing and curing low-frequency howls and motor-boating, proved to me very conclusively that a large value of capacity here is very important and that 2 mfd., while very often satisfactory, is not by any means so good as 4 mfd. The value of
(Continued on page 1352.)

**WIRING
DIAGRAM.**





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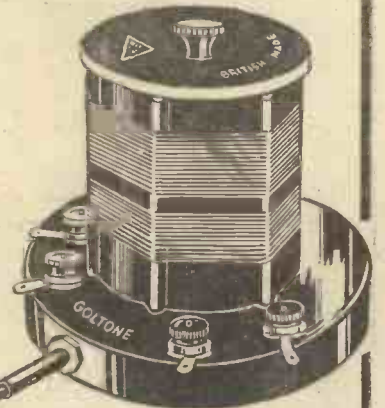
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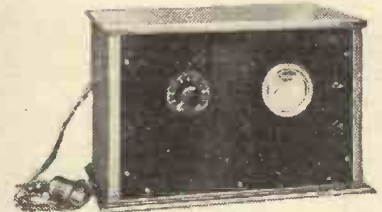
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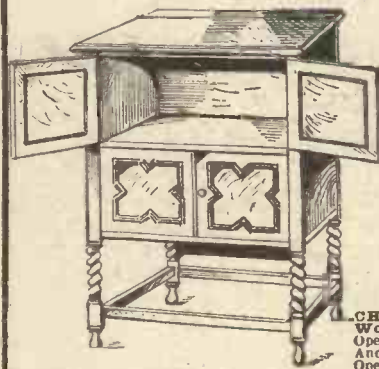
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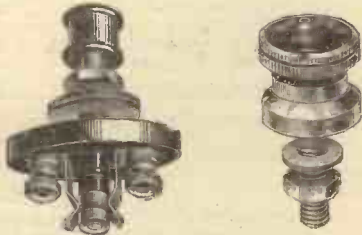
FROM THE TECHNICAL EDITOR'S NOTE BOOK



LILLEY LINES.

S. LILLEY & SONS, LTD., of Birmingham, recently sent us samples of their indicating terminals and push-pull switches. The indicating terminals retail at 2d. each, and are well-made articles. Messrs. Lilley are, of course, manufacturers. There would not be room for middlemen at such prices as that!

And the push-pull switch at 1s. is also a first-class production. It is of the one-hole panel-mounting variety, and is provided with neat little terminals, large, brightly nickelled, round washers to smarten up the



One each of the Lilley switches and terminals dealt with.

front-of-panel appearance, highly polished insulated knob, and other refinements that it surprises one to find in such a low-priced article. The action is definite, and the contacts efficient. Altogether an excellent component.

TWO R.I.-VARLEY COMPONENTS.

One of the great advantages of the electric soundbox is that it enables the reproduction from gramophone records to be controlled. The volume can be varied from a whisper to a roar, but this can only be accomplished by using an efficient volume control. The most popular type of control takes the form of a high resistance potentiometer, and there are not too many devices of this nature on the market that can be trusted to give smooth and constant resistance variation.

The arrival of a volume control potentiometer from Messrs. R.I.-Varley is in the nature of a welcome relief, for it increases the number—a remarkably small one—of passable articles of this kind. The R.I.-Varley volume control is of course well made and operates well, that goes without saying. It is a one-hole panel-mounting component, and its front adjusting knob is somewhat more deeply milled than usual. The retail price is 6s. 6d.

The R.I.-Varley Anti-Mobo Resistance-Capacity Coupler combines the features of the ordinary R.I.-Varley resistance-capacity coupler, with those of the R.I.-Varley Anti-Mobo Unit, the whole being embodied in one compact, handsome assembly. It is about the size of an L.F. transformer of fair

dimensions. The cost of this component is 25s., but it should not be forgotten that it incorporates a Varley Bi-Duplex wire-wound resistance, and is a first-class piece of work throughout.

ROTOROHMS COMPONENTS.

We recently received for test from The Rotor Electric Co., of 34, Kingsway, W.C.2, a power resistance and a potentiometer. The power resistance is of the carbon compression type, and its action is smooth and in every way satisfactory. It is a robust, well-made article, and has an attractive finish.

The potentiometer has a resistance of 500,000 ohms, and is equally efficient and well made. It operates excellently as a volume control, the resistance variation being smooth and uniform.

NEW EDISWAN VALVES.

The first pentode valve I officially received for test was an Ediswan, and it was a 2-volter. Now, curiously enough, the first 4-volter and the second pentode officially sent me for test purposes is also of Ediswan make. This one is styled the type 5E.415, an excellent index to its type and characteristics. The 5E. means, of course, "five electrode," which is the same as saying "pentode." The 415 gives its filament characteristics the valve taking .15 amp. at 4 volts.

This new Ediswan pentode has a fine "mu" for the class of valve. That is to say its impedance, 27,000 ohms, is remarkably low in comparison with its amplification factor of 50. This, again, points to a good "grid swing."

The connection to the priming grid is by means of a small terminal on the side of the base, and when this is at 120 volts, 150 being on the plate—these are the approximate maxima—the straight portion of the curve covers practically 15 grid volts. And true to its characteristics we find that this Ediswan pentode can deal with quite comfortable inputs.

It should, of course, be used immediately following a detector valve, even so in order to avoid overloading, as per the makers' instructions. But one can precede the detector with a stage or two of screened-grid H.F. amplification, and thus form a most powerful combination. The price of the 5E.415 is 25s.

Another new Ediswan valve is the type P.V.625A., a super-power valve. The characteristics of this valve are as follows: Filament volts, 6; filament current, .25 amp.; amplification factor, 4; impedance, 1,600 ohms.—The mu, or slope, is 2.5.

Some readers may be quite interested to know that this slope, or mu, is derived by taking the amplification factor, multiplying

it by a thousand and dividing it by the impedance in ohms. Thus, it will be seen that the smaller the impedance is in comparison with the amplification factor, the greater the slope, a factor which indicates to a considerable extent the efficiency of the valve; 2.5, it might be added, is very good indeed. Two or three years ago '5 was by no means bad.

This P.V.625A. will take up to 180 volts on the anode and, with a grid bias of 20 volts, the anode current is well over 30 milliamps. It is just the valve to use in

Traders and manufacturers are invited to submit radio sets, components, and accessories to the "P.W." Technical Department for test. All tests are carried out with strict impartiality, under the personal supervision of the Technical Editor, and readers are asked to note that this weekly feature is intended as a reliable and unbiased guide as to what to buy and what to avoid.

the last stage of a powerful multi-valver. In a set feeding a moving-coil loud speaker and used also for gramophone pick-up work, we found the P.V.625A. completely satisfactory.

It is a fine valve. The price is 15s., a remarkable fact when one remembers what was charged for valves having very inferior characteristics a year or two ago. But readers should note that the P.V.625A. can find a place only at the end of a very powerful receiver.

There is another Ediswan super-power valve, the 625X., more suited to the average medium-power set. This valve has an amplification factor of seven and an impedance of 2,700 ohms. This is the ideal kind of valve for the last stage, of say, a



This modern pavement artist is drawing a picture of a Ferranti Trickle Charger.

four-valver with two stages of L.F. amplification arranged to give quality results from the local station and others of like calibre. The price of the P.V.625X. is also 15s. With the addition of these three valves to their now most representative range, the Ediswan people have every right to add at the end of their instruction leaflet that "there is an Ediswan valve for every position in your receiver."

THE COSSOR MAP.

I have pinned up my Cossor map of the European broadcasting stations, and already it has proved of very considerable value. It is a fine map and has a wave-length list of the stations printed on it. I would advise "P.W." readers to secure their copies while the generous Cossor offer remains open.



RADIOTORIAL

All Editorial Communications to be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lill, Ltd., 4, Ludgate Circus, London, E.C.4. The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless receivers. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and the trader should be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS.

COMPONENTS FOR THE "SPANSACE" FOUR.

H. G. T. (Market Harborough).—"The set I have been using is a three-valver, neutralised H.F., Det., L.F. This has given excellent results, but I have decided to re-make it into a larger cabinet, and whilst I am about it making it four valves instead of three.

"A friend who has heard one working tells me that I ought to make the 'Spanspace' Four, as many of my components would be

suitable for this. Can you give me a full list of components required to build the 'Spanspace' Four, and tell me where I can get full details of this?"

The following components and materials are required for this set: 1 ebonite panel, 26 in. x 8 in. x 1/2 in.; 1 cabinet to fit with baseboard 9 in. deep and 2 1/2 brackets; 2 .0005-mfd. variable condensers, with slow-motion drive, or vernier dials, square law or S.L.F.; 1 .00035 or .0003-mfd. ditto; 1 on-off switch; 1 jack, No. 63; 1 jack, No. 68; 4 sprung valve holders; 4 baseboard-mounting resistors to suit valves; 1 neutrodyne condenser; 1 L.F. choke, 150 henries; 1 L.F. transformer about 4:1 ratio; 3 1-mfd. condensers; 2 2-megohm grid leaks; 1 25-megohm grid leak; 3 grid leak holders; 1 H.F. choke; 1 .01-mfd. fixed condenser; 2 .0003-mfd. fixed condensers; 1 .0002-mfd. fixed condenser; 9 terminals and 1 terminal strip; 2 sockets on strip of ebonite and 1 wander plug; 2 "Spanspace" Four aerial coils and 1 base (1 short-wave coil and 1

Daventry); 2 split primary H.F. transformers and 1 screen and base (1 short-wave transformer and 1 Daventry); wire, screws, etc.

ACCESSORIES.—Four valves; H.T., G.B., and L.T. batteries to suit valves; 'phones or loud speaker, and 'phone plug or plugs for connecting to set.

Full constructional details of this receiver, with connections in pictorial as well as in practical baseboard form, are given in the "P.W." blue print No. 36.

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Full details, including scale of charges can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do: On receipt of this an Application Form will be sent to you free and post free immediately. This application will place you under no obligation whatever, but having the form you will know exactly what information we require to have before us in order to solve your problems.

This can be obtained from the Technical Query Dept., POPULAR WIRELESS, Fleetway House, London, E.C.4, upon payment of 6d. per blue print, but please note that in addition a stamped addressed envelope must be enclosed.

(Continued on page 1346.)

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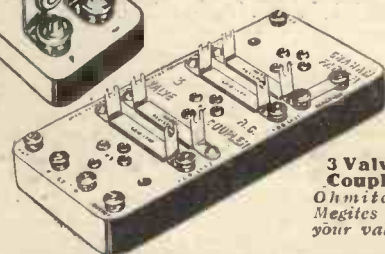


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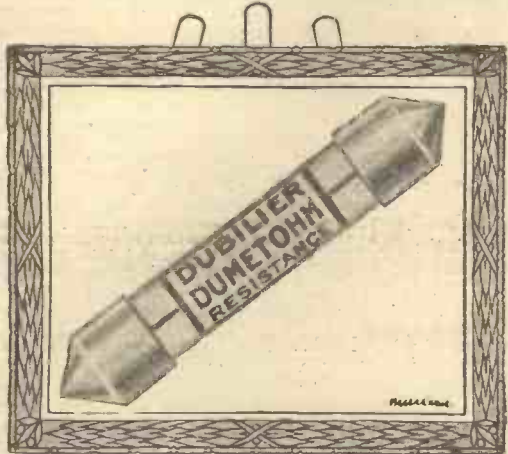


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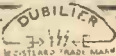
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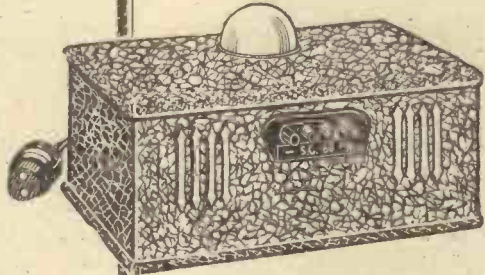
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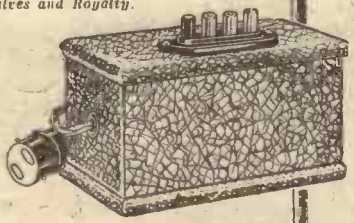
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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1344.)

THE POLARITY OF TELEPHONES.

T. R. D. (Canterbury).—"The 'phones I use are an old pair but very sensitive, and during the course of their long life I have changed the leads twice and fitted new ones. As they were then being used for crystal reception I omitted to notice which of the leads was marked red and which black, and now I want to use the 'phones for a valve set, and this question of which is positive and which negative is going to prove difficult.

"Is there any method of telling which is the correct lead to use as positive and which negative, or does it not matter much?"

When you are using a valve set you must be careful to see that the 'phones are connected in circuit the right way round, as if they are joined up incorrectly it is only a question of time before they become demagnetised. When telephones have no indication the usual method to determine the polarity is as follows:

Carefully unscrew one of the ear caps and remove the diaphragm, leaving the magnets exposed to view. Suspend the 'phones in some convenient position where they are perfectly rigid, and then load up one of the magnets with small pins, gramophone needles, or similar objects, until its magnetism is supporting all the load it can hold.

Then send a small current from a dry cell through the telephone cords first in one direction and then in the other. If the loading of the magnet has been very carefully done it is possible to tell when the current from the cell is going in the right direction, because it then tends to hold the load of pins more firmly.

If the cell is reversed so that it opposes the magnetism of the 'phones, the load will fall off as soon as the current starts to flow. The leads can then be marked positive and negative to correspond with the connections of the dry cell.

SCRAPING AND SCRATCHING NOISES.

"SONNY BOY" (Harrogate).—"My dad gave it to me at Christmas and it went all right, and kept on going all right until this last week,

when it started scratching. What is the cause of scratching?"

If the set develops a continuous scraping or scratching noise, the trouble is usually due to the primary winding of the L.F. transformer having burnt out; and when this is the case the scratching is generally accompanied by a very great reduction in the strength of reception. A faulty high-tension battery, also, will give rise to a continuous scraping noise, and the only cure is replacement.

Another possible cause is a broken flexible lead which may appear to be O.K., but which may actually have several strands broken, giving imperfect contact and thus setting up the scratching noise. Obviously, the only cure for this, also, is replacement. When a scratching noise appears not continuously, but at intervals, you can suspect a bad contact of either 'phones, valves, coil sockets, rheostats, or in any one of the leads. But if the noise only occurs when you are tuning, it will probably be found that a spot of dust has settled on the vanes of the tuning condenser, and this, of course, can easily be removed with a pipe-cleaner or a duster.

THOSE AMAZING SHORT WAVES.

H. W. C. (Cheshire).—"This is rather a lonely village, and I am rather a lonely person, so you can imagine that wireless has been a bit of a God-send. I have only been taking your paper a few weeks and, of course, most of it I simply do not understand.

"One thing puzzles me greatly, and that is the short waves. I do not expect to understand the technical part of it, of course; but it seems to me so odd that people should build special receivers and have special coils, and so forth (which I gather to be the case), unless there is some special fascination about short waves. What is this? Why cannot they be satisfied with the ordinary wave-lengths, and how can the short waves be in any way superior to these?"

By far the most interesting, amazing, and absorbing reception is carried out on wave-lengths far below those to which the ordinary receiver will tune. By some fortunate chance (which is not yet fully explained), short wave-lengths 'travel and 'carry' wireless messages extremely well, even in daylight

(Continued on page 1348.)

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PRICES:
 Tested at 500 A.C. Work volts
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 4 mf. 6/9.
 Tested at 1,000 V.D.C. Work
 volts 300 A.C. or 450 D.C.
 1 mf. 4/-, 2 mf. 5/-, 4 mf. 10/-.

Do not accept a silver grey condenser without the HYDRA label. Others are imitations and we are not responsible in case of breakdown.

LOUIS HÖLZMAN,
 On and after March 10th,
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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1346.)

and at times when the ordinary wireless waves are comparatively "held down" by the effect of sunlight. Consequently upon the short wave-lengths, almost every day British amateurs are picking up messages from radio friends in New Zealand and Australia, whilst it is quite easy to hear America, South Africa, Chili, and such far-off places, even using only a one-valve set!

The reason that short-wave working has recently become more popular is that three or four years ago, when short wave-lengths were only just beginning to be appreciated, there was little use in trying to experiment with short-wave reception unless one knew the Morse code. For at that time it was by telegraphy in code that communication between one country and another was made. (As a matter of fact, this means of communication is still extremely popular among amateurs all over the world. Therefore, if you happen to be able to read the Morse code, the short waves are particularly well worth while, for you can take full advantage of this international short-wave communication, and thus start listening-in to all the world at once.)

Nowadays, even for the fellows who have not learnt the code, there are plenty of attractions upon the short waves. Not only Morse messages, but ordinary broadcast programmes and concerts, are now regularly sent out by many broadcasting stations upon wave-lengths below 100 metres.

Sometimes these short-wave transmissions are sent out simultaneously with the station's programme upon the ordinary broadcast wave-length; and though even the most powerful set in this country cannot pick up the ordinary programme, it is often possible for the short-wave set to pick up some foreign station's "younger brother" on the short wave-length and to hear the programme clearly.

On the other hand, these short wave-lengths are rather fickle, and reception upon them is not quite so easy as ordinary listening, although to the keen experimenter this very fact will add a charm to investigating them.

THE PROBLEM OF THE SILENT SET.

S. M. (Ripley, Yorks).—"The simple directions that you gave me for finding a fault by means of 'phones and dry cell encourages me to ask what is the best way

to look for a fault when the set absolutely refuses to work at all? I was up against this recently at a friend's house, and, frankly, I did not know in the least how to set about it."

In such a case the telephones or loud speaker attached to the set may be wrong, and it is a very simple matter to test apparatus of this kind. To test the 'phones, for instance, proceed as follows: Disconnect the 'phones from the set and place them over the ears in the usual way; then hold one of the little metal tags between the lips.

Now take a key, or similar small piece of metal, and gently rub it along the other telephone tag. If the 'phones are in good order, you will hear a weak but distinct scratching noise which corresponds exactly to the rubbing.

This sound is due to the minute currents set up by your own body, and only a very sensitive electrical instrument would respond to such tiny currents. If no sound is reproduced the 'phones are faulty, or there is a bad connection in the 'phone cords.

By listening first to one earpiece and then to the other, you can ascertain whether only one ear-piece is wrong or both. When the 'phones themselves have been proved O.K., you can inspect the set for a disconnection, and you can be pretty sure that, provided the aerial and earth are O.K., the likeliest cause of complete silence is a break in continuity.

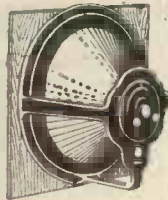
If a crystal set is in use, the various wires should be fingered gently to make sure the connections are adhering to their various places. Possibly one of the joints will be found to have broken apart, or a flexible lead broken, due to the repeated movements in adjustment. As a last resort the crystal detector itself may be unscrewed and examined, but probably the trouble will be traced to a broken wire.

By the way, it is a good plan to listen-in whilst any flexible leads, etc., are being moved, as generally in such cases the movement will restore the connection for a moment, and thus one can find which one is at fault.

When a valve set is being looked over the batteries should be disconnected before any tests are made, otherwise damage is certain to result. And, by the way, disconnect the battery leads at the battery end, and not at the set end, or these may short and seriously damage the set. Remembering that complete silence is nearly always due to a break in the circuit, it should not be very difficult to localise the fault if you employ the flash-lamp test to which you have referred. Apart from faulty components other causes of complete silence are wrong connections of high or low-tension batteries, or of 'phones, so that the fault cannot possibly escape a careful search.

(Continued on page 1350.)

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	Cradle with 9" duplex woven cone, clamping board and Squire Kraft Cone Kit	Cradle with 15" triplex woven cone, clamping board and Squire Kraft Cone Kit
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1 Lissen Variable Condenser, '0005	6	6	0
1 Lissen Fixed Condenser and Grid Leak	2	0	0
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1 Ferranti A.F. 3 L.F. Transformer	1	5	0
1 Ferranti Anode Resistance, 50,000 ohms and base	5	0	0
1 Cydon Reaction Condenser	7	6	0
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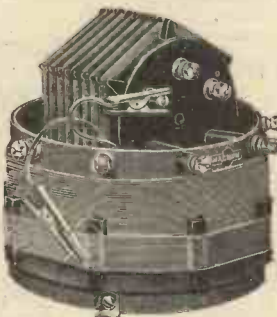
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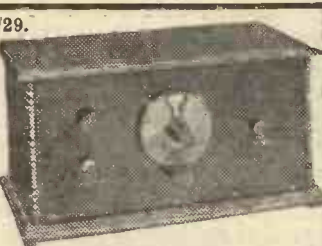
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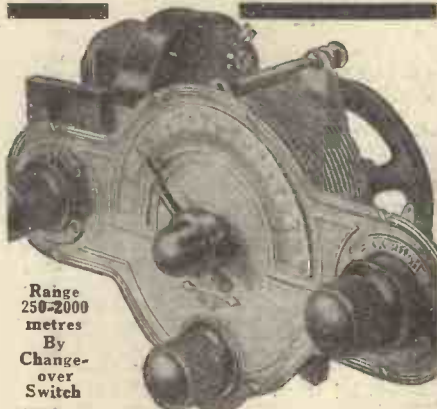
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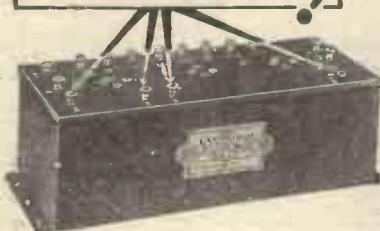
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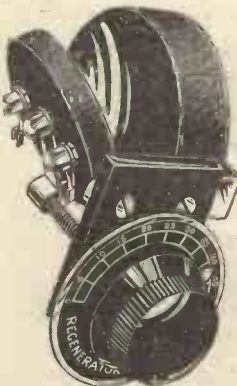
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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1348.)

RESISTANCE FOR D.C. MAINS UNIT.

DIRECTOR (E.C.)—"I am going to take my high-tension from the mains, and I have been offered a mains unit in which the voltages applied to the various valves are adjusted by means of anode resistances.

"These can be plugged in or out so that a suitable resistance can be inserted to give the voltage which is required, but as I have not got a voltmeter to test the voltage obtained, nor an unlimited number of resistances, I would like to know how I can tell what is the correct resistance to put in to give the correct voltages at the output terminals?"

The actual value of the three anode resistances will depend on the output voltages required from each H.T.+. Usually H.T.+1, gives a fixed voltage and should be used for the H.F. stages, and 1st L.F. H.T.+2, is generally used to give various voltages for the detector valve; whilst H.T.+3, is for last L.F. stages.

If the mains in use are below 120 volts the 3rd resistance (in series with H.T.+3) may be shorted. Let us assume that the mains in use are 200 volts and the set is a four- or five-valver, taking approximately 25 milliamps. (This value can easily be correctly obtained from the curves of the valves in use.) For the H.F. and 1st L.F. tapping, H.T.+1, we will assume that 90 volts is required for the particular valves in use.

From our curves we see that at 90 volts H.T. the H.F. valves take 4 milliamps, and the 1st L.F. 6 milliamps, giving a total of 10 milliamps. Now the problem arises as to the exact value of resistance

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to use so as to reduce 200 volts to 90 volts. Another point must, however, first be considered. The total resistance of the L.F. output choke is, say, 380 ohms, so that when the total current taken by the set is flowing (i.e. 25 milliamps), there is a voltage drop across the choke. This voltage drop is equal to:

$$C \times R$$

$$1,000$$

Where C = current flowing in milliamps, R = resistance of choke, in ohms. The voltage drop will, therefore, be

$$\frac{25 \times 380}{1,000} \text{ or } 9.5 \text{ volts.}$$

Thus, the voltage available will be about 190 volts, not 200 volts.

If 90 volts applied to the circuit gives 10 milliamps, obviously the normal resistance of the circuit must be

$$\frac{90 \text{ v.}}{10 \text{ m/a}} \times 1,000 = 9,000 \text{ ohms.}$$

The total resistance required in order that 10 m/a may pass if 190 volts are applied is given by

$$R = \frac{190 \times 1,000}{10} = 19,000 \text{ ohms.}$$

Subtracting the former from the latter we see that another resistance of 10,000 ohms is required.

So that if we connect a resistance of this value in series with H.T.+1, the required voltage will be applied to the H.F. and 1st L.F. valves. In a similar way, the value of resistance required for H.T.+2, may be obtained. Suitable wire-wound anode resistances of practically any resistance may now be obtained from most of the manufacturers of this type of resistance. Variation of detector voltage can be achieved in a variety of ways, one of the commonest being a good variable resistance capable of passing the required current without overheating.

Alternatively, interchangeable anode resistances may be used, but the former method is far better on account of ease of operation and fineness of adjustment.

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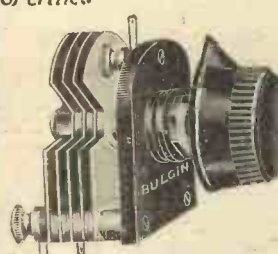


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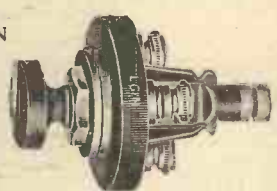
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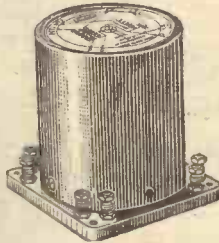
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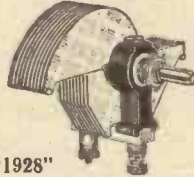


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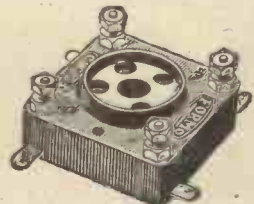
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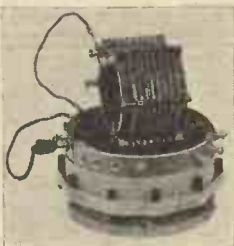
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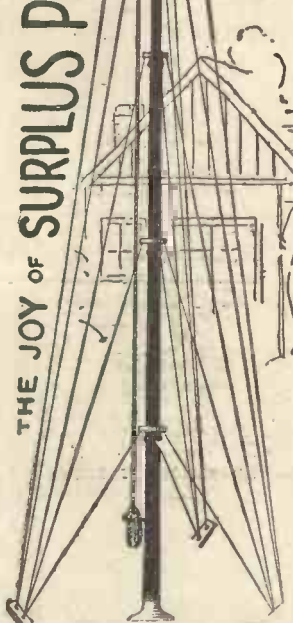
26 Feet high. In 3 sections of 1 1/2 in. Steel tube tapering to 1 in. Carriage, London, 1/6; Midlands, 2/6; elsewhere, 3/6. Weight 24 lbs. Two masts for 28/6.

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34 Feet high. In 4 sections of 1 1/2 in. Steel tube tapering to 1 in. Carriage, London, 2/6; Midlands, 3/6; elsewhere, 4/6. Weight 34 lbs. Two masts for 40/-.

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The "Super" Mast.

42 Feet **29/6** high. In 5 sections of heavy 1 1/2 in. Steel tube tapering to 1 in. A real bargain. Carriage, London, 2/6; Midlands, 3/6; elsewhere, 4/6. Weight 45 lbs. Two masts for 55/-.

P.R. MASTS are made of British Steel in 9 ft. lengths, from 1 1/2 in., tapering to 1 in., and are supplied with cast-iron bed plate, steel ground pegs, stay rings, galvanised steel flexible wire stays cut to lengths, pulleys, bolts, and fullest erecting instructions. No further outlay necessary.

NO HOLES TO DIG. ONE MAN'S JOB.

Any intelligent man can assemble and erect a P.R. Mast in a couple of hours. Our patent Mast being tapered, it is easy for anyone to raise it from the ground into position. Ordinary tubular masts require several hands and difficult rigging to do this. To help you the wire rope is sent out to size—a saving of endless worry. Imagine sorting out 500 ft. of rope in your back garden! Minimum Radius 3 ft. 6 in. The easiest Mast to erect.

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PRICE OF ACCESSORIES. P.R. Colloid Covering sufficient for a Mast—with brush, 2/6. Halyard Lox Line—Ryland's patent rot-proof: For 26-ft. Mast, 1/6; 34 ft., 2/-; 42 ft., 2/6. Per 100 ft., 3/-. Note.—Double length supplied to make lowering of Aerial easy.

A HIGHLY EFFICIENT AERIAL. P.R. Aerial is made of 14-28 High Conductivity Pure Copper Enamelled Wire—each strand insulated from its neighbour to give the highest signal strength obtainable. 100 ft., 4/3; 50 ft., 2/3.

P.R. MASTS 17-48, PATERNOSTER SQUARE, LONDON, E.C.4. Opposite G.P.O. Tube.

IF YOU USE VALVES it will pay you to write to us for particulars of the famous 3/6 range of P.R. valves. Each valve has a written guarantee of life and performance.

"RADIANO" TITAN THREE

(Continued from page 1340.)

the resistance chosen for this set (assuming that the reader uses as I recommend, a high-frequency type of valve as the detector) is 50,000 ohms.

The combination of the 50,000-ohms resistance and 4-mfd. condenser gives freedom from battery coupling which often occur with modern valves and high efficiency transformers, while it also enables us to use one high-tension voltage on the set, thus dispensing with battery tapping. There are two advantages in this, one being that our high-tension battery or accumulator is run down uniformly and not one section more than another, and secondly if we use, as many readers will do, mains units, we have not to worry about the actual voltage of any particular tapping—always difficult to ascertain without accurate measurements.

H.T. Values.

The high-tension voltage suggested for this set is not critical, but 120 is a very good value if a super-power valve is being used in the output and 150 is not too high if a mains unit is available. It will, of course, work with lower voltages than this,

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even with 70 or 80 and a power (but not a super-power) valve in the output.

The quality, however, on loud signals will not be so good, and wherever possible a super-power valve should be used. Excellent super-power 2-volt valves are now available for those who use 2-volt accumulators. After all, we have in the "Radiano" Titan a very powerful receiver capable of giving a super-power output valve—all it can handle, so why not make the best use of it?

A Question of Quality.

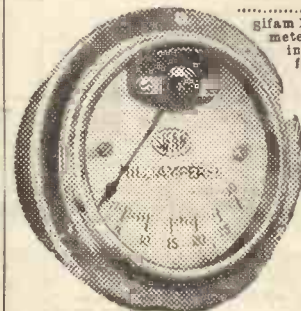
The pair of transformers I have actually used in this set work very well together, and it will be noticed that across the terminals of the second a 1/4-megohm grid leak is shunted. This is not a very vital component, and can be dispensed with if desired, but its object there is to flatten off a slight accentuation of high frequencies

(Continued on page 1354.)



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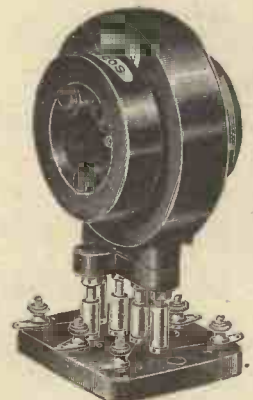
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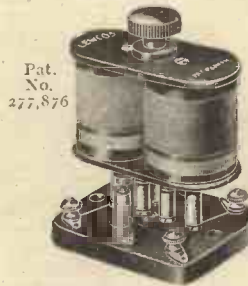


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"RADIO" TITAN THREE

(Continued from page 1352.)

which tends to occur when two trans-
formers are used.

The 1/4-megohm grid leak makes a negligible
difference to the strength of signals, but it
often gives an improvement in quality.
If you are interested, try with and without
it.

"Radiano" Flexible Wiring

When using a super-power valve it is, of
course, advantageous to use an output
filter, but such a filter was not included in
the present set in order to keep the price
down to as reasonable a figure as possible.
Ample room, however, has been left on the
baseboard for the addition of an output
choke and condenser unit, and if you
examine the theoretical diagram you will
see the connections for such a unit included.

The "Radiano" flexible wiring system
makes any slight changes in the set after it
has been built (such as the incorporation of
an output filter) a very simple matter. All
you will need for such a filter is a good

GOING TO BUILD A SET ?

Don't forget the two famous

Wireless Constructor Envelopes

which are now on sale, and
which respectively deal
with the construction of

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output choke and a 2-mfd. condenser.
Screw them both in some convenient
position near the last valve holder. The
following changes of wiring will be neces-
sary.

Choke Output Easily Fitted.

Remove the lead which goes from the
plate of the last valve to the loud-speaker
terminal, and also that which goes from
the second loud-speaker terminal to high-
tension positive. Now connect the plate
of the last valve to one of the choke
terminals and connect the other choke
terminal to the high-tension positive
terminal. Next, take a second lead from
the plate terminal of the last valve to one
terminal of the 2-mfd. condenser, and take
the other terminal of this condenser to
the negative loud-speaker terminal. The
positive loud-speaker terminal is now
connected to any point of negative L.T.,
the most convenient one being the filament
terminal nearest the terminal strip of the
last valve.

When using a power and not a super
power in the output, you need not trouble
to include an output filter, and as many

(Continued on next page)

WARNING

TO NEW COSSOR "MELODY MAKER" OWNERS

There are no efficient substitutes for the
**FAMOUS S.R.S. ULTRA
SHORT-WAVE COILS**

(Pro. Pats. 23416/28, 29215/28.)

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leave out the very features which make these
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by the Firm that made SHORT-WAVE RE-
CEPTION POSSIBLE ON THE ORIGINAL
COSSOR "MELODY MAKER" with the
FAMOUS S.R.S. ULTRA SHORT-WAVE
ADAPTION (Patent 11560/28).

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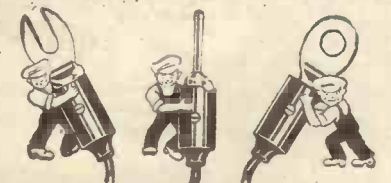
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Street, London, E.C.1.

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WHEN REPLYING TO ADVERTISEMENTS.

"RADIANO" TITAN THREE

(Continued from previous page.)

readers will desire to economise on high-tension current and use a power instead of a super-power valve, the simpler arrangement of components (without the output filter) is shown in the photographs and wiring diagram.

To build the set, first of all drill the panel and mount the switches and variable condensers as shown. Next mount the two panel brackets on the baseboard and hold the panel up against the front edge of the baseboard, marking through the holes in the brackets where you have to drill for the securing screws. It is only necessary to use one bracket securing screw for the panel at each end, the additional support required being given by three screws passed through the lower part of the panel into the front edge of the baseboard.

Fixing the Panel.

For neatness, countersink the holes in the panel which takes the securing screws for the brackets and when the screws are in place fill up the depressions with black playwax. (This wax slices off very cleanly with a knife, and a hard rub with a duster will polish the surface and completely obliterate the mark of the screw hole.)

The next step is to place the coil in position as shown, being careful the terminals come at the positions marked. Now arrange the other components, but before fixing the valve holders and transformer, put your terminal strip in place and make sure that the shanks of the terminals do not foul any other components.

The flexible rubber-covered wire used in this "Radiano" set can be obtained on a reel or in a coil. The method of wiring is simplicity itself. With a sharp knife, remove the rubber from one end of the wire for about one inch. Twist the strands between the fingers to prevent them spreading, and then bend the bared end into a loop and twist it so that a closed loop will slip over the aerial terminal shank.

Simple Wiring.

Allow enough wire to reach from the aerial terminal shank to either of the fixed condenser terminals and then allow a further inch for baring. Bare this wire, twist another loop and slip it over the condenser terminal nearest the terminal strip. Proceed in the same manner for the lead from the fixed condenser to the aerial terminal of the coil and pass on from wire to wire, marking off on your wiring chart each wire as made so as to prevent confusion.

Go systematically and do not jump from one part of the set to another, wiring up the aerial, grid circuit tuning condenser, filament wiring and switching, and so forth till you come to the last wire. If you have been systematic in this work and marked off each wire as made on your chart, a quick glance will show whether you have made every lead. What wire you have over make into battery leads, fitting them off with spade terminals and wander plugs, if you so desire.

Notice particularly the markings on the various terminals on the terminal strip. The order may appear to you to be somewhat unusual, but if you examine the design you will see the terminals are so placed that the leads going from them are

(Continued on next page.)

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"RADIO" TITAN THREE

(Continued from previous page.)

the shortest possible for the particular purpose. Thus grid bias, high-tension negative, and low-tension negative are placed next to one another, and all three are joined together behind the strip.

When everything is connected up put the aerial tapping on the "Titan" coil in about the third socket, or to the third terminal (if terminals are provided and not sockets). Join the flexible wire which goes from the aerial terminal of the set in such a way that the fixed condenser is cut out of circuit (or alternatively leave the fixed condenser in and join its two terminals by a short circuiting wire), and place the long-wave loading coil flex connection on the "Titan" coil on the No. 60 terminal.

The Valves to Use.

Set your reaction condenser at zero, pull the wave-change switch out, connect up your aerial and earth and low- and high-tension batteries and grid bias. Use the maximum high tension available up to 150 volts and grid bias on the last two valves according to the makers' instructions.

I recommend for valves in this set a high-frequency type in both the first and the second sockets, and a power or super-power valve in the last socket. If you are using a high-frequency type of valve in the second socket, then 3 volts will be suitable on 120 volts. Grid bias on the output valve should be that recommended by the valve-maker on the leaflet.

After you have become accustomed to the lower band, push the switch in and try on the upper bands. The degree of selectivity you will choose will depend upon your particular aerial, location, etc.; but if the tuning is too sharp, try more aerial turns, and if it is too flat use fewer aerial turns.

The sharpest tuning of all, at some appreciable sacrifice of strength, will be obtained by using the series condenser and the smallest number of turns on both coils. Remember that changing to the long wave will vary the reaction setting on your reaction condenser, so do not make any alterations or trials with this without first setting the reaction condenser to zero. This will save unnecessary oscillation.

Strength and Selectivity.

In the course of a very thorough test, not only were the local and alternative stations, together with 5 X X, received at full loud-speaker volume, but a number of other Continental stations were picked up with great ease. On the long wave-band, Radio-Paris, Eiffel Tower, Hilversum, etc., came in quite well.

It must be remembered, however, that a detector and two low-frequency stages will only pick up a large number of stations with the very careful use of the reaction condenser, and the inexperienced reader is recommended to use caution here, otherwise he may cause disturbance to his neighbours.

As a really powerful three-valver with the great advantage of sharp tuning and simple wave-change switching, the "Radiano Titan" should have a wide appeal, while the beginner who has never made a set before will find that the construction and operation is of the simplest.

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TECHNICAL NOTES.

(Continued from page 1328.)

wire, and these conditions may make all the difference to the strength of reception.

This is particularly the case where the reception is in any case fairly weak, as when receiving distant stations. It is true that a reduction in the incoming signal strength can be compensated by high-frequency amplification in the receiver, but this is all to the bad, and it is clearly very desirable to use all possible precautions to conserve the energy striking the aerial so that as large a percentage of it as possible ultimately passes into the H.F. circuit of the receiver.

A Curious Case.

I have known cases where an apparently inferior type of aerial strung up, for example, indoors for temporary purposes has proved actually better on results than an elaborate outdoor system, and the explanation has been more or less as indicated in the foregoing remarks; the indoor system has been comparatively free from leakage, although its actual pick-up efficiency might have been small, whilst the elaborate outdoor antenna, although intercepting a very much greater amount of radiated electromagnetic energy, was inefficient, due to leakages of the kind which we have just been discussing.

Composition of Solder.

Some useful remarks were made recently in this journal by a well-known contributor on the subject of the different grades of solder which are available for various radio purposes. One of the principal points brought out was that, owing to its comparatively high cost, the proportion of tin in so-called soft solder was apt to be reduced below a reasonable minimum.

Tinning.

You may know that pure tin has a very low melting point (not a great deal above 200 degrees centigrade), whereas lead, which is usually the other element in the solder, has a decidedly higher melting point. Consequently a large proportion of tin means that the melting point of the solder is reduced, which makes the solder much more easily workable for general radio purposes.

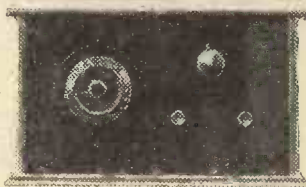
Another important point is that the tin has the peculiar property of making the solder "run," or adhere to the clean surface of other metals; the process of "wetting" the surface is sometimes, in fact, known as "tinning," and this is the principle involved in industrial work where various types of metal are "tinned" in order to protect the base metal and render it useful for special purposes. The most familiar example is so-called tinfoil which, as you probably know, is nothing more than thin sheet iron which has been coated with an extremely thin layer of tin.

Good low-melting-point solder will generally be noticed to have a fairly light colour and to be clean and silvery or whitish, whereas inferior solder, which is mostly lead with a very little tin, will have a dull and dirty appearance, resembling that of an old piece of lead pipe. You will find that the inferior solder is unsatisfactory to work with, and will give you endless trouble as compared with that containing the requisite proportion of tin.

(Continued on next page.)



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TECHNICAL NOTES.

(Continued from previous page.)

In Strip Form.

In this connection I notice that solder is now being introduced especially for the use of radio experimenters in the form of a very thin strip in which the flux is contained. The strip, in fact, is made by first forming a tube of the solder, the flux being inside the tube, and then rolling this out flat in exactly the same way as a collapsed tooth-paste tube.

This strip is very convenient for radio experimenters, as it can be wrapped a couple of times around a joint and snipped off and the soldering iron applied to the joint, when the solder with flux immediately completes the job. In fact, so convenient is it that the joint can be completed without a soldering iron at all, by the simple process of applying a lighted match to the joint after a small piece of the strip has been pressed around it.

Size of Coils.

Beginners often have some difficulty in deciding the exact size of reaction coil to use for a particular size of tuning coil, and sometimes you will find that one reaction coil is obviously too large, whilst the next size is obviously too small. A large coil brings in oscillation "with a bang"

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MODERN WIRELESS

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and gives poor signal strength, whilst with the small coil the oscillation may be very difficult if not impossible to obtain at all.

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A simple way to do this, especially if the reaction coil is of your own make, is to wind it until it is clearly too large and then gradually to reduce the winding turn by turn until the desired state of affairs is reached.

Logging Short-Wave Stations.

Logging stations with a short-wave receiver is not quite so easy as with the stabilised broadcast receiver, but after a station has been tuned-in to the loudest point, the reaction control should be turned as low as possible without losing the signal and the tuning condenser then adjusted until the signal is loudest. The station may then be logged, and if the reading is carefully noted the station can again be obtained subsequently with the minimum of "juggling."

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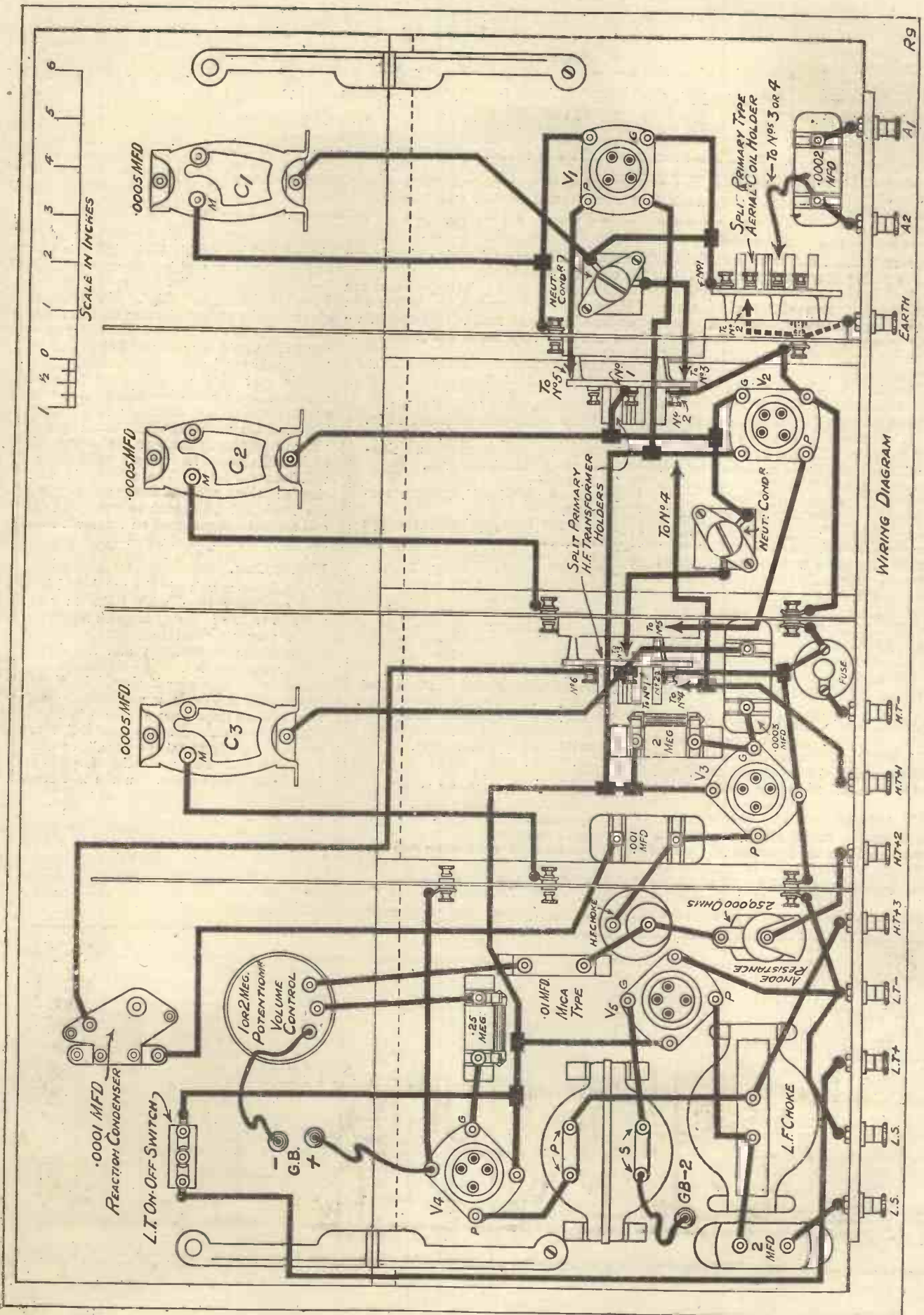
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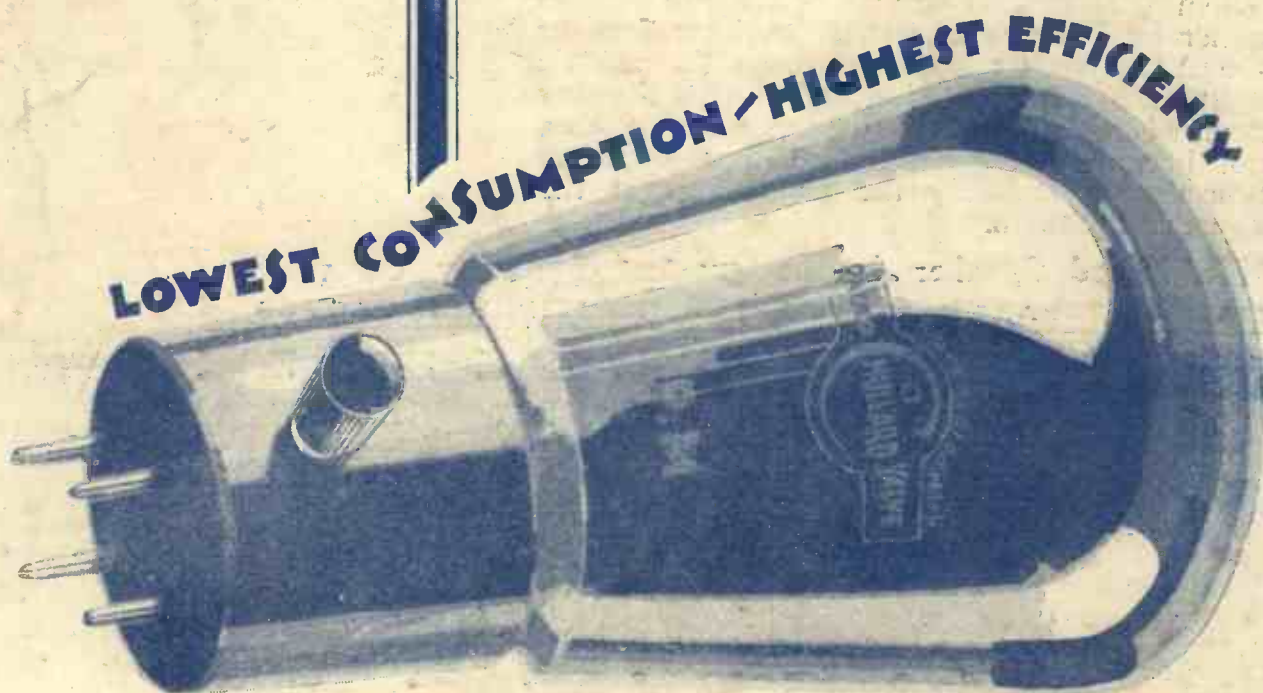
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