

**GREATEST VALUE—HIGHEST CIRCULATION**

# Popular Wireless

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No. 361. Vol. XV.

INCORPORATING "WIRELESS"

May 4th, 1929



**SPECIAL FEATURES IN THIS ISSUE.**

**Our Changing Circuits. More About The "Titan" D.C. Three**

**WHY I LEFT THE B.B.C.—By R. E. Jeffrey.**

**The World's Short-Wave Stations. Making Your Own Components**

Our cover photo shows the Jazz-band of the Vienna Broadcasting Station hard at work. Vienna can be heard quite well on a moderately sensitive set (one using an H.F. stage for preference) just above 5 G B, but below Brussels, on the tuning dials.



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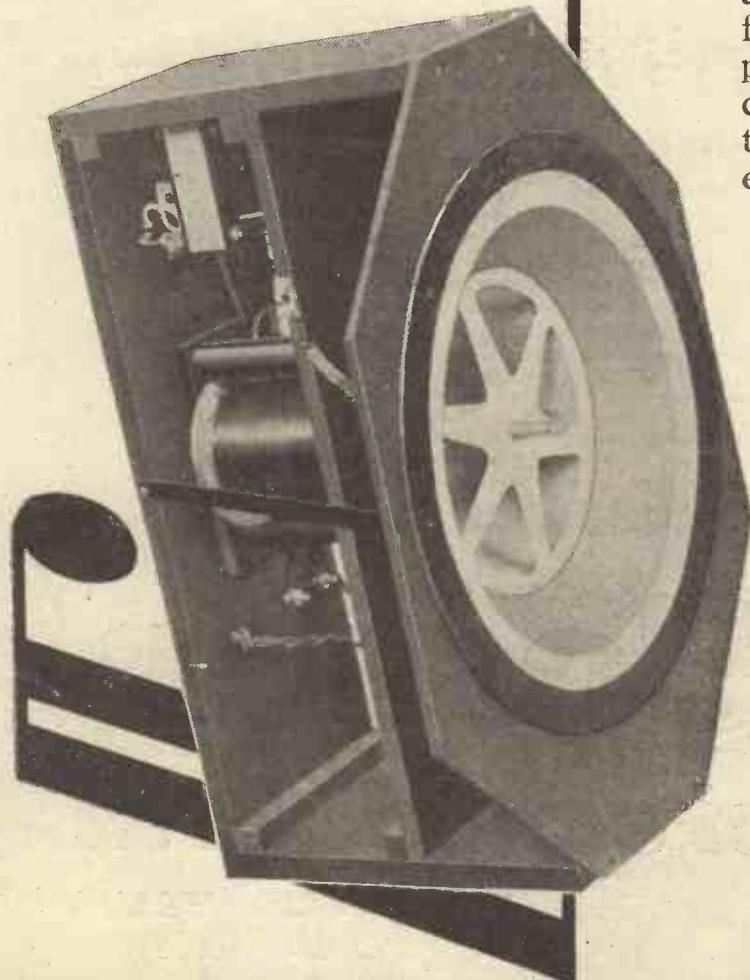
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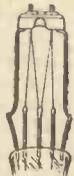


# MOVING COIL UNITS

# FOR SAFETY'S SAKE—

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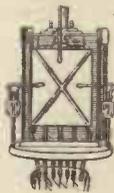
1. The double length of Cossor filament famed for its colossal emission. Note the seonite bridge holding it rigidly in position.



2. Around the two stout grid supports is wound the first grid, electrically welded at twenty-five points.



3. Note the enormous strength and rigidity of the screen. See how it is built on four stout supports and capped by a metal bridge-piece anchored to seonite insulator.



4. Finally, observe the construction of the anode. Actually two rectangular nickel plates are used and for greater rigidity each is diagonally ribbed.



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## USE

# Cossor Screened Grid Valves

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The purchaser of a Cossor Screened Grid Valve is definitely safeguarded against these risks. Its patented method of interlocked construction positively prevents the slightest individual movement of any element. The whole electrode system is braced top and bottom with a girder-like construction which is proof against the hardest blow. The Cossor "bridge" method ensures absolute alignment and guarantees life-long uniformity of characteristics.

For safety's sake, therefore, demand Cossor—the only Screened Grid Valve with interlocked construction.

# Cossor Screened Grid

THE ONLY SCREENED GRID VALVE WITH INTERLOCKED CONSTRUCTION

# Popular Wireless

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**ARIEL'S S.O.S.**  
**THE GARDEN MONTH BY MONTH.**  
**BEAM SPEEDING.**  
**FROM POLE TO POLE.**

## RADIO NOTES AND NEWS.

**A SECOND 5 S W.**  
**FISHING UP TO DATE.**  
**ANOTHER B.B.C. LOSS.**  
**LIVE AND LEARN.**  
**A CHANCE FOR MARCONI.**

### Ariel's S.O.S.

**W**ILL the gentleman named Buggins (or Figgins) last heard of in the 9.3 a.m. "up" train from Pinner on May 1st, call at this office, when his lunch-pail will be returned to him. He may recollect that he crabbed radio good and hard to us, and that his little parsivel contained a bag of acid drops, an apple (off colour), a booklet entitled "Your crystal set: how to make and use it," a copy of a parish magazine and a shoe-horn.

### The Garden Month by Month.

**N**OW is the time to put corks on the aerial—for the racing pigeons to rest on. The wireless pole should be treated to a height of 3-147 feet with Podder's Mixture, to prevent the tortoisoes from climbing and sneaking the atmospheric's eggs. Loud speakers will now be coming out in large numbers on the lawns. Lawn sand is useless; try a shotgun. Before watering the "earth" notify the Water Board. If you are afraid the gladioli have "gone west," give it up, make a "Titan" and get the East.

### Beam Speeding.

**T**HE craze for speed is quite as rampant as the mania for distance (see "Sydney" Two), but not half so safe. Major Segrave no sooner enjoys his triumph but up springs Mr. C. A. Villiers with a threat to produce a 3,000 h.p. car capable of a theoretical maximum speed of 400 m.p.h. For the steering of this fearsome brute it is stated that "beam" wireless is to be enlisted in some way so that it will actuate a red pointer which, moving over a white disc, will show the nerveless wonder who is driving the slightest deviation from the true course. 'Elp!

### From Pole to Pole.

**I** SHOULD have said, without taking much thought, that there scarce remained another record for radio to achieve, yet here is another. "From pole to pole" is the poetic figure for the greatest distance on the globe. It is about as scientific as "the ends of the earth." However, a report has been received in Copenhagen that Mr. Hansen, wireless operator of the American Hobbs Arctic Expedition, has been in radio communication with Byrd's South Polar Base. It knocks Jules Verne flat!

### A Second 5 S W.

**T**HE Italian Broadcasting Company has arranged for Marconi's to make a short-wave broadcasting transmitter for Italy. Owing to its experience with 5 S W the Company will to a large extent copy the design of that station. Whereas 5 S W has been operated mainly as an experiment, and has only casually catered for the overseas Britons, the new Italian station is intended expressly for broadcasting to the Italian Colonies. I wonder if this will suggest anything to our Colonial Office.

### Fishing Up to Date.

**A**LTHOUGH old Izaak Walton, the Compleat Angler, used to advise anglers to put a frog on a hook "as though you loved him," I fancy he was a pretty good "sport." Therefore I wonder what he would say if he could know that fifteen trawlers are fitted with echo-sounding apparatus for locating fish, or "'untin' the

'alibut with a hecho," as the night-watchman might say. I am waiting now to see radio applied to line fishing, and then that will be the end of *that* so-called sport.

### Another B.B.C. Loss.

**T**HE B.B.C. appear to be training at its own expense a number of technical men for the new industry known as the "Talkies." Mr. Jeffrey has already flown, and the latest news is that Mr. Baynham Honri, well known and appreciated by "P.W." and "Modern Wireless" readers for his articles, has joined the Gainsborough Films to take charge of the technical side of their new "sound" studios. The best of luck to him!

### Live and Learn.

**T**HE following amusing definition of electricity is given by the "New York Utility Bulletin": "Electricity is something that starts the Lord knows where (Continued on next page.)"

## BROADCASTING A BRITISH TRIUMPH.



After travelling faster over the land than any other man in the world, Major Segrave, Britain's speed king, beat the record for modesty, too, by broadcasting a graphic yet self-effacing account of his glorious achievement. Our picture shows (left to right) Mrs. Irving, Capt. Irving (designer of the "Golden Arrow"), Major Segrave himself, and Mrs. Segrave.

## NOTES AND NEWS.

(Continued from previous page.)

and ends in the same place. It is  $\frac{1}{3}$  of a second faster on its feet than its nearest competitor, backyard gossip, and when turned loose in Europe, will get to the U.S.A. five hours before it starts. It is sometimes known as science gone crazy with the heat, and if you can understand its manoeuvres you can do anything with it except open a can of peanut butter at a picnic."

### A Chance for Marconi.

"REYNOLDS' NEWS" wants people to make repeated "experiments of the most unlikely kind," because its radio expert found that the result "seemed good" when he put his earth wire into a can of water, and that the result was better when he had no earth connection at all. My inference is that his outside "earth" must have been so bad that any change was a change for the better. However, I am inspired by these marvels, and on the same principle that induced Mark Twain to boil his barometer I propose to dip my set into a can of water, gold-plate the earth wire and tie a rabbit to it.

### The Atom-Catcher.

OUR scientific friend who adds to the much-needed gaiety of the English Sunday by writing Reynolds' radio notes says that atoms of electricity pour out electrons from either valve or crystal. I am afraid he has grasped the sticky end, for not even Einstein dares to corrupt our cherished belief to that extent. But our visionary, having envisaged atoms pouring electrons out of a crystal, says, "The reader who recognises the infinitesimal size of atoms received on his aerial will easily understand how readily they may be lost," etc. A sol<sup>n</sup> of atomic needle in a bundle of etheric hay, I suppose.

### The Orthodox View.

WELL, I must be serious and informative after having had my little joke. First, to clear up this business of aerials catching atoms—which they don't. Atoms do not really come into the matter at all. When a conductor of electricity—an aerial, say—cuts an electro-magnetic wave, the wave causes a high-frequency to-and-fro current to flow in at a certain voltage. It is this current which operates a crystal set and this voltage which works a valve set. The aerial does not pick up atoms or electrons, but electro-magnetic energy which is carried to it by the waves.

### The Human Aerial.

C. K. and S.B. (Boscastle) write to confess that they disconnected the aerial from a four-valve set and "could get practically nothing." So then they held hands, clutched the aerial terminal and promptly tuned in a description of a hand of bridge, and some dance music. This ought to give a useful idea to those of us who find that radio interferes with courting. Squeeze her hand and twiddle the dials simultaneously, eh? I used to prefer one armchair and a dim light, but times and tastes are altered.

### Happy Schooldays.

ONCE more I have received the B.B.C.'s Syllabus of School Broadcasts, and as is my custom, I offer you a few choice samples. "Caddis Worms." "Greenfly and Ladybirds." "Hywel Dda and the

making of Laws for Wales." "The Why and Wherefore of Farming." "An 18th Century Election." "Beaux and Belles in Bath." Splendid! Employer: "Jones, what's the postal rate to California?" Jones: "Dunno, sir. But if you'd like some information about Caddis Worms or Hywel Dda, I'm 'ere."

### Mergermania.

HIGH finance seems to consist these days mostly in taking two or more concerns and clapping them together. Just now the whole communication world is tending to coalesce into groups, and the latest merger is that of the Radio Corporation of America's telegraph section

## SHORT WAVES.

POLITICAL BROADCAST.  
2 L O-cution.—"Sunday Pictorial."

"Wireless sets and accumulators, headphones, crystals and cat's-whiskers are twice as good and half the price they were a year ago," we read. Yes, and the programmes are twice as long and half as good—so we don't seem to benefit much, somehow.

### A SCIENTIFIC BLUNDER.

Professor of Psychology: "Jones, I have come to the conclusion that you have what is known as an 'Inferiority Complex.'" Student (a radio fan): "That's where you're wrong, professor. Mine is an eight-valve Superhet."—"Radio News."

"How to make a handsome radio console," we read in an American magazine.

Well, we certainly need something to console us for the noise our set usually makes.

### TO SAY NOTHING OF LANGUAGE.

Hint to constructors from the Radio World: "You can push back the insulation of the solid, single-strand wire with your ANGER after having cut the wire to the desired point."

Yes, and after an unexpected collision with the warm end of the iron, our anger had risen to such a degree of solidity that you could punch a hole through the panel with it.—"Radio News."

An advertisement recently appeared in a provincial paper as follows: "Eight-valve electric seat with loud speaker complete, £50."

We'd rather be hanged.

"This will prove a brave kingdom to me, where I shall have my music for nothing!"—*Tempest*, III, ii.

Those Post Office inspectors must be neglecting their job again.

and the International Telegraph and Telephone Corporation, which is about the biggest thing of its kind in existence. Whether this latest deal will get past the U.S.A. anti-trust laws remains to be seen.

### Bouquet for Post Office.

A FRENCH steam trawler operating in the Indian Ocean testifies to the excellent service given to it by the British Post Office station at Portishead on short waves. Now, Portishead is about ten miles from Bristol, which is an unseasonable distance from the Indian Ocean, so that these results argue great credit for both the P.O. station and the ship equipment. To old wireless men the thought of clearing ship traffic at such a distance must feel like a beautiful dream.

### Asking For It!

THE President of the National Broadcasting Company of U.S.A. announces that he is determined to encourage the international element in broadcasting. He says that America wants to hear our

scientists, our literary men and other brainy birds, and above all our politicians. Well, they'll be lucky if they hear much from the last-mentioned gentry and what they do hear they are heartily welcome to.

### Television News.

I AM indebted to an Uxbridge reader for passing on the following announcement received from W 8 X K. "K D K A, the Westinghouse station at Pittsburg, is conducting a series of television experiments on Mondays, Wednesdays and Fridays from 10 p.m. to 11 p.m. G.M.T. The disc revolves at 1,200 revs. p.m. and contains 50 holes. Scanning is from left to right and top to bottom. The transmissions are made on 63 metres. Moving-picture films are being used as subjects. Details of transmission are liable to be changed without notice."

### "The 'Fanfare' Five.

A. H. (Hants) asks, in our issue of April 20th, page 191, whether he qualifies for a Valve Bartschip on the strength of his getting 53 stations on the L.S. with his "Fanfare" Five. That honourable order was instituted to mark outstanding performances of long-distance reception, due regard being given to the valve-power used and conditions in general. Therefore, while I congratulate our sixteen-year-old friend on his work and his luck, I think he will not press his claim in view of my explanation. I will, however, invest his set with the O.B.E. (Orlways be Efficient).

### The Old Soldier.

VERY well, gentlemen, I submit to force of numbers. 5 GB *does* fade if you say so. No doubt the locality in which I live is more bracing to 5 GB than are many others. I have had 5 GB on L.S. all this evening as steady as a rock, the distance being about 70 miles in a S.E. direction. I do notice that this station is much weaker on some days, and have always attributed that to the experimenting; it is an experimental station. I use a non-descript three-valver and a piece of aerial which has been slung to a may bush for over six years.

### "Radio Jerks" Harmful?

A NEW YORK professor, much to my delight, is heavily down on the early morning "jerks" exercises by radio, which have been instituted in the U.S.A. He says that the alarm clock is a distinct shock to the system. Good! He says that early morning exercises and cold baths are all wrong. Better! He adds that in rising we should proceed leisurely, imitating the cat, by stretching first one leg and then another. Best of all! I like that professor because he is preaching my own system.

### Another "Double."

A. P. (Larbert) had the luck to hear K D K A rebroadcasting P C J, the signals being in wonderful form. He did it with a "Progressive" Three, which evidently makes picking up K D K A as simple as falling off a log. *En passant*, A. P. swears by 4-volt valves and an H.T. accumulator. Personally, I use 6-volters, because I have a 6-volt battery which cost me much gold, and is so skilfully (hem!) handled that it is apparently immortal. ARIEL.



# R. E. JEFFREY ON "WHY I LEFT THE B.B.C."

After six years' service Mr. R. E. Jeffrey, who has held the positions of Programmes Director and Director of Dramatic Productions, has left the B.B.C., and has taken an important position in a well-known corporation. He will assist in the development of Talking Pictures as he has assisted in the prosperity of British Broadcasting. The real reason for Mr. Jeffrey's resignation from the B.B.C. is disclosed exclusively in the following interview with "Ariel."

"There have been some very laudable attempts—and, in fact, some successes—at introducing entirely new types of programmes, or highly finished programmes with a continuous idea running through them, but these have not been very many in number."

Mr. R. E. Jeffrey then spoke of the organisation with which he has been connected in various responsible capacities.

"It is exceedingly difficult in an organisation as big as this, which must of necessity be efficiently administered. It is also exceedingly difficult to allow the artiste—in this case, meaning the creative mind—a free enough hand to produce work of outstanding merit."

"In my opinion," went on Mr. Jeffrey, "an artiste must work almost alone, and be on test solely responsible for his success or his damnation. It is only in this way that he can give of his best."

"Departments are anathema to him, observing channels of routine, conferring with others concerned and endeavour to make his own opinion or his own conception agree with their views, cools the fever heat of inspiration which his idea has given him. It often confuses his mind into doubts, and sometimes goes as far as to almost destroy his urge and initiative."

"It has almost the same effect of two or three people trying to drive a high-spirited horse with different sets of reins."

I asked him whether he was of the opinion that too much organisation spoils the quality of present-day wireless programmes. He answered my question by the following words:

"Organised art, excluding commercial

art, is a new problem to face in modern times, and whether the B.B.C. has solved it or not makes interesting speculation.

"I think the B.B.C. is a monument to Sir John Reith," continued Mr. Jeffrey. "It has been built with the utmost care, and the earlier stones were laid with what seemed to be almost unerring judgment and taste."

### Youth and Energy Required.

On the whole, Mr. R. E. Jeffrey is quite optimistic that the improvements of former years will be continued.

"The improvement in broadcasting, like everything else, is a matter of time," said Mr. R. E. Jeffrey, in conclusion. "Broadcasting needs youth and energy, and I see no reason why, in the end, it shouldn't get it. Just as British talking pictures are doing their utmost to secure a say in the international markets by sparing neither time nor expense in the carrying out of their plans, so should broadcasting employ everything and everybody that is up to date. In this way programmes will improve, and when the administration is fully aware of just what is needed, and furnishes those needs, the perfect programme will arrive. Anyway, we haven't done so badly these last few years . . ."



Mr. R. E. Jeffrey.

MR. R. E. JEFFREY, in his six years' service with the B.B.C., had become a very popular man with staff and artistes alike, and his going was deeply felt.

"R. E.," as he is popularly known, and I had our last cup of tea at Savoy Hill a few days ago. Through the windows of his office the graveyard of the Savoy Chapel seemed even drearier, a fitting setting to the memories of the years gone by.

"Yes," said R. E., "it is all rather sad, but I am afraid rather inevitable."

"Why inevitable?" I asked. He smiled.

"Talking pictures have a great future—"

"So has wireless," I said.

He smiled again.

### Not Enough Opportunity.

"POPULAR WIRELESS Weekly has always been interested in your activities," I interposed. "Supposing you tell me just why you are leaving the B.B.C.?"

He did not reply, but his gaze wandered to the handsome silver candlesticks on the shelf, a memento of the staff's appreciation of his work at the B.B.C., and rested awhile on them before replying.

"My reasons for leaving the British Broadcasting Corporation, with whom I have been associated for the past six years, are really quite simple. The reasons are roughly these. With the tremendous development of the organisation, the opportunity of doing creative work, which is chiefly done with the driving powers of enthusiasm and inspiration, seems to be rather more restricted."

### Programmes Are Better.

"I think that there is no doubt that the average excellence of the programme is much higher than it was, say, this time last year."

"The detail of the programmes has been greatly improved, but I don't think this applies to items, or even programmes, of a special nature."

## COMMENTS FOR CONSTRUCTORS.

Amongst the aid to easy set construction a magnetised screw-driver should not be forgotten.

Sudden variations in the strength of reception with a crystal set are often caused by powerful valve sets being operated in the neighbourhood.

If you are leaving home for several months it is not wise to leave the L.T. battery idle all this time, but it should be taken to the charging station with instructions for giving it an occasional charge.

When trouble is experienced on a mains unit used in conjunction with noisy mains it can often be overcome by connecting two large condensers in series across the mains and earthing the centre point.

# A NEW TRANSFORMER.

One of "P.W.'s" oldest established and best known advertisers has, after much intensive research, produced an L.F. transformer which truly has an extraordinary efficiency. Its N.P.L. curve is completely straight over a very wide band of frequencies.

By THE TECHNICAL EDITOR.

SEVEN years ago an L.F. transformer was generally nothing much more than two bunches of wire wound one above the other on a few pieces of iron wire. This last constituted the core, and might have been merely two or three dozen hairpins for all the real magnetic qualities it possessed.

There were, however, one or two exceptions, and of these the R.I. was particularly notable in that its design and construction was as far in advance of the simple "hedgehog" or "pudding" type of transformer as Big Ben is of a half-crown alarm clock.

## An Early R.I. Production.

It is my opinion that we owe a very great deal indeed to that early R.I. transformer, for it showed that striking advances could be made by skilled, enthusiastic designers. It proved that broadcast reception had not reached its pinnacle in the resonant, squeaky reproduction those little "pudding" transformers lead the way to.

Good though that 1922 R.I. transformer was, it has been beaten six times over by as many successive R.I. designs. You will remember the introduction of the now famous R.I. "Straight-Line" transformer, and later of that little red-coloured "General-Purpose" type with a guinea performance at 15s.

But now R.I.'s have come along with yet one more triumph, and that is their "Hypermu." And I think that they have very, very nearly attained their ideal of perfection. The "Hypermu" is to be sold at 21s., and its curve makes you think of R.C.C. right away.

It is an N.P.L. curve to which I am referring, and it is perfectly straight between 40 cycles and 1140 cycles, while there is an almost negligible drop below 40 cycles to 25 cycles and a rise up to 5,000 cycles that is actually advantageous when one is striving for perfect results with an average cone speaker.

In order to achieve these results the transformer is connected (as per the makers' instructions) in a rather different way from normal, although its performance is still excellent when used in the ordinary way.

## Beating the Americans.

The "Hypermu" is a small component, its dimensions being 3 in. by 1½ in. by 3 in. high and its weight is but 13 oz. We understand that the transformer derives its special qualities from the use of a new iron alloy for the core, the arrangement of a special and ingenious magnetic circuit and patent windings. It is completely iron shielded, and the whole assembly is enclosed in a handsome bakelite case.

The ratio of the "Hypermu" is 4 to 1 and this, together with the component's very high general electrical efficiency, enables one to achieve great amplification with the even response above indicated.

The "Hypermu" has, of course, a better performance curve than any of those expensive American transformers, which for a brief time had our own manufacturers fairly beaten. Indeed, Messrs. R.I. boldly claim in big black letters that "the 'Hypermu' gives perfect high and low note amplification—greater and more uniform than that of any commercial intervalve transformer in the world." And I have no hesitation in saying that I consider that R.I.'s have set the world a hot pace.



This is the new R.I. Transformer.

## SAVE YOUR CIRCUITS.

By ALFRED G. SHARP.

MOST wireless enthusiasts at some time or other experience the annoyance of not being able to find a particular article, or circuit, or gadget described in the pages of "P.W." just at the time it is wanted. Looking haphazardly through a pile of back numbers, and finding everything except what you are looking for, is a trying business when you are keen to "get on with the job." If the following simple method is adopted, you will be able to astonish your friends (and perhaps yourself!) by finding in a few seconds the article you want, whether it appeared last week or last year.

All that is required to make a start with your "P.W." reference library is a spring-back folio, which can be purchased from your stationer for about 1s. 6d. These folios are strongly made of cloth boards, and the spring-back principle enables them to hold papers of any size

in a firm grip without sewing or gumming being necessary. They have a neat appearance, and can be had in various colours. For preserving the pages of "P.W." ask for the quarto size.

Collect up your loose copies and arrange them in date order. The page numbers will then run consecutively. It will not matter if some of the copies are missing. Arrange them in order as far as they go, or, if you prefer it, obtain the missing copies from the Back Number Department

## Preparing the Pages.

Take the earliest copy first and open it at the middle pages. Prise up the ends of the staples which hold the pages together; these can then be pulled out from the back and placed on one side for later use. Now take each double page separately, see exactly what it contains, and decide whether you wish to keep it or not. If you want, say, the left-hand page of the paper only, cut across the double page about ¼ in. on the right-hand side of the fold in the centre of the paper, which will leave you the page you want with a margin for the binder to grip when you come to put it in the folio. When you require to save the double page complete, it is a simple matter to paste a strip of paper along the folded edge to bring it to the same size as the single sheets on which you have left the ¼ in. margin.

When you have prepared as many pages as you think the folio will hold comfortably, check them through to see that the numbers still run consecutively; then, taking the pages twenty or so at a time, tap the edges on the table to get them even, and keep them together by fixing two of the staples through the paper forming the margin.

Place these in the cardboard folder, which can be taken from the folio by folding back the covers, and you will then see how much you have to trim off the margin edges to ensure a neat fit. When you have prepared all the pages in this way, they can be inserted in the folio; but if you prefer to have the pages loose, so that they can be taken out one at a time at will, it will be necessary to remove the staples.

In either case, first of all arrange the papers correctly in the cardboard folder, then fold back the covers of the folio and insert the folder containing the "P.W." pages. When you allow the covers to spring back, you will find the pages securely held.

## Making An Index.

The final step is the preparation of an index, and an hour spent on making a list of the subjects referred to in the various articles, with the number of the page alongside, will be time well spent, and will be saved later many times over. The index can be written on the cardboard folder, or a separate sheet of paper may be inserted, with the subjects arranged alphabetically or under groups, such as "Cone Speakers," "Crystal Sets," "One-Valvers," "Two-Valvers," "Batteries," "White Prints," etc.

As a result you will have all your favourite circuits, set designs, articles and workshop wrinkles together in a handy form for instant reference, and the attractive appearance of the volume on your bookshelf will probably make you want to add others to it to make a complete "P.W." reference library.

**C**ONTINUING last week's notes on the operation of the D.C. "Titan," it will be perfectly obvious that the addition of a fairly accurate voltmeter will do much to simplify the initial adjustments, especially those of the grid-biasing and voltage-regulating resistances.

Mention was made of the positions of the arms controlling the L.T. and G.B. voltages as far as they applied to the original set, but it should be understood that owing to the widely varying characteristics of the filaments of the valves, the exact settings of the arms will, in all probability, be slightly different on the reader's own set.

We should commence the adjustments on the 1,500-ohm variable resistance, and the remainder, as already mentioned, on the assumption that the 150 milliamperes (15 ampere) required by a normal 15-ampere valve will be slightly above or below this figure.

**Adjusting the Filament.**

Thus, if we set the 1,500-ohm resistance to pass this current as denoted on the milliammeter fitted on the panel, we should expect the voltage across the filament of, say, the pentode valve in the  $V_3$  position to be 4 volts (as required by a Mullard Pentode valve). Unfortunately, this does not always follow, owing to slightly different filament characteristics, and a 0 to 6 or 0 to 8 voltmeter placed across the filament of  $V_3$  will show whether this is so.

A reading under 4 volts will prove the filament is consuming more than 15 ampere, and the 1,500-ohm Truvolt fitted on the baseboard can be varied until the reading on the voltmeter shows just 4 volts. At the same time, the constructor must be alive to the fact that a further slight readjustment may be necessary on the resistance mentioned above when the filament voltages on the remaining two valves have been corrected.

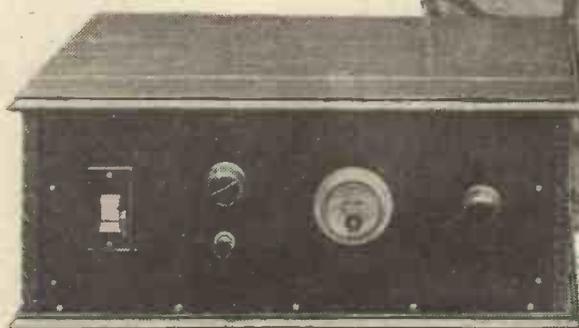
It means the filament voltage of the  $V_3$  valve must be corrected and checked by the variable resistance and L.T. voltmeter, and the  $V_1$  and  $V_2$  valves treated similarly. The reasons why these points are stressed are that (1) careful attention to filament voltages will prevent overrunning and short lives, (2) by correcting the filament voltage of  $V_3$  the risk of muffled signals due to too low a voltage is minimised.

**Grid Bias and H.T.**

Now, there only remains the question of grid bias on  $V_3$  before we carry on with the actual operating instructions. The resistance of 400 ohms marked R on the diagrams controls the grid bias, and the measurement of this may be undertaken by placing a suitably sealed voltmeter across the 2-mfd. condenser at C.

Of course, it will be realised that grid bias depends first on the particular valve

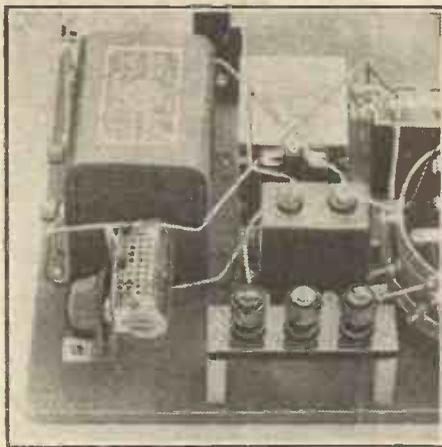
# More About the TITAN D.C. THREE



Some further operating details. By G. V. COLLE.

used, and secondly on the H.T. voltage applied to it. If the valve is a pentode the grid bias will lie between -6 and -9 volts, while if of the ordinary small power type it will probably be greater, say -7½ to -10½ volts.

H.T. voltage can be measured with a suitable voltmeter or with one of the triple-range meters now available to constructors. The negative of the meter connects to the negative filament of  $V_3$  and the positive to the  $P_3$  terminal (H.T.+) on the universal output transformer. A



The separate A/E terminal board.

reading taken under these conditions shows the applied H.T. voltage because it is not practicable to connect the positive side of the meter to the plate of  $V_3$ , owing to the resistance of the meter itself upsetting the characteristic of the circuit. For the purpose of grid biasing, however, the test named will be sufficiently accurate.

We now arrive at the point where the operation of the various panel controls can be undertaken. These include the tuning condenser, the reaction control, the wave-change switch, and the volume control.

First of all, we will assume the plug connecting to the mains is inserted in its socket with the valves in position inside the receiver, and that the milliammeter is registering on the scale (if needle tends to go off the scale the mains plug must be

reversed) at the correct number of milliamperes as found best for the valves in use.

To commence the operating, first decide on the wave-range to be covered, which, if it be the broadcast band, will mean that the wave-change switch will have to be pulled out. Set the volume control at maximum—that is, to the side which is joined to the secondary of the L.F. transformer away from the grid bias end, then arrange the tapping clip on the "Titan" coil unit at the 8-turn tapping on the primary, the "earth" tap being connected

to the 25 terminal on the loading coil.

To complete the adjustments before turning the tuning condenser dial, set the reaction condenser away from the point where the set goes into oscillation.

**Reaction Control.**

The wave-length to which the set tunes on the broadcast band will naturally depend on the position of the moving vanes of the tuning condenser, so it will only be necessary to adjust this dial to determine the wave-length, the reaction condenser simply increasing the volume of distant transmissions up to the point where oscillation occurs which, incidentally, should not be allowed to happen if interference with neighbouring receivers is to be avoided.

A little care in the adjustment of this control is necessary to achieve this object, and the writer's only suggestion is always to "slacken" off the knob towards the minimum position before continuing the search for distant stations. A little practice in this respect is far better than a lot of advice, and after some hours at the controls, stretched over a period of a few days, the constructor should become quite competent.

A word about the "Truvolt" connections. These should be twisted tightly round several times before soldering as the heat generated in the "Truvolt" may loosen the soldered joint, which if not otherwise secured would spring free and possibly cause trouble.

**Cutting Out Interference.**

Very fortunately for those people living within a few miles of the transmitter, there is a definite cure for bad interference with little trouble. The writer refers to the standard wave-trap first evolved by Mr. G. P. Kendall, of this paper, and obtainable commercially from a number of radio manufacturers. Tests with this wave-trap at approximately four miles from 2 L O have indicated that, as far as this receiver is concerned, the trap will confine 2 L O to a few degrees either side of its natural tuning point.

However, readers are advised to test the set without the wave-trap in the first instance, with the knowledge that, if it is at all possible to eliminate normal interference it can be accomplished by this receiver.

## LATEST BROADCASTING NEWS.

MR. PERCY PITT'S  
SUCCESSOR.B.B.C. PROMS. AGAIN—HOLI-  
DAY TALKS—YORK MINSTER  
—MUSIC OF THE GOWS.

## Mr. Percy Pitt's Successor.

THE fervour of denial at Savoy Hill demonstrated that there was something in the rumour that Mr. Percy Pitt could not be prevailed upon to continue the conduct of the work of the B.B.C. Music Department after the end of this year. Readers of these notes will have known that the succession has been a close thing between Sir Hamilton Harty and Dr. Adrian Boult, with Beecham stock intervening every now and then.

Although nothing can be gleaned from either the B.B.C. or Dr. Boult, it is known as a fact in Birmingham that he has received and accepted the job. There is a rumour that Dr. Boult will seek the assistance of Mr. Percy Scholes to fill the post of second in command likely to be rendered vacant by the prospective capture of Mr. K. A. Wright by a lucrative competitor of the B.B.C.

## B.B.C. Proms. Again.

Intense satisfaction will be felt by music lovers throughout the country in the news that Sir Henry Wood is to conduct this year's season of Promenade Concerts at the Queen's Hall, which is to begin on Saturday, August 10th, and continue until Saturday, October 5th.

But for the timely assistance afforded by the B.B.C. two years ago the "Proms." would in all probability have ceased to exist, yet it was only natural that under a new régime difficulties of one sort and another should occur.

The public heard of some, and also rumours of others, last autumn, but all these have now been overcome, and the completed arrangements provide for a specially augmented orchestra and an extra number of rehearsals. Everything indicates that the 1929 "Proms." will be the best for many years.

Incidentally, Sir Henry got everything he asked for. Also be it noted Sir Henry does not agree that this season is anything like his "swan-song" in Proms. If the B.B.C. decline to meet his terms after the forthcoming season he will probably carry on at Queen's Hall, sans B.B.C.

## Holiday Talks.

This year's holiday talks will differ from those of last year inasmuch as they will be more concentrated. Instead of dealing with small single areas, the talks on Great Britain will be much wider in scope, and embrace in turn all cathedral cities, the North of England, our sea-coast, and the whole of Scotland and Wales.

Thus, in a series of six or seven talks, listeners will be informed of the best parts of the country in which to spend their holidays, whether they intend travelling by

rail or road. No one is better able to undertake these talks than Mr. H. V. Morton, the well-known journalist, whose descriptive writing is known to most people.

His next talk, to be given in the London Studio, takes place on Tuesday, May 14th, when under the title of "The Neglected North" he will show that even industrial England is well worth seeing when on holiday, and describe the somewhat neglected beauty spots which are within easy reach of Manchester and the neighbouring towns of Lancashire. The talks, which are to be given fortnightly and include one at a later date on Ireland, will alternate with another batch of talks on Holidays Abroad.

Northern listeners will also be interested in a special series of talks, arranged for their special benefit, entitled "Holidays in the North of England," one of which, to be given on Thursday, May 16th, will describe a Camping Holiday round and about the Roman Wall in Northumberland.

## York Minster.

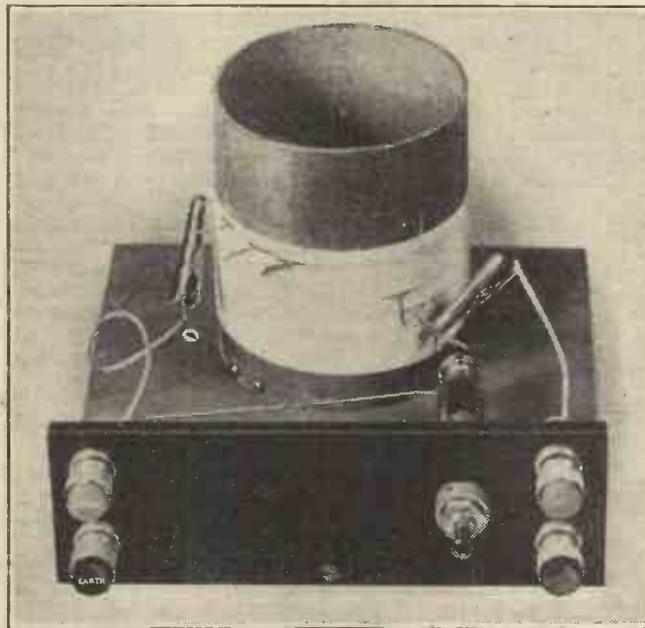
The annual Military Sunday Service at York Minster on May 5th is to provide listeners with the next of those all too infrequent Sabbath Day morning broadcasts which since the earliest days of the B.B.C. have held a high place in the list of items that always bring their full quota of appreciative letters to Savoy Hill's post-bag. This year the preacher is the Archbishop of York.

The service, true to Military custom, begins at 10 a.m., but the actual broadcast includes some of the preliminary ceremonial in the form of music by the Massed Bands of the 5th Inniskilling Dragoon Guards, the 1st Northumberland Fusiliers, and the 1st Green Howards. Listeners should, therefore, switch on their sets at 9.45. The service concludes at 11.15 a.m. with the singing of "Onward Christian Soldiers" and the National Anthem.

## Music of the Gows.

An old fiddle, which once belonged to Neil Gow and which delighted the ears of King George IV during his memorable visit to Scotland in 1822, will be used by Alec Sim during his recital of "Music of the Gows" in a Scots programme from the Aberdeen Studio on Monday evening, May 13th.

The family of the Gows were great composers, collectors and players of the reels and strathspeys of the North, and Neil was the most famous of them all. The old fiddle has been lent for the broadcast by Mr. Neil Gow of Perth, and experts say that it has lost none of its famous mellow tone.



A real simplicity set—the "Non-Con," described in detail elsewhere in this issue.

## TECHNICAL NOTES.

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

## WAVE-LENGTHS

MODULATION—BROADCASTING DIFFICULTIES—AERIAL EFFICIENCY ETC., ETC.

## Wave-lengths.

ONE of the greatest difficulties with which broadcast engineers are at present confronted and, indeed, a difficulty which is rapidly becoming more and more serious, is the congestion of the ether with broadcast wave-lengths. In consequence of this it is often a very difficult matter to find suitable wave-lengths for new broadcasting stations so as to avoid interference.

Various conferences have been held from time to time to consider this question, which is obviously one of international importance, and the only practical solution so far is one of mutual arrangement and accommodation.

## Modulation.

It is interesting, therefore, to note that a new method of modulation has been

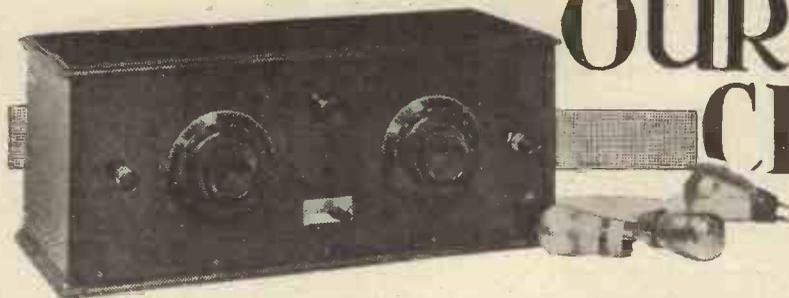
brought forward which is designed to reduce the width of the band, in other words to limit the side-band fringe.

In this new method, instead of varying the amplitude of the carrier-wave, this is kept at constant amplitude, but the waves are crowded together or spaced more apart; in other words, a frequency-modulation system is employed. The frequency modulation is, of course, controlled by the microphone currents, just as the amplitude is controlled in the ordinary amplitude-modulation system.

It is claimed that with the frequency-modulation method the side-bands can be limited to about 100 cycles, whereas up to 5,000 cycles is often allowed with amplitude-modulation.

(Continued on page 272.)

# OUR CHANGING CIRCUITS



A résumé of four years of circuit improvement based on a study of "P.W." set designs.

By N. A. STURGESS.

**M**OST of us realise that radio is a science which is, if nothing else, progressive; but it is not until we look back over a space of years and observe the immense strides which have been made that we realise the comparatively short time in which such tremendous improvements have taken place in set designing.

leading topic of the contributors is again super-hets. The leading constructional article is entitled "A Neutrodyne Reflex Super-Het.," of the circuit of which a copy will be found below.

Among other interesting points, it will be seen that the circuit incorporates three sets of swinging-coil reaction and nine

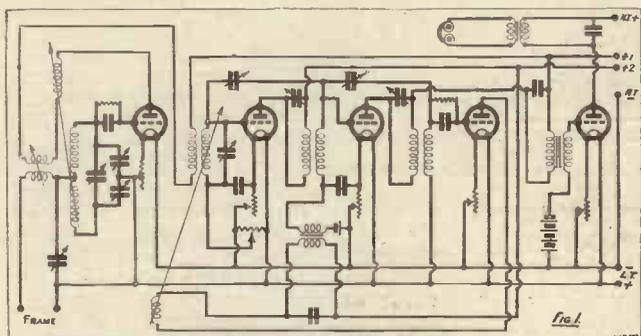
present neatness and expertness of layout in "P.W." receivers.

### The Reflex Filadyne.

About this time a great deal of discussion was going on in the "Correspondence" page of "P.W." with regard to the Filadyne circuit. Nothing of a particularly sensational nature is to be seen, but some readers may be interested to consider the accompanying diagram for a "Reflex Filadyne" (Diagram 3) due to a correspondent.

The growing modernity of "P.W.'s" sets becomes more and more apparent as we go along, until on August 4th, 1928, we have details of the "Travellers" Three. This was a portable 0-v-2 set, incorporating all batteries and loud speaker, and is due to the Research Department. It is designed in the usual efficient style, and is one of the first sets to incorporate a micro-condenser for reaction.

(Continued on next page.)



This diagram of a Neutrodyne Reflex Super-Het. appeared in "P.W." some three years ago.

In "P.W." No. 168, August 15th, 1925, one of the most important articles was on the subject of "Reducing Valves in the Supersonic Heterodyne Receiver." The writer points out that the lowest number of valves required for efficient super-het. work is eight, and consequently goes on to explain various ways in which this number might be cut down!

### Those Super-Hets.

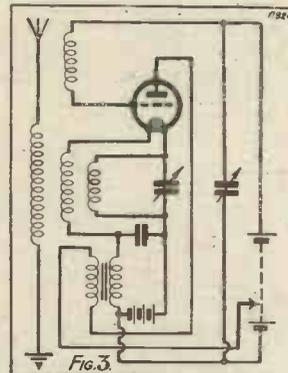
It might interest some present-day radio fans to know that one of the suggestions was that one of the valves might be made to function simultaneously as an H.F., I.F., and L.F. amplifier. It is not intended

a set built and described by a member of the Technical Staff. As it would probably be of interest to the student of radio, the circuit is reproduced below.

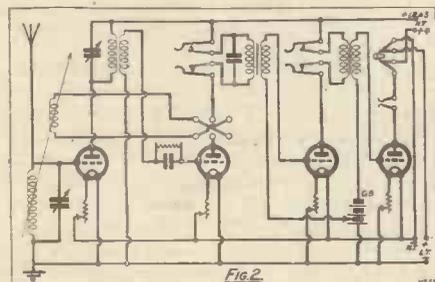
### Only Three Years Ago!

In the original article this is accompanied by several photographs of the exterior of the completed receiver. On a cursory examination, the chief points to strike the eye are three jacks, seven variable controls, and a D.P.D.T. Switch. It is evidence of the great strides made by radio that this state of affairs should be apparent in a circuit only three years old, published in a periodical known to be foremost in set design. The cost of the set, incidentally, was about £14.

A year later, on August 6th, 1927, there was published in "P.W." a set known as the "Regional" Three. This set is probably one of the most important that the journal has ever contained, for it embodies, for the first time, a metal screen and below-baseboard wiring. In this set one sees the first important step towards the

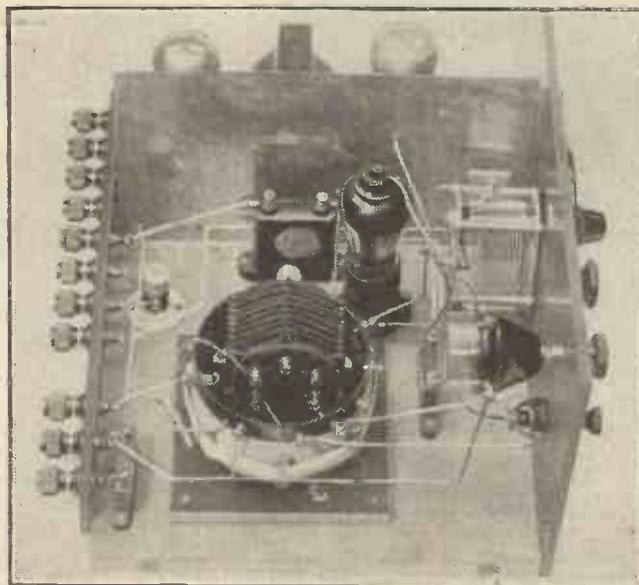


A Reflex Filadyne, a modification of a unique circuit invented by "P.W.'s" Technical Editor.



This "P.W." circuit necessitated seven variable controls, a D.P.D.T. switch and three jacks. Even so, the "Titan" Three, with its one dial tuning, would beat it hollow, although it has one valve less.

to dwell too long on these circuits of four years ago, but it might be noted, in passing, that the average number of panel controls in a four-valve receiver at that time was eight. Strangely enough, in the "P.W." of August 21st, 1926 (just a year later), the



This is the "Titan" Three, which crystallises in one compact, simple, and inexpensive assembly all the vast progress that has been made in set design during the past few years.

## OUR CHANGING CIRCUITS.

(Continued from previous page.)

Although, so far, details have been given of only one number of "P.W." for each year, so rapid have been the developments in set design towards the end of the year 1928, that it will be as well, perhaps, to break our rule, and conclude this short article with a brief resumé of the issue for August 18th, 1928.

### Look Easy—And Is!

In the description of the "'P.W.' Four," it is said that "the design . . . has been worked out very carefully to make it look easy as well as actually to be easy to make, in hopes that some readers who have previously held back may be encouraged to try it and so find out for themselves the advantages conferred by this type of receiver." In this intention the "P.W." Research Department has certainly succeeded, for a more neat and simple version of an efficient four-valver could hardly be imagined.

It is interesting to compare this set with the four-valver of 1925, and to notice the changes which have taken place in design during four short years. The panel has come from the top of the set to the front, while the valves have deserted the panel for the baseboard. The number of panel controls has been decreased by about six, and to-day the constructor's work has been enormously simplified by the production of standard coil units, S.M. dials, S.G. valves, and many other modern developments. What, then, will this year bring?



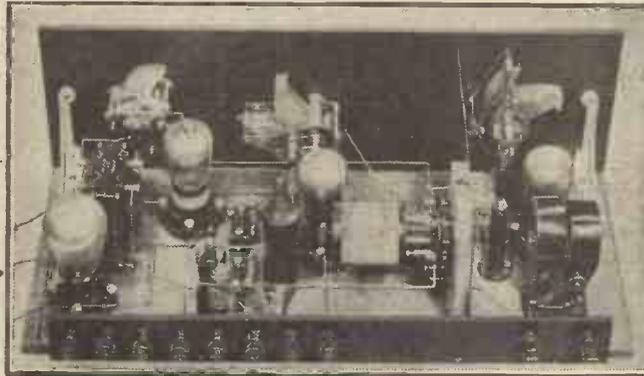
Could anything express more dignified simplicity than the "Travellers" Three, a recent "P.W." portable-set design?

## USEFUL HINTS.

As an H.T. accumulator has an extremely low internal resistance it will supply a much heavier current than an ordinary H.T. battery, and is therefore far more dangerous than the latter to any valve filaments, etc., over which it has been momentarily shorted.

The type of aerial known as a "Beverage" is one whose wave-length is several times that of the wave-length to be received, its height being only a few feet from the ground.

When tests with a milliammeter indicate that an abnormally heavy plate current is taken by valves with normal grid bias, the insulation of the coupling condensers should be suspected, as it is possible that high-tension leakage across this point will nullify to some extent the value of the bias applied.



Here is a really efficient four-valve set of modern design.

## CONSTRUCTING CONE SPEAKERS.

By JERVIS ROSCOE.

PERHAPS the most difficult problem in the building of a cone speaker is the positioning and fixing of the driving unit. It is essential, if good results are to be expected, that the reed should coincide with the axis of the cone. The most satisfactory way of building the speaker is to buy a piece of three-ply wood 16 in. square.

### Cone Centred.

A circle of 12 in. diameter should be removed from the middle of this by means of a fret-saw or keyhole saw. Two pieces of  $\frac{3}{8}$ -in. wood, 16 in. long and 5 in. wide, should be screwed to two opposite sides of the front so as to project at right angles to the front. It may be necessary to screw two other pieces of wood along the remaining edges of the front to prevent warping; in any case the trouble involved is well repaid.

Two bars of wood 17 in. long by  $\frac{3}{8}$  in. square should now be fitted to the unit in

such a way that the reed is midway between them and approximately at the middle position of an imaginary line running parallel to the bars and half way between them. The bars should be placed parallel to each other by means of small cross-members screwed to each bar by two screws, and should be fixed in this position.

The cone, previously prepared, may now be fixed to the carrying ring which has been

Quite good loud-speaker extension connections can be made with ordinary coil plugs and sockets, the sockets being mounted upon the skirting-board and the plug attached to the lead of the loud speaker.

Whatever method is employed for plugging in a loud speaker, this can easily be shorted by means of an ordinary on-off filament switch connected across its terminals.

When direct-current mains are utilised to provide the field of a moving-coil loud speaker it is generally quite unnecessary to provide smoothing apparatus. The mains can be connected direct to the field winding.

The position of the electrodes inside a pentode valve is such that electrons leaving the filament for the plate must pass first the control grid, then the screening plate, and finally a grid which is connected internally to the filament.

fitted to the front. It only remains to place the bars carrying the unit on the wooden planks, which were fitted to the front, in such a way that the reed projects downwards towards the cone.

### Reed Adjustments.

Movement in a sideways direction is unlimited, so that the reed can be accurately positioned in this respect. Movement in a direction at right angles to this is possible to the extent of an inch upwards or downwards, owing to the fact that the bearing members are 17 in. long, while the plank edges upon which they are resting are only 16 in. apart.

Having positioned the reed really carefully so that it is exactly central and parallel to the axis of the cone it only remains to mark the crossbars and, having drilled them, to screw them in position. The cone should be firmly clamped to the reed in such a way that the supporting ring does not tend to pull the cone towards or away from the unit.

### An Adaptable Chassis.

The construction above described may be regarded as a chassis which may be mounted in any suitable form of cabinet. The method has the great advantage that the work on the cabinet can all be done before the somewhat delicate cone and its actuating mechanism is introduced, thereby obviating all risk of straining or damaging these parts.

Should it be wished to try different types of unit, all that is necessary is that the new unit should be mounted on bearing members or crossbars as described, which can easily be fitted in place of the others, which are quickly removed.

It is only by trying different units, different cones and supporting membranes that the enthusiastic amateur can satisfy himself as to the best speaker for his particular requirements. Such experiments are only possible with a construction of the above form, which from its nature makes alterations a matter of simplicity.

# MAKING YOUR OWN COMPONENTS



## 4. A VERY USEFUL SWITCH.

**B**EFORE attempting a description of the switch illustrated on this page, it is only fair to mention that unless the constructor has the major portion of the various small parts in his scrap-box, the switch will not prove an economical proposition, because for the outlay entailed a commercially made version can be purchased for practically the same cost. A glance at the photographs shows that with the exception of the bush and its clamping nut, the remaining parts are to be found in the odds-and-ends box of almost any ardent radio enthusiast, so that it may be safely assumed the total cost will be but twopence, this amount representing the cost of the bush mentioned above.

### Simple to Assemble.

A small switch will probably possess a small self capacity between the various spring connections, as it is reasonable to suppose the amount of metal will be in proportion to the size.

The design of a switch will also govern construction and the more simple it is in this respect, the easier it is to assemble.

including the famous "Titan" series of receivers.

The extra contact mentioned also serves a further purpose, being the means of providing the snap action that denotes when the switch is on or off. It should, therefore, be retained as a permanent feature of the design. Not the least interesting point in connection with this particular switch is the absence of any insulating material on the control arm, this latter material tending to

may be adapted to nearly all the wave-change schemes given in POPULAR WIRELESS

as the locking device for the single-hole fixing on the panel of the receiver. The head of the bush faces the springy contacts, and the heads of the  $\frac{5}{8}$ -in. countersunk 6 B A metal screws for the terminals face the knob of the switch.

Originally the springy nickel-plated brass arms were constructed from some spare grid-leak clips, though if these are not procurable in  $\frac{3}{8}$ -in. or  $\frac{1}{2}$ -in. widths, they may be made from either sheet metal of this width or actual springy brass strip of similar gauge. The arms are bent to shape as shown, drilled 6 B A clearance and clamped under the bases of the small terminals.

### Fitting the Knob.

Make the centre contact of the same material, only screwing this on to the edge of the ebonite "body" by a 6 B A round or cheese-head  $\frac{3}{8}$ -in. long screw, a soldering lug being added before insertion into the ebonite. To complete the switch, the centre control arm which is attached to the knob, must be constructed. This simply consists of a piece of brass rod  $\frac{3}{8}$ -in. diameter (or to fit centre hole in bush, if of another size) screwed 4 B A each end for a distance of  $\frac{1}{2}$ -in., the over-all length being  $1\frac{3}{8}$  in.

The brass "knob" at the end of this arm is made from a terminal head screwed on to the arm and filed as shown. Failing the screwing it may be riveted into place according to the tools and ingenuity of the constructor. Finally, select a suitable knob, and screw this to the remaining end of the brass control-arm, the switch now being complete.

This is the fourth of a new series of articles prepared in response to numerous requests for instructions for the actual construction of components at home. Each item in this series has been assembled and carefully tested (with measurement of value where necessary), and the reader can be certain that he will be successful if he follows the specification carefully.

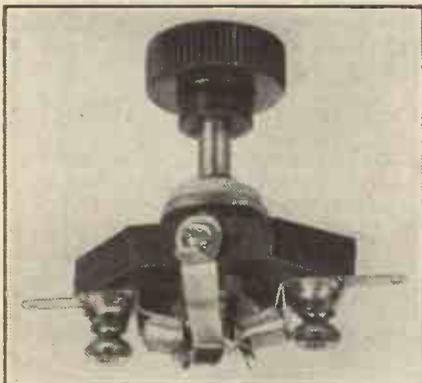
destroy its electrical efficiency by depositing a film over the bright metal contacts. Double springs are employed for each springy contact arm, the back spring in each case reinforcing the action of the front one, thus preventing any "tired" contacts.

### Full Constructional Details.

Dealing with construction in detail, the body of the switch is cut from a piece of  $\frac{1}{2}$ -in. thick ebonite  $\frac{7}{8}$ -in. wide and of an over-all length  $1\frac{1}{2}$  in. The ebonite is then marked for the centre bush ( $\frac{1}{2}$ -in. diameter approx.), and the two terminals which carry the double spring arms. Make the distance between the terminals  $1\frac{1}{2}$  in., which is  $\frac{3}{8}$ -in. each side from the centre of the bush.

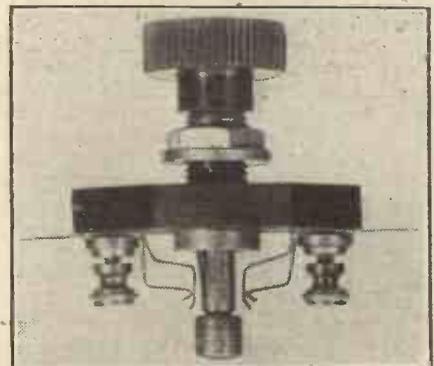
Drill the centre hole the diameter of the screwed portion of the bush, and the terminal holes 6 B A clearance, countersunk on one side of each. If so desired, the ebonite may be chamfered at the corners something after the style of the one shown in the photographs, but depending on the taste of the constructor.

Now insert the bush, which incidentally should have a length of  $\frac{5}{8}$ -in. excluding the head, and screw in the nut, the latter acting



You will probably be able to find most of this material needed for this switch in your junk boxes.

Turning now to the switch under review it will be seen the design conforms more or less to the specification given in the preceding paragraphs. It is primarily intended for the L.T. "on and off," but as the constructor can see, the third contact provided on it increases its utility in that it



You can use this switch for practically any of the wave-change designs described in "P.W." as well as for L.T. on-off purposes.

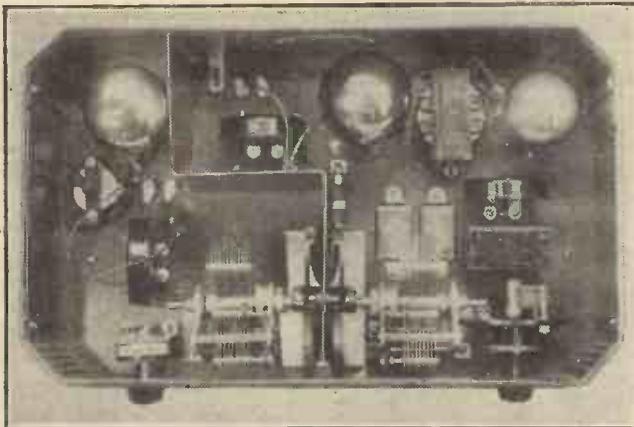
## FROM THE TECHNICAL EDITOR'S NOTE BOOK

# Tested and Found-?



## THE "IGRANIKIT" RECEIVER.

Not so very long ago I purchased a certain article which cost me 8s. 6d. Very urgently wanting a similar article on a later occasion I went into one of the "P.W." workshops



A view of the receiver section of the "Igranikit" set. The lid of the case has been removed and a "bird's-eye" photo taken of the receiver's "innards."

(this was after the shops were shut) and made one myself. Shortly after this it so happened that the managing director of the concern which made these articles was in my office.

I jokingly referred to the 8s. 6d. as being exorbitant and, indicating my home-made replica, told him I had made it at a cost of but a few pence.

"Quite so," said he smilingly "but how long did it take you to make it? Two and a half hours. Well, surely your time was worth more than 8s. 6d.?"

And of course I had to admit that it was.

The same sort of thing applies to a home-made receiver. You cannot assemble and wire a set in a factory by machinery. Skilled workmen have to do this, and even more skilful workmen have to test the set out. The home assembly of a set provides the constructor with a few hours of interesting occupation, and the trying out is just as fascinating, but by doing this he has eliminated two expensive processes of manufacture.

That is why it is possible for manufacturers to supply complete sets of parts of good receivers at most attractive prices. An excellent example of this is the "Igranikit" receiver, due to the Igranik Electric Co., Ltd. Outfit No. 3 of this comprises all

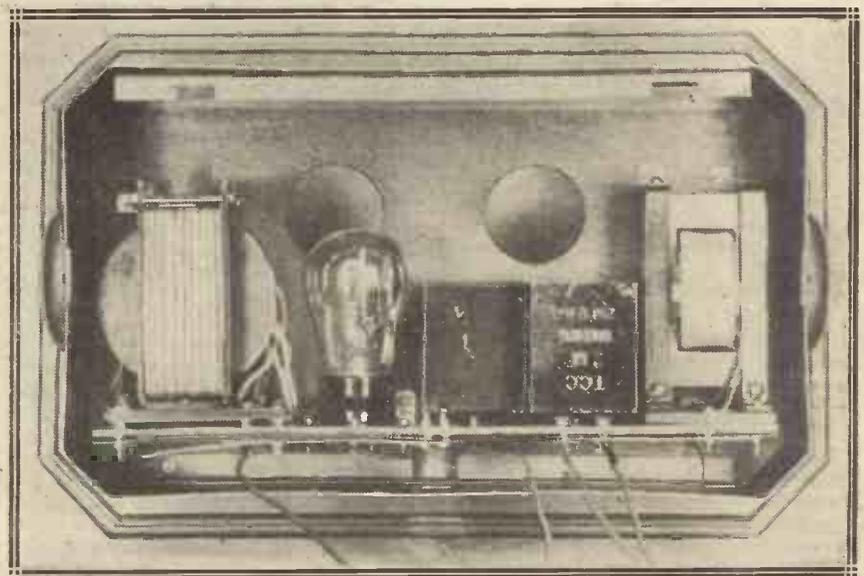
the necessary parts for a mains-operated three-valve set.

The outfit consists of two distinct sections, that is, the receiver proper and an A.C. mains-supply unit which supplies rectified H.T. to the valves in the receiver and low-tension alternating current for heating the filaments of the receiving valves and of the H.T. rectifying valve. Very clear and comprehensive instructions for assembly are supplied.

The "Igranikit" makes a compact, rice-looking, safe and simple instrument. It is contained within a metal casing of a decidedly artistic character, and besides metal housing the set of parts includes a wiring template, coils, and, in fact, everything you need.

## PHYSICAL PRINCIPLES OF WIRELESS.

This is one of the latest monographs on physical subjects published by Methuen & Co., Ltd., at 2s. 6d. net. The author is J. A. Ratcliff, M.A. There is a foreword by Professor E. V. Appleton. It is, of course, a work of an advanced nature, although there is much interesting information well within the scope of the average amateur.



Here you see the eliminator portion of the "Igranikit." This section derives the H.T. and filament heating current for the set from A.C. mains.

## INTERFERENCE IN RADIO.

"An Investigation of the Interference caused by Transmissions from Radio Stations," is the title of Special Report No. 8, issued by the Department of Scientific and Industrial Research. This report is available from any of His Majesty's Stationery Offices, price 1s. net.

## A PRICE REDUCTION.

Siemens Bros. & Co., Ltd., announce the reduction in prices of H.T. Batteries for portable sets as follows: Size No. 1075, 126 volts, price reduced from 30s. to 25s., and Size No. 1077, 108 volts, price reduced

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.

from 25s. to 21s. 6d. No alterations have been made in these batteries themselves, and the quality remains at the original high level.

## GARNETT, WHITELEY & CO., LTD.

This company has taken offices at 125, High Holborn, London, W.C.1.

## FERRANTI "SCREENED-GRID" THREE.

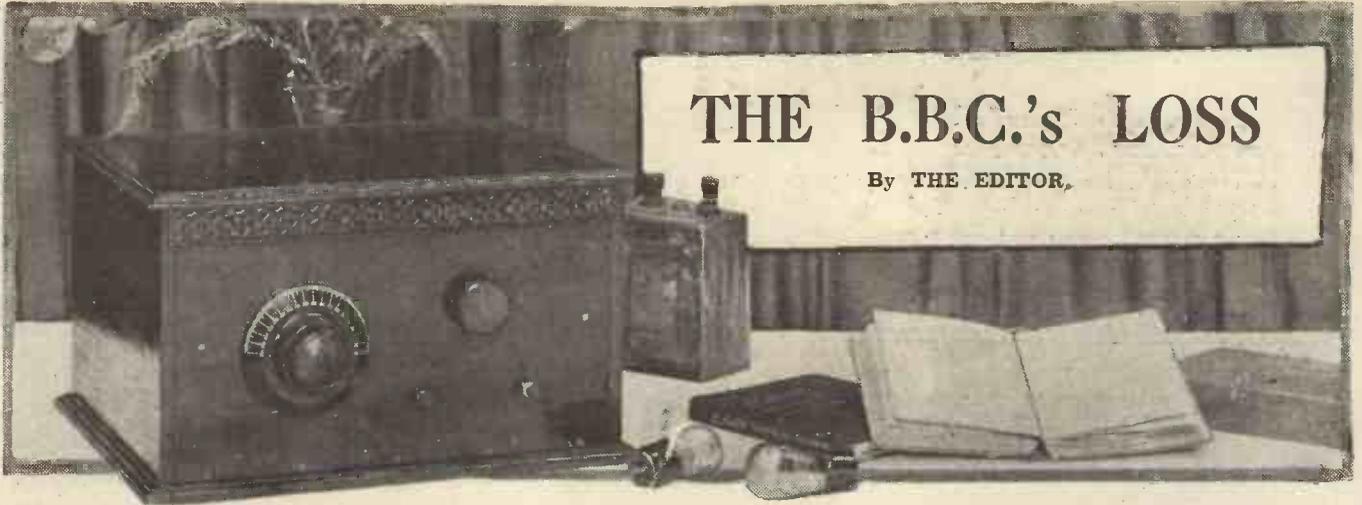
The Ferranti people inform us that they find that constructors are in some cases being advised to fit condensers of .0003-mfd. capacity to the above set under the impression that standard condensers of .00035 mfd. are not available.

They ask us to draw attention to the fact that to use the lower capacity makes the set incapable of tuning-in 5 G B.

This is a case in point where a diversion from the specification of a set can lead to trouble.

# THE B.B.C.'s LOSS

By THE EDITOR.



READERS will learn with regret that Captain A. G. D. West, B.Sc., Chief of the Research Department of the B.B.C. for the last six years, has resigned, in order to join the technical staff of The Gramophone Company (H.M.V.), where he will assist in the development of radio gramophone sets.

Captain West, although perhaps not so well known to the public as his chief, Captain Eckersley, has undoubtedly done a great deal of good for the technique of broadcasting during the last few years. Research work in connection with the echo room, with fading, and with relays from America are a few of the subjects he has successfully tackled.

## 2 L O's Nightingales.

Night after night Captain West spent at Biggin Hill, in Kent, during December, 1923, in an endeavour to pick up the transmissions from K D K A, Pittsburg, in the United States, in order to relay the transmissions through 2 L O so that even crystal-set users might hear the programmes from America.

Later on, early in 1924, Captain West made his first debut at Oxted as, one might say, the Technical Manager of the Nightingales. He himself has said this was one of the most tantalising jobs he has had. He spent many nights locating the birds, only to find that on the night particularly fixed for the first nightingale broadcast, when the microphones had been carefully placed in adjoining woods, not a single nightingale would keep to the stage. Instead of singing at their accustomed places, for some particular reason the birds decided to change their ground, and, of course, by sheer cussedness kept well out of range of the microphones.

## Further Important Developments.

However, Captain West was well supplied with a drum of cable, and in ten minutes he had run out a new line and located the birds: and, as our readers will remember, made a very successful job of the broadcast.

Captain West has carried out successful broadcasts from under the Thames, when divers went down to investigate the bed of the river near Westminster Bridge. Another experiment which he arranged was that of broadcasting the Savoy Orpheans from an aeroplane some 10,000 ft. above Croydon Aerodrome. Readers will remember, per-

haps, that on this occasion our ubiquitous "Ariel" was present in the plane, just as, by the way, he was the first journalist to be present at Biggin Hill when the experiments in connection with relays from America were in progress.

Captain West also did a good deal of work on the technical side for the broadcasting of services from Canterbury Cathedral, Westminster Abbey, and York Minster, which, if we remember rightly, took place originally in 1925.

It was about that time that Captain West developed the Dramatic Control Board at 2 L O, which later was so perfected that a large number of studios could be used simultaneously for getting specific effects in broadcast drama, such as the combining of speech, voices, and orchestral sounds without undue muzziness.

Another of the leading B.B.C. engineers—this time the Chief of the Research Department, Capt. A. G. D. West—has left the B.B.C. to take up an important position with The Gramophone Company. In this article some of his outstanding technical triumphs are recalled, and we feel sure that readers will join with us in wishing him the best of luck in his new venture.

It was Captain West who had a lot to do with the design of the B.B.C.'s portable transmitter, which was first used by taking it to the Zoo in order to relay the sounds of the animals to 2 L O, and thus to listeners.

However, although Captain West is leaving the B.B.C., it is good news to hear that he will still be able to give us the benefit of his experience and knowledge, as he is acting in the capacity of Adviser on Acoustics to the B.B.C.

\* \* \* \* \*

A very important leading figure in the world of wireless has been on a short visit to this country in the person of Mr. A. M.

Aylesworth, the President of the National Broadcasting Co. of U.S.A. This company is certainly the biggest of its kind, and it sends out programmes from over sixty-five stations, and it has been calculated that it serves a clientele of fifty million listeners in the United States.

Mr. Aylesworth has vision, and one of his great ideas is that before long the great statesmen of England and the United States will be able to address simultaneously by means of wireless a public on both sides of the Atlantic. Mr. Aylesworth is convinced that the greatest benefits will accrue through wireless talks between the two great English-speaking countries of the world, both in times of tranquillity and during periods of differences of opinion, which inevitably occur.

## Do We Want Politics ?

With all respect to Mr. Aylesworth, however, we doubt very much whether the majority of people in Great Britain or America would be particularly interested in hearing each other's politicians. Some of our leading lights, of course, like Mr. Lloyd George and Mr. Churchill, would probably greatly interest American audiences for a time, because of the almost legendary stories which have grown up around them, and we feel sure that many of our listeners would thoroughly enjoy listening to such a man as President Hoover.

Mr. Aylesworth says:

"We want to hear your scientists, we want to hear your men of literature and learning, and, above all, your politicians."

It certainly would be fine if we could listen-in to some of America's leading literateurs and some of America's leading scientists, but why drag in politicians ?

## Trans-Atlantic Broadcasting.

Mr. Aylesworth, like Mr. Sarnoff (the President of the Radio Corporation of America), is a man who has devoted practically all his life to furthering the interests of radio. While he was in this country opportunities were afforded him of going thoroughly into our system of broadcasting and of meeting all the chiefs of the B.B.C.

With Mr. Aylesworth was Mr. Horn, the Chief Engineer of the National Broadcasting Co. of America, who came to confer with Captain Eckersley on technical matters relating to problems of broadcasting in common to both countries.

**CELLULOID FOR CONES.**

The Editor, POPULAR WIRELESS.  
Dear Sir,—I have been experimenting with celluloid for a cone loud speaker. The experiments have proved very successful and I should like other wireless amateurs to know about it.

The thickness of the celluloid used is 73/1,000 in. and the diameter of the cone 12 in. To join the cone together I used a special adhesive.

I am using a Blue Spot Unit. The quality of tone and the volume is wonderful. I have compared it with a linen diaphragm loud speaker and I much prefer the celluloid cone.

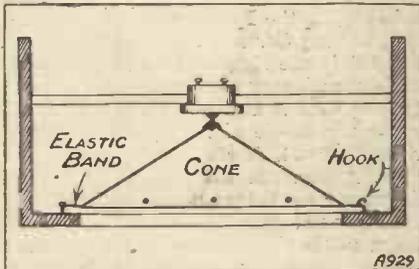
The celluloid and adhesive I obtained quite reasonably from H. Rheinlander & Son, New Malden, Surrey.

I hope that readers of the POPULAR WIRELESS will benefit by this.  
Yours faithfully,  
H. J. HOPKINS.

**FIXING A CONE.**

The Editor, POPULAR WIRELESS.  
Dear Sir,—The following method I have devised for fixing the cone of a home-made loud speaker, and which I have found to give excellent results, may be of interest to readers of POPULAR WIRELESS.

Near the edge of the paper cone, spaced equidistant, are punched eight holes, and to prevent



same from tearing, I got a bootmaker to insert in each a boot eyelet. Inside the speaker box are fixed eight small hooks coinciding with position of the holes in edge of cone, which is suspended, as shown in sketch above, by eight small elastic bands. The bands being merely looped through the holes in the cone, it is a simple matter to renew them when they become perished.

Yours truly,  
ROGER KNOWLES.

South Hayling Island,  
Hants.

**THE "TITAN" COIL.**

The Editor, POPULAR WIRELESS.  
Dear Sir,—For the guidance of those readers of "P.W." that may be puzzled by the instructions given for the winding of the "Titan" coil unit (and there must be hundreds, for out of five units made by personal friends of mine, upon examination, not one was found to have the primary coil wound in the correct direction), may I submit the following hint?

Start to put on the secondary coil first, and, imagining a watch facing you in the centre of the end of the former, wind on the 40 turns in the same direction as the hands of the watch travel. Upon completion, wind on the reaction coil in the same

**CORRESPONDENCE.**

**CELLULOID FOR CONES**

**THE "TITAN" COIL—A RADIO THRILL—"EVERYBODY'S" THREE—A READER'S SET.**

Letters from readers discussing interesting and topical 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.

direction, just as though it was a continuation of the secondary, not forgetting the 1/2-in. space between the two.

Now reverse the former and, again imagining the face of the watch facing you, but this time in the reaction end of the former, wind on the primary, starting at the reaction end of the secondary coil, in the same direction as the hands of the watch travel.

By carefully following the above instructions the veriest tyro in coil matters cannot wind the primary in the wrong direction.

Yours faithfully,  
CHAS. W. HARVEY.

Preston.

**A RADIO THRILL.**

The Editor, POPULAR WIRELESS.  
Dear Sir,—As I have read so many little experiences related by your readers, I thought I would write and let you know this one, which occurred just recently to me. For three years now I have probed wireless mysteries through the eyes of your "Popular" magazine, and benefited thereby to the extent of hearing the biggest thrill of my wireless life. To begin with, my set is your famous "Everybody's" Three, with two or three additional gadgets for tuning purposes, one of which is a two-plate vernier controlled by thread 5 ft. from the set. This is only used on the S.W., of course, and is very useful.

I can receive 5 S W, 3 L O, W 2 X A D, W 2 A F, W 8 X K, P C J, and 7 L O, all at varying strengths, but on the loud speaker (I am not meaning my ear up against it). However, to get back to my thrill, and I hope it will interest you. Last night, after finishing my supper, I tuned in W 2 X A F and found it exceptionally strong. Imagine my surprise, then, when, at the conclusion of a programme from Albany, a relay was taken from our short-wave station at Chelmsford which was experimenting with antenna, I think. The relay consisted of the chimes from Big Ben. I thus heard Big Ben give his twelve booming chimes to America, while I was sitting at the fire in the "wee county" in Scotland. Every note was clear just as I hear it from the local, and the announcer's words were ditto, clean and pure.

I think this a unique experience, and says a lot for:  
1. 5 S W and its stretching abilities.  
2. W 2 X A F for its reception and clean broadcast.  
3. "Everybody's" Three.  
4. POPULAR WIRELESS, from which I gleaned all my experience.

Hoping I haven't bored you, and wishing the paper the best of luck which it deserves.  
Yours sincerely,  
THOMAS MACKISON.

P.S.—I would very much like to know if anybody else got this "thrill," for "thrill" it was to me.  
Alloa, Scotland.

**"EVERYBODY'S" THREE.**

The Editor, POPULAR WIRELESS.  
Dear Sir,—I also have made "Everybody's" Three. I think it is a very fine set. On my first evening over twenty stations, including W 8 X K (Pittsburg), all on loud speaker. The loading coil is home-made and quite satisfactory. I, like your correspondents, find reaction rather fierce, but can forgive this to an otherwise well behaved and very powerful set.

Thanking you for such a splendid circuit, I am, sir,  
Yours sincerely,  
C. R. LE CORRE.

**A READER'S SET.**

The Editor, POPULAR WIRELESS.  
Dear Sir,—I enclose diagram of my set, which may be of interest to readers.

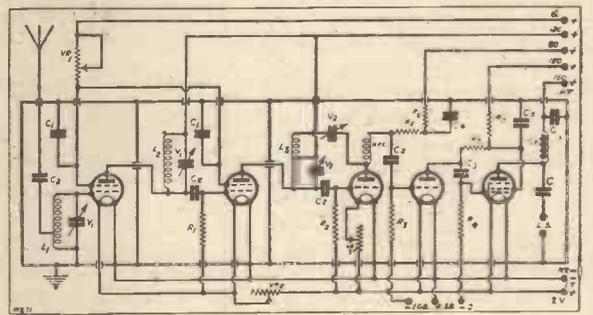
The lay-out will get any continental station at full loud-speaker strength. The selectivity is very good indeed, provided the right value of plug-in coil is used in the second screen-grid circuit. Leipsig can be separated from London at my house at Golder's Green. Places like Rome, Milan, and Madrid are very loud. Owing to the R.C. coupling there is no distortion, and the tone is fine on a cone speaker.

No doubt your Technical Staff will find many faults in the values, and I am sure with correct values the set could be still further improved. The set works on a 70-ft. aerial, or on a frame 2 ft. square, and is stable under all conditions. Tuning is quite easy, the third or grid coil is tuned to hear the "chirrup," and the "plug-in" is then tuned until clear, the aerial coil then brings up the volume.

The set is also good on ultra-short waves. I have so far cut out the first S.G. valve for this work, but I am experimenting so as to include this, as the set is quite stable—there is no sign of motor-boating.

I enjoy your paper each week very much indeed.  
Yours truly,  
F. PAGET.

London, England.



**SHORT-WAVE NOTES.**

By. W. L. S.

I HAVE received quite a number of applications for the "H. A. C." club, but unfortunately many of the applicants do not seem to realise that South America is counted as a continent on its own for these purposes.

"H. G. S." of Salisbury, however, passes the test with P C J, P L E, 3 L O, 7 L O, 2 X A F and Monte Grande. He reports the latter station on 32 metres instead of 15 metres, as usual. He also reports C J R K (Winnipeg) and numerous other Americans.

Another reader has been using "Everybody's" Three on short waves, and has received C J R X and C J R W, slightly above 5 S W. These Canadian stations seem to be waking up all at once.

Many thanks also to "W. B." of Newport, for a very interesting list of stations heard, some of which are new to me. He reports W 2 X A on several wave-lengths, also Madrid (E A R-110). There is also apparently a new station at Copenhagen working on 31.6 metres on Thursdays and

Fridays at 7 p.m. G.M.T., just free from P C J on 31.4. Also Florence (I H O), which is a station owned and operated by an Englishman, with a power of 14 watts only, on about 42 metres.

**An Amateur Broadcaster.**

CT 1 A A, a Portuguese amateur who used to be renowned for the incredible length of his "C Q" calls, and the speed with which he let loose another one without apparently listening for replies, has now blossomed forth into a broadcasting station. I think he is confining himself to gramophone records at the moment, but his transmission is quite good.

"H.W.B." claims distinction among short-wavers because he is using a set without a slow-motion dial. Apparently he does not find tuning particularly difficult, since he has logged 3 L O on 31.55 metres in addition to a fair number of others.

I also have to acknowledge a very interesting letter from "Bindle," Peshawar, India, on the subject of 5 S W. He says it is distinctly amusing to read in "P.W." about people who complain because they do not receive bass notes, when out there they jump for joy if they hear anything at all. The only trouble is that they have to sit up till after midnight and then are rewarded with a talk on Social Uplift or something similar!

The midday transmission is apparently audible in India for only about four months in the year, and the 7 p.m. transmission means sitting up till the small hours. Apparently the star turn is Java. Never mind, "Bindle," I think short-wave broadcast is distinctly on the increase just now, and you should soon have a dozen alternative programmes.



We do not supply baffle boards, but recommend the use of a board at least 18" square.

*Dimensions:*

- Overall diameter of metal frame - - 10 $\frac{1}{2}$  in.
- Overall depth - - 2 $\frac{1}{2}$  "
- Overall depth with No. 66K Unit - - 4 $\frac{1}{2}$  "
- Overall depth with No. 66A Unit - - 3 $\frac{1}{2}$  "

**Moving Coil results with the**

**BLUE SPOT unit!**

You can now build a wonderful speaker in the easiest possible way with the new Blue Spot chassis, a Blue Spot 66K unit, and a baffle board which your dealer can supply cut to size. Only a screwdriver is needed to fit the unit in position on the chassis. The spindle is automatically centred in the cone. All there is then to do is to tighten up the nuts and screw the chassis to the baffle board—there you have a perfect speaker equal to anything

you have yet heard. Equally good results can be obtained by bolting the assembled chassis to the front of a cabinet of your own design or choice. Hear the Blue Spot unit with the special chassis at your nearest wireless retailers, and compare it with any moving-coil speaker. Listen for the bass!

Price of Blue Spot unit (66K, adjustable), 25/-.

Price of Blue Spot Chassis, 12/6.

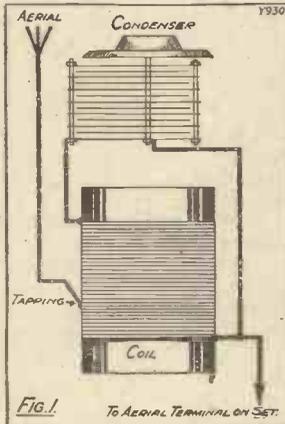
**F. A. HUGHES & CO., LIMITED, 204-6 Great Portland Street, London, W.1**

Distributors for Northern England, Scotland and North Wales: H. C. RAWSON (SHEFFIELD & LONDON) LTD, 100 LONDON ROAD, SHEFFIELD; 185 PRINCESS STREET, MANCHESTER.

**I** EXPECT that there are quite a few amateurs who would like to find a type of wave-trap that is really satisfactory in use very near to the local station, and I hope that my experience may be of benefit to them.

You know, of course, what the auto-coupled trap is. It is just a coil tuned by a condenser, a portion of the coil being connected in the aerial lead. This is shown in Fig. 1 which is shown in pictorial form; so that the less experienced experimenter who is interested in this question shall be able to follow it.

When you want to cut out the jamming from your local you just turn the condenser till it fades away (the jamming, not the condenser). The adjustment is pretty sharp, so the first time you try this arrangement you will have to move the condenser rather carefully.



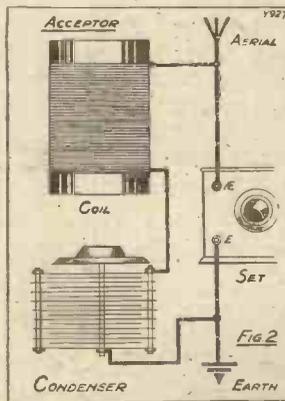
Now the very fact that you have such a critical adjustment shows that the setting of trap will not affect other stations working close by. Compare it against a rejector trap and you will find that with the latter the local jamming goes out, not always entirely either, over a wide band on the condenser, which can be set almost anywhere within 10 or 15 degrees.

**A Favoured Type.**

The "acceptor" trap (Fig. 2) will also cut out the local station pretty well, but you won't get anything much either side of it.

All traps will cut out interference on a particular wave, but the most important part of a trap is its behaviour "off tune."

There is another type of trap that is a favourite with some amateurs, and that is the coupled absorption trap shown in the Fig. 3.



When you want to cut out jamming, you turn the dial of the trap condenser till it goes, and the coupling has to be jolly tight before it does go, if you are as near to a station as I am. I hate to think what the effect of this coil is going to be on the efficiency of the grid coil, and although it

**THE AUTO-COUPLED WAVE-TRAP.**

Four types of wave-trap are described, and the superiority of one of these is graphically illustrated.

By C. P. ALLINSON, A.M.I.E.E.,  
A.M.I.R.E., F.Inst.P.Inc.

gives a reasonably sharp trapping effect, it is not so good as the auto-coupled trap.

This auto-coupled trap is a bit of a puzzle as a matter of fact. It behaves, in its action, pretty much the same as a series rejector. This means that owing to the properties of a tuned circuit it develops a voltage across it that is equal to and in exact opposition to the signal voltage in the aerial. This prevents the signal from going through the aerial coil of the set and so nothing is heard. But, curiously enough, the practical requirements of this trap are the same as for an acceptor.

A rejector trap, to have a very sharp trapping effect, both in theory and practice needs a small coil, and a large condenser (have you ever seen an old Naval rejector?), while for an acceptor trap to be as sharp and efficient as possible the coil should be as large as practicable and the condenser small.

**An Ideal Arrangement.**

And that is what you want in the auto-coupled trap—a large coil and a small condenser. Of course you mustn't overdo it, for if you do you will merely undo the good you have done. I find myself that something like an 80-turn coil of fairly thickish wire (say 20 or 22 D.S.C.) on a 4-in. Paxolin former, tuned by a .0003 mfd condenser is an ideal arrangement. A coil of this kind is only wanted though, if you are right on top of the local. If you are at a reasonable distance there are many suitable coils available, for this trap works well even with a comparatively poor coil. An important and valuable feature.

For practical details of this kind, I think you can't do better than read Mr. Kendall's recent article in which I may say I have found very helpful.

Before I close these notes I would like to give a diagram for the benefit of the more advanced experimenter which will show him graphically the extreme superiority of the auto-coupled trap over others.

Let him turn to Fig. 4 and he will see what I mean. The vertical height of the curve

above the horizontal line gives the signal strength, the dotted line represents 100 per cent signal strength, i.e. what would be received at all wave-lengths if the trap were not there. The horizontal line gives wave-lengths from 200 to 300 metres.

**Illuminating Curves.**

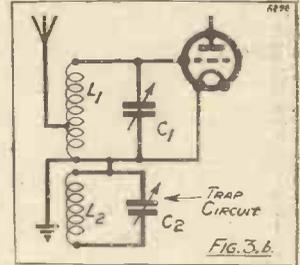
The trap is supposed to be set to cut out jamming on 380 metres in every case.

Curve 1 is a series rejector—what chance Continental stations when a signal on a wave-length 50 metres either side of the trap setting is only 25 per cent of its normal value.

Curve 2 is an acceptor trap, a bit better, but look at the nasty kinks in it, and I also always find with it that it brings the local in again, at a totally different point on the tuning condenser in the receiver.

Curve 3 is the coupled absorption trap—but look, it doesn't really trap all the jamming, though otherwise it is a better curve than the others.

Last, but not least, curve 4, the auto-coupled trap. I think this speaks for itself, and although not quite so symmetrical as curve No. 3 it is ever so much sharper, and that is the important point.

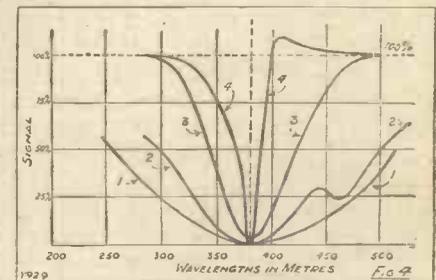


**HELPFUL HINTS.**

If a drill is not available and a carpenter's brace must be used, the shank of the smaller wireless drill can be enlarged to fit this by winding a fairly stout wire round it in the form of a spring.

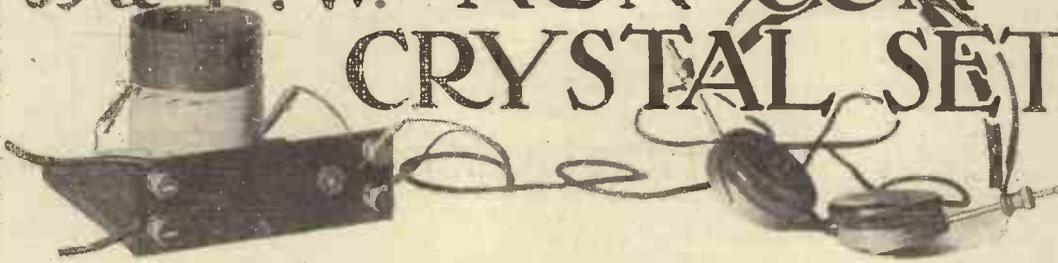
Holes in a panel can generally be filled up quite successfully by means of shoemaker's heelball, black sealing wax, or one of the preparations specifically sold for this purpose.

An ebonite panel which has gone a little "grey" can be restored by lightly smearing with a trace of mineral oil and polishing with a soft, clean duster.



If you are troubled by threshold howl the following partial cures can be tried: H.F. chokes in each 'phone lead; fixed condenser across 'phones; choke output circuit for 'phones; a different L.F. transformer; and capacity coupling for the aerial circuit instead of loose inductive coupling.

# The P.W. "NON-CON" CRYSTAL SET



ONE might truthfully say that this is probably the least expensive and most easily constructed crystal set that it is possible to obtain—with, of course, due regard to efficiency.

The reader who requires a de-luxe receiver has had a large number of different designs to choose from. We have had wave-change crystal sets, sets in which the problem of selectivity has been given special attention, and receivers which have appealed perhaps more to the enthusiast and experimenter than to the beginner.

It has always been the policy of the "P.W." Research and Construction Department to cater for every type of reader.

## COMPONENTS REQUIRED.

- 1 Baseboard, size 6 in. × 6 in.
  - 1 Ebonite panel, size 6 in. × 3 in. ×  $\frac{1}{8}$  in. or  $\frac{1}{4}$  in.
  - 1 Crystal detector, permanent or semi-permanent type (R. I.-Varley in set. Various types are available, e.g., Brownle, Harlie, etc.).
  - 1 Coil former, 3 in. diam. × 3½ in. long (Pirtoid, Radion, Becol, Paxolin, etc.).
  - $\frac{1}{2}$  lb. No. 24 gauge D.S.C. wire.
  - 4 Terminals.
  - 2 Spring clips.
- Small quantity of tinned copper wire, flexible, wood screws, etc.

There is the absolute novice, for instance, situated within eight or ten miles from a main B.B.C. station, who has never attempted to make a set of any kind, and to whom, quite naturally, a complicated crystal circuit is a bit of a mystery, and therefore to be avoided. Then, again, we have the "young hopeful" who probably has only a few shillings to spend, but who, nevertheless, is keen to "try his hand."

Thirdly, there is the listener who lives within the "shadow" of a powerful broadcasting station, and who does not require anything elaborate. In fact, he just wants a simple little set with which he can listen to the broadcast programmes.

## Inexpensive to Build.

Now the "Non-Con" crystal set is ideal for these three types of readers. The cost of the receiver is, roughly, four or five shillings, not including telephones. A pair of 'phones can be purchased for about twelve shillings and sixpence; hence the total cost should not be greater than seventeen or eighteen shillings. The set can be made in a couple of hours, and the wiring is so extremely simple that no

Nothing could be more easy to build and operate than this efficient set—which is even without a condenser. Once set it remains always ready for action.

Designed and described by THE "P.W." RESEARCH AND CONSTRUCTION DEPARTMENT.

previous knowledge of constructional work is necessary.

You will possibly wonder why the set has been called the "Non-Con." Well, it is because there is no tuning condenser. Most receivers consist of an inductance coil and a condenser. The station is tuned-in by rotating the condenser dial. In this case, however, the condenser has been dispensed with, thus cutting down expense and increasing the simplicity. The tuning is carried out by varying the two tapping clips.

Of course, this is not a highly selective method, but then the listener who only wants one station does not require selec-

tivity. In any case, a crystal set will not bring in distant transmissions. To achieve this a valve receiver would be necessary.

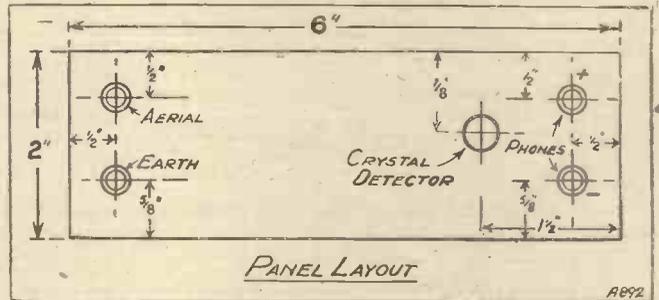
The arrangement of tapings along the coil is such that a very fine adjustment can be obtained, and you will not find that the volume has suffered through the omission of the variable condenser.

To commence the construction of the set you will first of all have to wind

the coil. Procure a former 3 in. in diameter and 3½ in. in length. A cardboard tube impregnated with wax or shellac varnish will be quite satisfactory. Alternatively, you can purchase a Paxolin or Pirtoid former. Also, you will need about a quarter of a pound of No. 24-gauge D.S.C. wire.

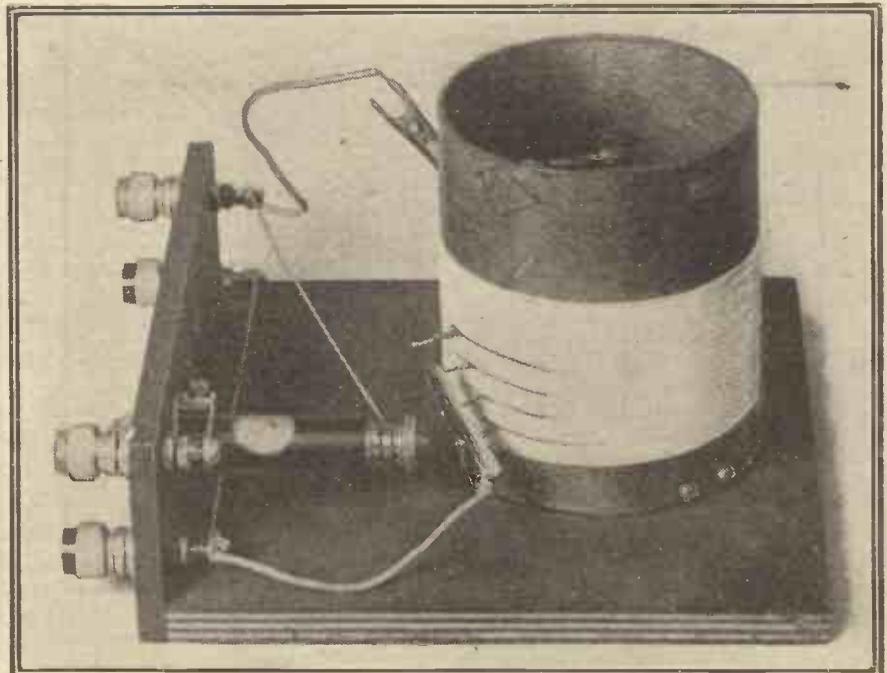
## Winding the Coil.

Now take the former and punch a couple of small holes at a distance of about 1 in. from the top. Thread the end of the wire through these holes two or three times in order to secure it firmly. Then wind on two turns and make a twist or loop in the wire for the first tapping



marked "2" on the wiring diagram. Wind on two more turns and take a second tapping. This is marked "4."

(Continued on next page.)



This general view of the set emphasises its simplicity, five connections only being necessary.

**THE P.W. "NON-CON" CRYSTAL SET.**

(Continued from previous page.)

Continue the winding and make a loop at six and eight turns. Then wind on for another twenty turns and make another tapping at the 28th turn. Proceed in this way, making loops in the wire at the 38th, 48th, and 58th, thus completing the coil at the 68th turn, when two more small holes should be punched in the tube to secure the end of the winding. Do not forget to place the turns close together—in fact, touching.

**Preparing the Tappings.**

Then take a penknife or safety-razor blade and scrape off the silk covering from the loops you have made. These tappings must be bare in order that the spring clips may make proper contact. You must not varnish the coil or impregnate it with wax, since this would result in a serious decrease in its efficiency.

Next procure a baseboard 6 in. by 6 in. by

$\frac{3}{8}$  in., or thicker if you wish, and obtain also a piece of ebonite 6 in. in length and about 3 in. in width. Drill five holes for the terminals and crystal detector. You will also require three holes along the bottom edge of the strip for the wood screws which are used to secure it to the baseboard.

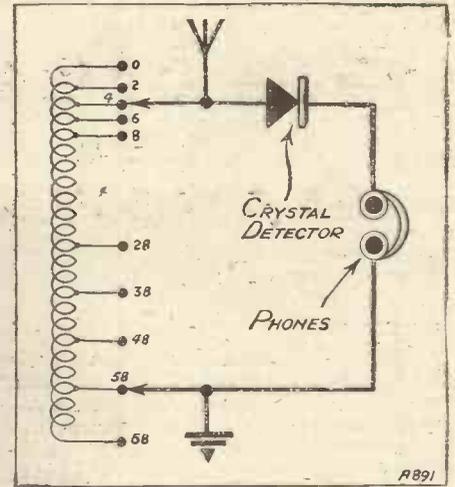
**Wiring Up.**

The dimensions for the crystal detector and terminals are not in any way critical.

Fix the ebonite strip to the baseboard and mount the terminals and detector in position; then cut a piece of wooden strip so that it fits tightly inside the coil former. Thus you will be able to secure the coil in position on the baseboard by passing a screw through the centre of the wooden strip.

You will now be ready to wire up. Take a straight length of No. 16-gauge tinned-copper wire, or a strip of Glazite, and join up as follows: Aerial terminal to one side of crystal detector, other side of crystal detector to top 'phone terminal, bottom 'phone terminal to earth.

There are also two flexible leads. These can be ordinary rubber-covered flexible. One lead is joined to the aerial terminal and the other to the bottom 'phone terminal.



The ends of the flexible leads terminate with two spring tapping clips.

This completes the construction of the set, and the next procedure is to connect it up to the aerial and earth for the preliminary tests on broadcasting. The coil, as it stands, will tune up to 500 metres, and therefore covers all wave-lengths on the medium broadcast wave-band.

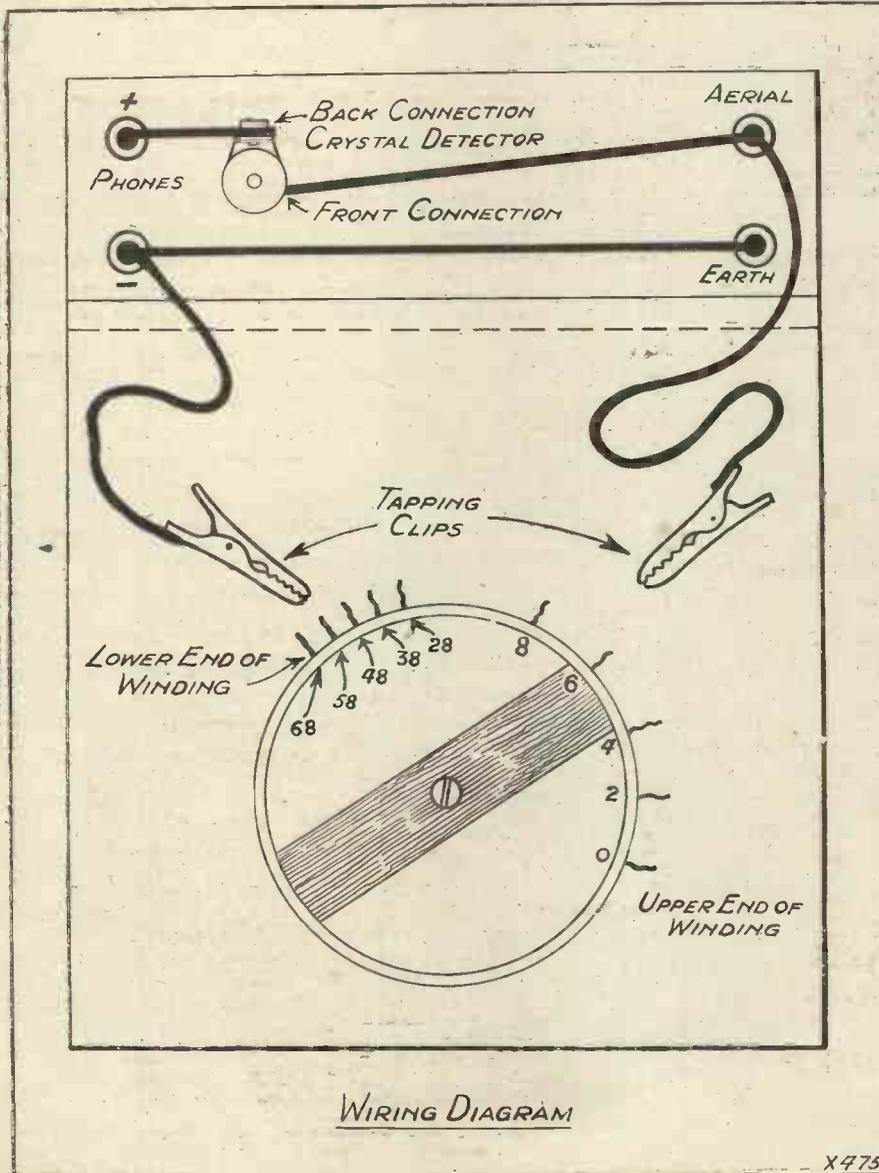
**Tuning In.**

It will not tune up to 5 X X on the long-waves, and the receiver is not intended for the reception of this station. This would necessitate the use of a second coil and would complicate the design. Let us suppose that your local station is 2 L.O. Join the aerial and earth leads to their respective terminals, and a pair of 'phones to the 'phones terminals. Place the tapping clip which goes to the bottom 'phones terminal on tapping 38 and vary the aerial tapping clip along the smaller tappings at the upper end of the winding. Assuming that signals are audible adjust this aerial clip until you obtain the greatest volume. As an experiment try the lower tapping clip on the 48-turn tap and note whether the volume increases or decreases. By adjusting the two clips, it is an easy matter to find the best positions for maximum volume. Remember to adjust your crystal detector, unless, of course, it is one of the permanent variety.

**The Aerial System.**

The tuning procedure is the same for any particular station. In most cases it is best to place the aerial clip on "0" and to listen for the station by connecting the other clip to each of the large tappings in turn, starting from 28. Then when the coarse adjustment is found vary the aerial tapping clip along the small tappings. When you choose your 'phones remember that the high resistance type are the more sensitive, and therefore preferable. Use a good outdoor aerial, erected as high as possible. The earth may consist of a connection to the main water supply, or of a zinc or copper plate buried at least 3 ft. in the ground.

Remember that an efficient aerial and earth system is "half the battle" when you are receiving such minute signal impulses as those which your receiver has to handle. All joints where they are exposed to the air, or to damp soil, should be perfect electrically and mechanically.

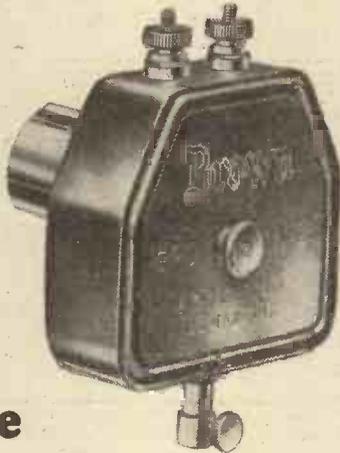


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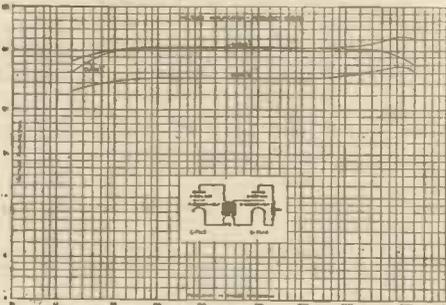
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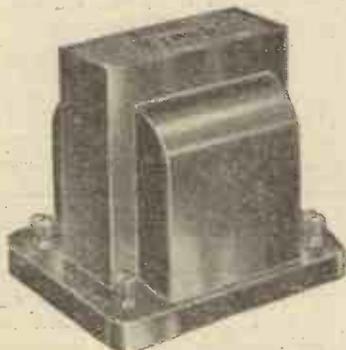
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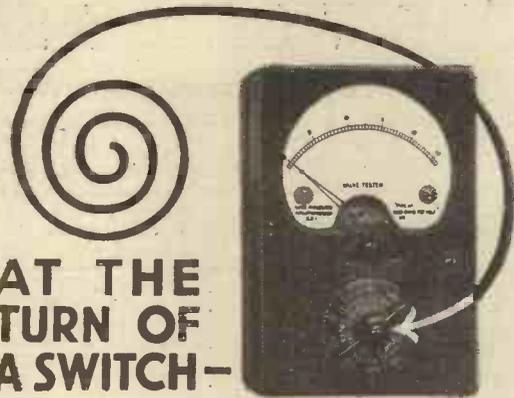
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# THE WORLD'S SHORT-WAVE STATIONS.

A List giving the wave-lengths upon which the principal short-wave broadcasts are to be tuned in.

## STATIONS WORKING ON WAVE-LENGTHS BETWEEN 15 and 30 METRES.

Wave-length in Metres.	Name of Station.	Call-Sign and Remarks.	Wave-length in Metres.	Name of Station.	Call-Sign and Remarks.
15.5	Nancy (France) .. ..	Usual hours 9-10 p.m.	22.8	Fort Wayne (U.S.A.) ..	W O W O. Power of 1 kw. Usually commences at midnight.
15.74	Bandoeng (Java) .. ..	P L E. Wed., 12.40 p.m. to 2.40 p.m.	23.35	Oakland (U.S.A.) .. ..	W 6 X N. Relays K G O. Tues., Wed. and Fri. from 6.30-10 p.m. Also 3.0 a.m.-9 a.m. Weds. Power of 5 kw.
16.3	KOOTWYK (HOLLAND) ..	P C K. Works during morning from about 6 a.m.	24.5	St. Assize (France) .. ..	F W.
16.88	HUIZEN (HOLLAND) ..	P H O H I. Usually works from 3 p.m.-5 p.m. daily, on 40 kw.	25.4	PITTSBURG EAST (U.S.A.)	W 8 X K. Relays K D K A. Sun., 5.30-6.30 p.m. (Church Service) and Concert 7-9 p.m.
17.00	BANDOENG (JAVA) .. ..	P L F. "Radio Malabar." Power of 30 kw.	25.53	CHELMSFORD (ESSEX) ..	5 S W. Power of 15 kw. Mon. to Fri., 12.30 to 1.30 p.m., and 7 p.m. to 12.00.
17.20	Nauen (Germany) .. ..	A G C.	25.6	Winnipeg (Canada) .. ..	C J R X. Power of 2 kw. Mon. to Sat., 10.30 p.m.-12.30 a.m. Also Sat., 6 a.m.-7 a.m.
19.56	SCHENECTADY (U.S.A.) ..	W 2 X A D. Relays W G Y. Sun., 9.30 p.m.-5 a.m. Mon., Wed. and Fri., 00.00 to 6 a.m.			
21.96	Schenectady (U.S.A.) ..	W 2 X O.			
22.2	Vienna .. ..	Power of 24 kw.			
22.48	ROCKY POINT (U.S.A.) ..	Transatlantic Phone station.			

NOTES.—As all short-wave working is more or less experimental, the times of transmission and power used are not standardised to the same extent as on the longer wave-lengths. In addition fading and daylight effects introduce uncertain conditions, so that reception is less reliable upon short wave-lengths, but is often more spectacular as regards distances covered, etc.  
The more important stations are printed in heavier type. The Chelmsford station, though using high power, is not received strongly in most parts of Britain, owing to "skip-distance" effects.

## STATIONS WORKING ON WAVE-LENGTHS BETWEEN 30 and 45 METRES.

Wave-length in Metres.	Name of Station.	Call-Sign and Remarks.	Wave-length in Metres.	Name of Station.	Call-Sign and Remarks.
30.75	Agen (France) .. ..	Tues. and Fri., 10-11.15 p.m.	31.48	Schenectady (U.S.A.) (cont.)	a.m. Fri., 00.00 to 6.30 a.m. Sun., 00.00 to 6 a.m.
30.91	NEW YORK (U.S.A.) .. ..	W 2 X A L. Wed., 1 a.m.-6 a.m. Thurs., 1 a.m.-3 a.m. Sat., 1 a.m.-5 a.m. Sun., 1 a.m.-4 a.m. Power of 5 kw.	31.55	Melbourne (Australia) ..	3 L O. Sun., 7 p.m.-8 p.m.
31	NAIROBI (KENYA COLONY)	7 L O. Daily, 4 p.m.-7 p.m. Sometimes relays 5 S W from 7 p.m. to 8 p.m.	32	Pontiac (U.S.A.) .. ..	W 8 X A O. Relays W J R and W C X. Power .75 kw.
31.25	Bergen (Norway) .. ..	L G N.	32.5	Paris (Eiffel Tower) (France)	F L. Time Sig. at 7.56 a.m. and 7.56 p.m.
31.28	Sydney (Australia) .. ..	2 F C.	32.5	Sydney (Australia) .. ..	2 B L.
31.4	HILVERSUM (HOLLAND)	P C J. Power of 25 kw. Announces in English. Thurs., and Fri., 7 p.m.-9 p.m. Sat. 2 a.m.-7 a.m. Also works (in other languages) 00.00 to 4 a.m. Fri. Also in Dutch. Sat., 1 a.m.-2 a.m.	37	Vienna (Austria) .. ..	U O T H. Mon. and Thurs., 10.30 p.m. to m/n.
31.48	SCHENECTADY (U.S.A.)	W 2 X A F. Relays W G Y. Power of 10 kw. Tues. 00.00 to 6 a.m. Wed. 00.00 to 5.30	40	PARIS (RADIO VITUS) (FRANCE)	Now Testing.
			40.2	Lyons (France) .. ..	Y R. Mon. to Sat., 4.30 p.m.-5.30 p.m.
			42	Perth (Australia) .. ..	6 A G. 10.30 a.m. and 3 p.m.
			43	Madrid (Spain) .. ..	E A R 110. Tues. and Sat., 10.30 p.m. to midn't.
			43.5	Rome (Italy) .. ..	I M A. Sun., 5 p.m.-7.30 p.m.
			44	San Lazaro (Mexico) ..	X C 5 1. 8 a.m. and 8 p.m. daily.
			44.4	Vienna (Austria) .. ..	0.24 kw.

NOTES.—Both Sydney and Melbourne have recently been received well (even upon simple 2-valve sets), but conditions need to be particularly good for these stations to be identified.  
An interesting station on this wave-band is the Paris (Radio Vitus) station, now testing on 40 metres.  
Nairobi, a comparatively new station, is sometimes receivable at quite good strength. Schenectady, 2 X A F, is one of the most consistent short-wave stations in the world, whilst Hilversum's programmes are particularly well adapted to reception in Britain.

## STATIONS WORKING ON WAVE-LENGTHS BETWEEN 45 and 100 METRES.

Wave-length in Metres.	Name of Station.	Call-Sign and Remarks.	Wave-length in Metres.	Name of Station.	Call-Sign and Remarks.
50	Moscow (Russia) .. ..	R F N. 1 p.m.-2 p.m. Tu., Thurs. and Sat.	62	San Francisco (U.S.A.) ..	W 6 X A R. Relays K J B S from 1 a.m.
50	Karlsborg (Sweden) .. ..	S A J.	65.18	Newark, N.J. (U.S.A.) ..	W 2 X B A. Relays W A A M between 1 a.m. and 6 a.m. Tu., Thurs. and Sat.
52	Bergedorf (Germany) ..	A F L. Power of 3 kw.	66.04	Cleveland, Ohio (U.S.A.) ..	W 8 X F. Power of .5 kw., starts at 1 a.m.
52.02	Cincinnati (U.S.A.) .. ..	W 8 X A L. (Relays W L W). Mon. to Fri., from 12.50 a.m.	67.65	Doberitz (Germany) .. ..	A F K. 5 kw. Mon., Wed. and Fri., 11 a.m. to m/n and 7 p.m.-8 p.m.
54	Brooklyn (U.S.A.) .. ..	W 2 X B H. Relays W C G U from midn't. Power .15 kw.	70	Vienna (Austria) .. ..	U O K 2. Sunday 6 p.m. to m/n for first quarter of each hour.
54.02	Columbus (U.S.A.) .. ..	W 8 X J. Relays W E A O.	70	Springfield, Mass. (U.S.A.) ..	W B Z.
56.7	Nauen (Germany) .. ..	A G J. Occasionally after 6 p.m.	80	Constantine (Tunis) .. ..	8 K R. Mon. and Fri.
53.5	Richmond Hill (U.S.A.) ..	W 2 X E. Relays W A B C weekdays, m/n to 6 a.m., Sun. 4.50 p.m. to 6.30 p.m.			
60	Paris (France) .. ..	Radio L L.			
61.06	Council Bluffs (U.S.A.) ..	W 9 X U. .5 kw. Relays K O I L.			

At one time this part of the short wave-band was a favourite hunting ground. Several of the American stations can still be heard occasionally, when conditions are good, but now most of the well-received stations use lower wave-lengths.

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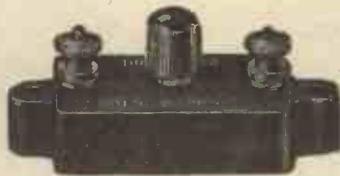


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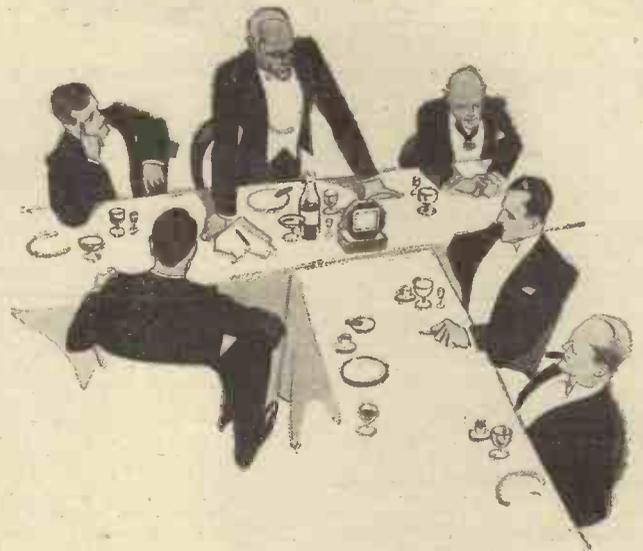
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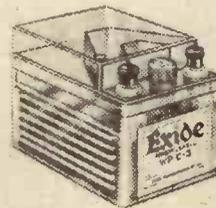


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# RADIOTORIAL



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 or 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. Lile, 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 specialties described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

## QUESTIONS AND ANSWERS.

### A LICENCE PROBLEM.

A. L. (Blackburn).—"In a recent issue of POPULAR WIRELESS, with reference to a question asked in Parliament regarding a reduction in Wireless licence fees, the Postmaster-General stated that the licence fee was for programmes, and that these worked out at three a penny, etc. The reply in your journal was to the effect that licence fees were paid

for the use of wireless apparatus and not for programmes.

"Now this is my question: If at the expiration of my wireless licence I discontinue the use of my set for wireless programmes, and take down the aerial and earth, but use the set for amplifying gramophone records with a pick-up device, am I liable to be prosecuted for using wireless apparatus without a licence? If your version is correct, then I must have a licence to use the set as stated. If the P.M.G. is correct, then I don't think so. Which is correct? Do I need a licence or not?"

We have taken a legal opinion on this question, and the answer is that no P.M.G. licence is required for an

amplifier used solely for gramophone reproduction, provided that there is no aerial on the premises, i.e. no facilities for wireless reception.

### THE CAUSE OF HOWLING.

W. I. H. (Newton-le-Willows).—"What is it that makes the set howl, and will an anti-motor-boating device stop it?"

Usually howling is due to one of the batteries running down, to the use of too big a reaction coil, or to bad spacing of components or wiring, although the use of an unsuitable grid leak, grid condenser, or mains unit will also cause this trouble.

Although an anti-motor device will very often cure it, or will make it very, very much less troublesome, the correct method of dealing with a howl is to remove the cause of it if possible, and from an inspection of the foregoing list you will see that it is possible in most cases. If, however, your batteries, reaction coil and spacing of the wiring appear to be O.K., and in accordance with the set designer's instructions, your best plan is to try the anti-motor-boating device, which will probably effectively cure the trouble.

### BACK NUMBERS OF "P.W."

S. T. (Blackburn, Lancs).—"Where can I get back numbers of POPULAR WIRELESS?"

Back numbers of "P.W." are obtainable from The Amalgamated Press, Ltd., Back Number Dept., Bear Alley, Farringdon Street, London, E.C.4. Price 4d. per copy.

### USING ORDINARY VALVES INSTEAD OF SCREENED VALVES IN THE "TITAN" THREE.

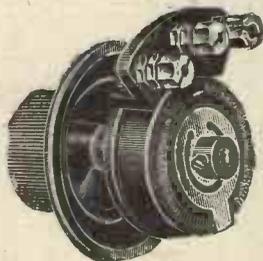
J. R. W. (Devonport Barracks).—"Reading with interest in the correspondence columns of 'P.W.' the fine results of the 'Titan' Three made by home constructors, I have at last made one, but the results were very poor. I have used all the parts recommended by 'P.W.' except the screen-grid valve, using an ordinary valve in the first socket. This might be the cause.

"If I may mention, in the blue print supplied in 'P.W.' the leads from R<sub>1</sub> and R<sub>2</sub>

(Continued on page 268.)



## RELIABLE IGRANIC RESISTANCES



### MEGOSTAT

A variable high resistance giving even and positive control of volume due to special arrangement of arm and track. Also useful as grid leak, stabilising resistance, etc. Four sizes, each with engraved knob and dial, 50,000 and 500,000 ohms, 1 and 5 megohms. Each 6/-

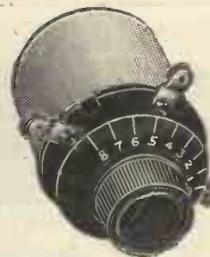


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Wire wound and fitted with positive 8-point rotary switch giving different values of resistance as required. Can be used as variable anode resistance, tapped series resistance or volume control. With engraved knob and dial. Single hole fixing. Two sizes:

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	PR 4	2	.095	120,000	32	R.O.
	PR 9	3.5-4	.063	18,000	14	H.F. Det.
	PR10	3.5-4	.063	10,000	8-7	L.F.
	PR11	3.5-4	.063	88,000	40	R.C.
	PR17	5-6	.1	18,000	17	H.F. Det.
	PR18	5-6	.1	6,500	9	L.F.
	PR19	5-6	.1	80,000	40	R.O.
	POWER 7/6 Each Postage 4d.	PR20	2	.15	7,000	6
PR40		4	.15	7,000	6	"
PR60		6	.1	5,000	6	"
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Wholesale Manufacturers.

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Dovecote

April 10th, 1929.

Your Ref.  
Our Ref. RP/AM.

The Editor,  
Messrs. John H. Lile, Ltd.,  
"Popular Wireless",  
4, Ludgate Circus,  
LONDON, E.C.4.

Dear Sir,  
We feel it is our duty to let you know the really wonderful results of advertising in your journal, in response to our various adverts re our S.R.S. ultra short wave coils for the original and New Coscor "Melody Maker" receivers. We have received orders and inquiries from practically every part of the world, and almost every letter bears the inscription "Seen in 'Popular Wireless', truly a world wide tribute to the reaching power and circulation of your journal.

We are,  
Yours faithfully,  
STONEHOUSE RADIO SUPPLIES.

P.S. You have our permission to use this letter in any way you may wish.

1/3



1/3

W. B. ANTI-PHONIC VALVE HOLDER

**SPECIFIED**  
**for the**  
**MULLARD**  
**S.G.P.**  
**MASTER THREE**

WHITELEY BONEHAM & CO., LTD.,  
Nottingham Road Mansfield, Notts

## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 266.)

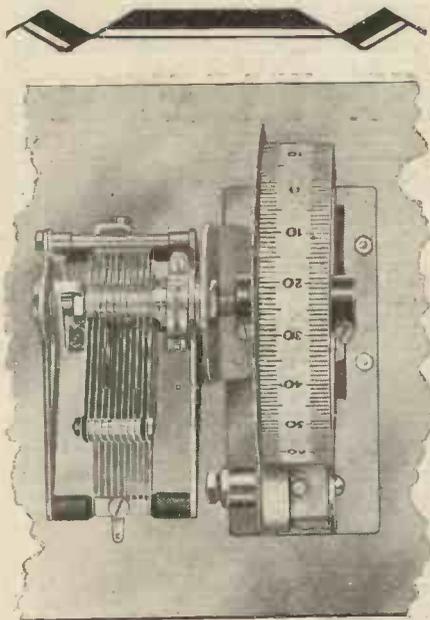


Illustration shows one of the two J.B. Condensers specified for the Mullard S.G.P. Master Three.

# MULLARD SPECIFIES TWO NEW



# CONDENSERS for the S.G.P. MASTER THREE

Completely assembled, as illustrated, ready for fixing to panel in a few moments.

**40/-**  
THE PAIR

Advt. of JACKSON BROS., 72, St. Thomas' Street, London, S.E.1. Telephone: Hop 1837.

are not joined anywhere. I noticed in the 'Titan' Two and 'Titan' One, these leads are joined, does it make any difference?

"Some readers have trouble with the change-over switch, as mentioned in this week's paper. I have the 'P.W.' change-over switch, so I can't be wrong as regards the switch. Using 2-volt valves and 96 H.T.

"Looking forward to further reports of this splendid set, as I cannot trace the fault, I am waiting to see if any other readers have had the same difficulty. As I am greatly interested in the 'Titan' Three I would like to have it right."

You say I have used all the parts recommended by "P.W." "except the screened-grid valve, using an ordinary valve in the first socket." From a technical point of view, this is a simply terrible admission to make.

It is like being a motorist, and saying, "I have blown the tyres up hard, and am using the very best lubricating oil. I have got a fine kit of tools, but I poured water into the tank instead of petrol. Would this make any difference?"

Honestly, to use an ordinary valve in a screened-grid valve set and to expect results like the screened-grid valve would give is no better than to expect water in the petrol tank to give good results in a motor-car or motor-cycle. It cannot be too clearly understood that the screened-grid valve is a special type of valve with special connections, and when it is incorporated in a set efficiently the behaviour of the set rests upon and depends upon the connections to the screened-grid valve.

If you put an ordinary valve into the S.G. circuit it is of necessity one connection short (to the valve itself) and that the most important connection of all; and, moreover, the other connections to such a valve are "all wrong." Consequently in the "Titan" Three, or in any other set depending upon the efficient use of a screened-grid valve, it is absolutely useless and hopeless to try and use an ordinary valve in place of the screened-grid valve.

When considering the above facts do not be confused because you may have seen in "P.W." accounts of how readers have been able to use a screened-grid valve as a detector, although it is not intended as a detector. We know that this can be done, but it is really a pure fluke, and it is only interesting because it is so completely against everyday experience and expectation.

We hope that, just to prove what we have been saying is strictly in accordance with facts and in no way exaggerated, you will be able to purchase for yourself a screened-grid valve, try it on the "Titan" Three, and get the results of which the set is capable. Provided that you have it connected up O.K., and your components are all right, as soon as you put in the screened-grid valve you will receive such a crop of stations that you will be staggered by the capabilities of the set, and by the fact that not only is it essential for a screened-grid valve to be used in it, but that when this is done the "Titan" uses this valve to its full efficiency and with such success in amplifying weak signals as would seem impossible with any ordinary valve.

### ANOTHER "TITAN" BLUNDER.

J. E. R. (Devonshire).—"Having read of the wonderful results by your readers in 'P.W.' of the 'Titan' Three, I made one and I can only get 'phone strength. All components are as used in the famous 'Titan' Three. I am using an ordinary valve in the first socket instead of a screened-grid valve, however, with 100-volt battery. I cannot get better results even by changing leads round, etc., using a Lissen super L.F. transformer 3 to 1 ratio. Could you please put me in the right direction?"

It is absolutely hopeless to expect an ordinary valve to work in place of the screened-grid valve in the "Titan" Three, or in any other similar set. Please see reply given above (to J. R. W.)

Whilst on this subject, we would like to point out, too, that not only is the screened-grid valve totally different in its internal connections and operation from an ordinary valve, but owing to this fact the connections to the valve holder do not correspond with the connections to a valve holder for an ordinary valve. The latter type of valve has connections to grid, filament (two), and the plate. The screened-grid valve itself has grid, two filament connections, and the plate terminal, and in addition to these it has a screening grid.

This screening grid is, for convenience, arranged so as to connect to what would be the plate terminal of an ordinary valve. And therefore when a screened-grid valve is placed in an ordinary valve holder the P terminal on the valve holder is connected to the

screening grid and not to the plate of the S.G. valve at all. The true plate or output terminal of the screened-grid valve is the extra terminal, placed on the top of the valve, so you will readily understand that if you have not been connecting this, the screened-grid valve cannot possibly work, for whatever happens inside the valve is not being passed on to the rest of the circuit.

### THE SILENT SET.

T. N. N. (Woking).—"Ever since last Christmas it has been working fine, and nobody could want better programmes than we had. But last Saturday it was silent, and since then—nothing. What can we do?"

In such a case, the first thing to do is to look over the set carefully and make sure that no lead has come off. If they all appear to be in order make sure that the telephones themselves are working, either by comparison on another set or by testing with one of the methods described in "Radiatorial" from time to time.

If the telephones themselves prove to be O.K., and the set itself has not been tampered with and appears to be normal in every way, the next thing to do is to examine the aerial and earth connections outside. If the aerial wire is touching on a roof or waterpipe, or if the aerial or earth leads have become disconnected or broken you will hear no broadcasting.

Remember, also, that the earth lead may be broken right underground, out of sight, so this test should be a very thorough one; if you cannot find any trace of a broken wire the only likely cause is a break in the wiring inside the set, or faulty contacts, if it is a crystal set.

If it is a valve set incorrect connections of the batteries would be sufficient to cause silence, and of course a similar result would accrue from a broken battery lead. Generally speaking, any broken contact

## "P.W." TECHNICAL QUERY DEPARTMENT

### Is Your Set "Going Good"?

Perhaps some mysterious noise has appeared, and is spoiling your radio reception?—Or one of the batteries seems to be run down much faster than formerly?—Or you want a Blue Print?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers an *unrivalled* service.

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.

**LONDON READERS PLEASE NOTE:** Inquiries should NOT be made in person at Fleetway House or Tallis House.

will disclose itself if gently investigated with the finger by the noises it sets up in the telephones; but remember that if a valve set is being used very great care must be taken not to allow the high-tension wiring (which includes everything connected to H.T. positive) to come into contact with the low tension (which includes everything connected to the filaments of the valves).

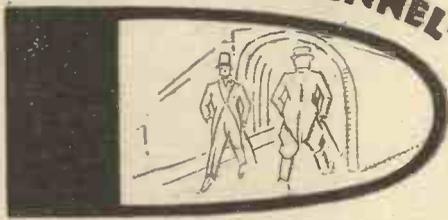
Unless great care is taken the batteries may be shorted or, worse still, the valves may be burnt out. If you carefully go over the set on the lines indicated we think it is certain you will come across a fault, but in the unlikely event of your not doing so we are afraid it means you will have to have expert advice to determine the cause of the failure. By "expert advice" we do not necessarily mean a highly-paid or highly-skilled technician, for, as a matter of fact, it is practically certain that anyone who has used a valve set for a few months, and who is interested in it, will be able to suggest where your fault lies after an inspection of the receiver and of the aerial and earth, etc.

### A QUESTION OF NEUTRALISATION.

F. G. (Ipswich).—"I found no difficulty in adding the high-frequency stage as suggested by you, but I have been astonished at the number of extra stations it brings in. Not only this, but it seems to be much more simple and satisfactory than the other set, and the programmes are more steady and satisfactory

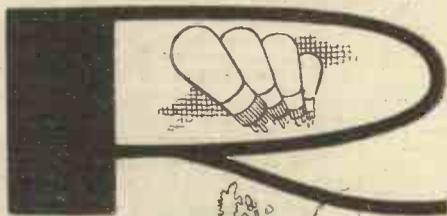
(Continued on page 270.)

# THE CHANNEL TUNNEL-

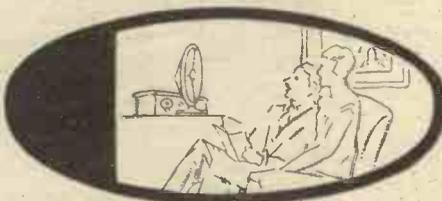


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Super-Power, 1 amp	7/6
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best Copper 7/22, 100 ft. Insulated Aerial.  
**NOT AVAILABLE ON HIRE PURCHASE GOODS.**

# RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 268.)

in every way. I should like to go up the long waves with it, but understand that it will then be necessary to re-neutralise. What is the correct method of doing this?"

The following method of neutralising is recom-  
mended for use in sets employing one stage of H.F.  
and provided with a reaction control.

Set the reaction control at minimum and likewise  
the neutralising condenser. Now, on setting the  
tuning condensers so that the two tuned circuits are  
in step with each other it will probably be found that  
the set is oscillating.

To test for oscillation, touch one or other of the  
sets of plates of the tuning condensers (this may be  
either the fixed or moving, according to the partic-  
ular set). You will probably find that the set will  
only oscillate under the above conditions when the  
two circuits are in tune with each other and this can  
be used as an indication. (It is convenient to perform  
the operation at some point near the middle of the  
tuning range.)

Now increase the capacity of the neutralising con-  
denser. (In the case of such condensers as the  
Gambrell "Neutrovernia" this means screwing  
downwards.) Test at intervals for oscillation as this  
is done, and you will presently find that the set has  
ceased to oscillate and will not recommence, even  
when the tuning dials are slightly readjusted.

Now increase the reaction a little, until the set once  
more oscillates, and again increase the neutralising  
condenser setting until oscillation ceases. Slightly  
readjust the tuning condensers again to make sure  
that the set is completely stable once more. Proceed  
in this way until it is found that the correct adjust-  
ment of the neutrodyne condenser has been overshot.  
Once this point has been passed it will be observed  
that further increases of the neutrodyne condenser  
setting no longer stop oscillation but cause it to become  
stronger.

The object is to find such an adjustment of the  
neutralising condenser as will permit the greatest  
setting of the reaction condenser to be used without  
producing oscillation. It will then be observed that

## HAVE YOU SECURED YOUR MAY "MODERN WIRELESS" YET?

when the two tuned circuits are in step and the set  
is brought to the verge of oscillation a slight move-  
ment in either direction of the neutrodyne condenser  
will cause the receiver to break into oscillation.

It is to be understood that in the preceding notes,  
where a reaction condenser is spoken of, any form of  
reaction control may be understood.

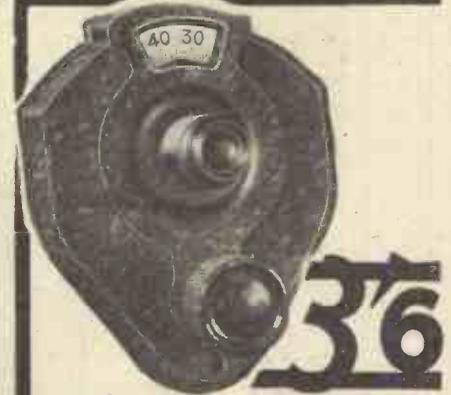
## PREFIXES FOR SHORT-WAVE STATIONS.

"MARINER" (Belfast).—"Now I am ashore  
again I am all at sea with regard to the  
nationality of the short-wave stations, the  
prefix signs of these having been altered while  
I was on my last voyage. Can you give me the  
list of the various countries and the call-sign  
letters which indicate what part of the world  
the signals are coming from?"

The following are the new nationality prefixes:

- |                       |                      |
|-----------------------|----------------------|
| CE Chile              | ON Belgium           |
| CR Azores             | OZ Denmark           |
| CM Cuba               | PA Holland           |
| CT Portugal           | PK Dutch East-Indies |
| CN Morocco            | PY Brazil            |
| CV Routhmania         | RA U.S.S.R.          |
| CP Bolivia            | RV Persia            |
| CX Uruguay            | RX Panama            |
| CZ Monaco             | RY Lithuania         |
| D Germany             | SM Sweden            |
| EA Spain              | SP Poland            |
| FI Irish Free State   | SU Egypt             |
| EL Liberia            | TF Iceland           |
| ES Esthonia           | TS Saare             |
| ET Ethkopia           | UL Luxembourg        |
| F France and Colonies | UN Jugo-Slavia       |
| G Great Britain       | UO Austria           |
| HA Hungary            | VE Canada            |
| HB Switzerland        | VK Australia         |
| HC Ecuador            | VO Newfoundland      |
| HH Hayti              | VP-VS Colonies       |
| HR Honduras           | VU India             |
| HS Siam               | W U.S.A.             |
| I Italy and Colonies  | YL Iraq              |
| J Japan               | XI Latvia            |
| KI Philippines        | YM Danzig            |
| K4 Porto Rico         | YN Nicaragua         |
| K6 Hawaii             | YS Salvador          |
| K7 Alaska             | YV Venezuela         |
| LA Norway             | ZA Albania           |
| LU Argentina          | ZL New Zealand       |
| LZ Bulgaria           | ZP Paraguay          |
| OH Pinland            | ZS South Africa      |
| OK Czechoslovakia     |                      |

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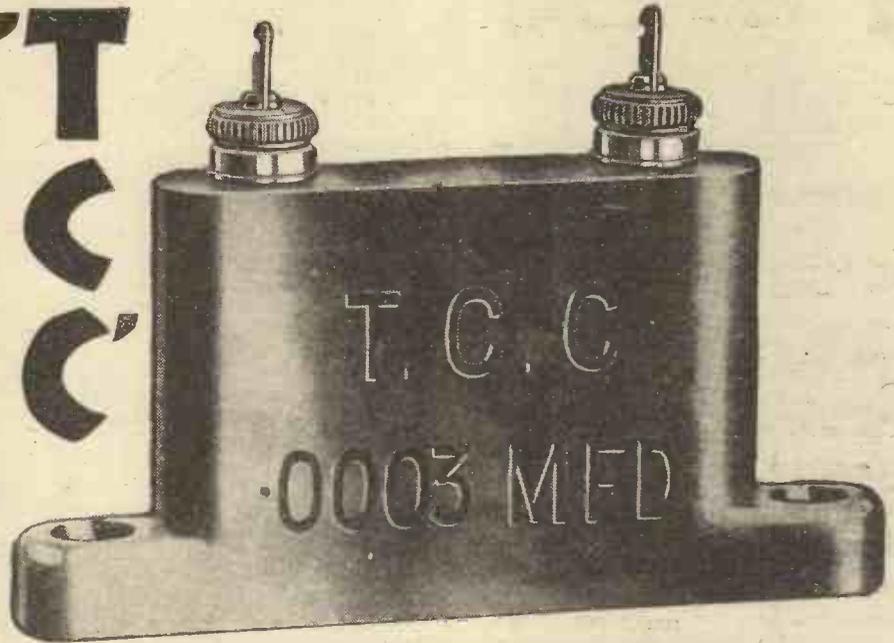
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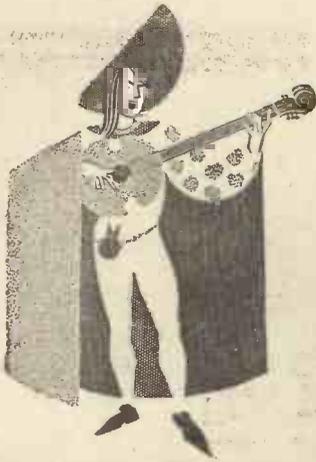
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### TECHNICAL NOTES.

(Continued from page 232.)



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### Broadcasting Difficulties.

If this frequency-modulation arrangement proves to be applicable generally, it should be a great step towards solving what would otherwise appear to be one of the main difficulties of broadcasting in the near future.

### Aerial Efficiency.

I have been asked why it is that receiving aerials are generally of the single-wire type—occasionally twin-wire—whereas aerials used on ships, transmitting stations and in similar situations are almost invariably of the multi-wire type. My correspondent makes the somewhat natural remark that in these cases, where questions of expense and labour of erection are not of primary importance, it is presumable that the best and most efficient type of aerial is used. He comes to the conclusion that if a "sausage" aerial were used for receiving, it should prove much more efficient as a pick-up of energy than an aerial of the single antenna type.

### Effect of Capacity.

Although this is a very natural observation to make, and incidentally one which I have several times before received from readers, it is not really correct. It is true

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are reminded that technical inquiries at Tallis House (or at Fleetway House) cannot be attended to if made in person, so all

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that multi-wire aerials are almost invariably used for large transmitters, but in those cases the aerial is required to have a comparatively large capacity, and a multi-wire aerial of that type has a very much greater capacity than single-wire aerials such as are ordinarily used for broadcast reception.

If the receiving aerial had an unduly large capacity its efficiency would actually be lessened, notwithstanding that it might consist of a multiple system of wires. As a matter of fact, receiving aerials, even when used for reception other than broadcast reception, are generally of the single or twin type.

In short, there is nothing in the idea that large multi-wire aerials should actually be better for broadcast reception, and you will find that a well-insulated single-wire aerial of suitable dimensions, placed as high as possible and as far away as possible from surrounding objects, will give you all the efficiency you may expect.

### E.S. Speaker.

I referred the other day in these Notes to an electrostatic loud speaker, in which a large diaphragm was placed in close proximity to a similar surface, one of the two surfaces being charged to a voltage of 200 to 300 volts. In this type of loud speaker the speech impulses are converted

(Continued on page 274.)

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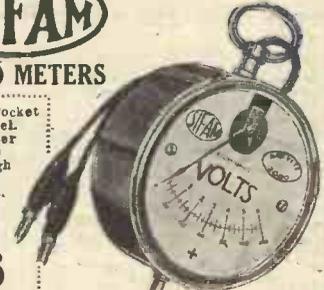
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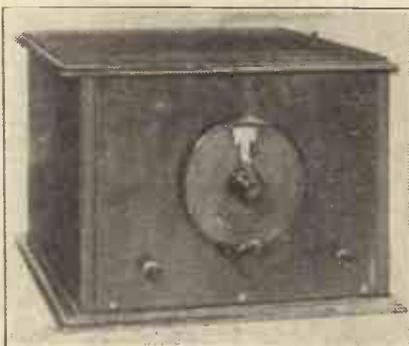
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## TECHNICAL NOTES.

(Continued from page 272.)

into potential variations, and are applied to the system of high-potential surfaces. In this way the speech impulses impose characteristic variations upon the potential difference between the surfaces and so set up mechanical vibrations which reproduce the sound waves.

### Corona Effect.

Another electrostatic loud speaker has lately been developed which has been called the "Corona" speaker; the reason for the name is that the "radiator" is charged up to such a voltage that electric corona discharge is just on the point of taking place. I suppose most of you know what is meant by the corona discharge. It is a phenomenon which occurs quite generally in high-potential apparatus and particularly in high-voltage alternating-current transmission lines. Very high voltage transmission lines are not commonly used in this country, but in the United States and some other parts of the world it is quite a general practice to transform A.C. current to an extremely high voltage before transmission, and then to transform down again at the

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other end. The high voltage transmission lines are quite luminous at night-time owing to the "corona" and "brush" discharge effects which take place.

Apparently in this new "corona" loud speaker the high potential surfaces are arranged in such a way that the voltage at which the corona is formed is fairly critical, and consequently if additional voltage variations—which are derived from a low-frequency amplifier—are super-imposed upon the voltage already applied, the corona effect is precipitated.

### Reproducing Speech.

I have not actually seen one of these instruments at work, but I am told that the production of the corona effect by the super-imposed speech-impulse potentials results in atmospheric waves which reproduce the speech and music just as in an ordinary loud speaker.

Although it is unwise to prejudice anything of this kind, it seems rather a great departure from conventional practice and one always has a natural aversion to very high voltages, notwithstanding that the energy behind such a system may be exceedingly small. I should be inclined to doubt, therefore, whether a loud speaker of this kind would be likely to prove really practical in the hands of an amateur.

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**R**Einartz reaction is so universally-used with a variable condenser as the control that one is apt to forget that there is another way, and a good one at that, of getting the desired effect. Probably the reason is that the alternative, effective though it is, does not suit large sets very well, and so we do not often see it.

This is the idea of the other method: you connect up exactly as in the ordinary Reinartz circuit, with a high-frequency choke in the plate circuit of the valve, and a condenser and reaction coil shunted from plate to filament exactly as usual. This is where the difference comes in: the control of reaction is not obtained by using a variable condenser, but by varying the coupling between the reaction and tuning coils.

**Slightly Greater Sensitivity.**

What was the reaction condenser is now a fixed one of a fairly large capacity (almost anything over .0005 mfd.) which merely acts as a blocking condenser to prevent the H.T. battery from being shorted by the reaction circuit. At first sight there might seem to be no real difference between this scheme and the ordinary one, especially when you see how similar they are on paper, but actually there is a distinct difference.

The point appears to be that there is always a fairly free path of escape for H.F. currents from the plate of the valve to filament. In the ordinary Reinartz, of course, there is no such easy path, unless you happen to be working with the reaction condenser at a fairly large capacity setting.

Just why this easy path of escape should be an advantage is a point not very clearly understood, but it appears to prevent a form of what can be called choking for lack of a better word. In any case, it does often in practice mean that slightly greater sensitivity is obtained from the valve, and so the scheme possesses distinct attractions.

**Effect Upon Tuning.**

True, it has the usual drawback of the swinging-coil circuit, i.e. the necessary two-coil holder with its considerable demand for space. In large sets, therefore, it would be something of a nuisance, but in smaller ones, such as one and two-valvers, it is quite easy to incorporate it. Certainly, it is well worthy of a place in any collection of circuits.

It may not be quite so easy to operate as an ordinary Reinartz (it certainly calls for just a little skill to get the full results), but the performance which it will give in sympathetic hands makes it very interesting to the more experienced user.

The only point calling for a little practice with the circuit is that adjustments of reaction upset the tuning a little more than in the Reinartz type. This, of course, was one of the defects of the older swinging-coil reaction circuits, and it

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takes just a little experience to allow for it. As compared with the older form of the circuit, the one we show has one important advantage: since the reaction circuit is entirely separated from the 'phones, a high-frequency choke serving to exclude H.F. currents from them and ensure that such currents traverse only the reaction circuit, body capacity effects are cut down to vanishing point.

this circuit: the X coil should be a No. 60 for the ordinary wave-band, and a No. 250 for the long waves. The reaction coil should be a No. 35 or 50 for the lower waves and No. 100 or 150 for the long waves.

**The Valve To Use.**

The choice of a valve is naturally a very important matter in any circuit which depends on reaction for its sensitivity, and this one is no exception. What you want is obviously a valve giving the smoothest possible reaction control, and one of the R.C. type with an impedance of from 40,000 to 60,000 ohms is usually good. One of the H.F. type (20,000 to 30,000 ohms) is also suitable, although the R.C. is generally a little better.

Careful adjustment of the H.T. is also required for the best results, and voltages from 30 to 50 or thereabouts should be tried. You will probably find that rather a lower voltage than usual seems to suit the circuit best.

A circuit of this type is really very easy to handle, since there are but two controls. The skill of the operator is shown by his method of using the reaction adjustment. The set will be in its most sensitive and selective condition when the valve is just off the point where it breaks into oscillation.

Hence, in order to make full use of the reaction control, various adjustments of H.T. should be tried and the smallest coil which will produce adequate signal build-up should be employed.

For instance, with a very freely oscillating valve a No. 25 coil would give plenty of reaction, but with a high-impedance valve it would probably be necessary to use a No. 50.

**Vernier Control.**

With a swinging-coil circuit it always pays to choose a two-coil holder having a geared control for fine adjustment. This is a great help towards obtaining that critical point where signals are loudest, but yet not distorted by too much reaction.

Another point to remember is that the H.F. choke must be a good one. A good choke is one that possesses a large number of turns and a low distributed capacity. You will not go far wrong if you purchase one of the well-known makes, but some of the cheap imported types have not sufficient turns for adequate reaction to be obtained on the long waves.

Then, again, there is the question of grid-leak value. For all-round results a 2-meg. leak is perfectly satisfactory, but distant reception is sometimes improved by the use of a higher value such as 5 megohms.

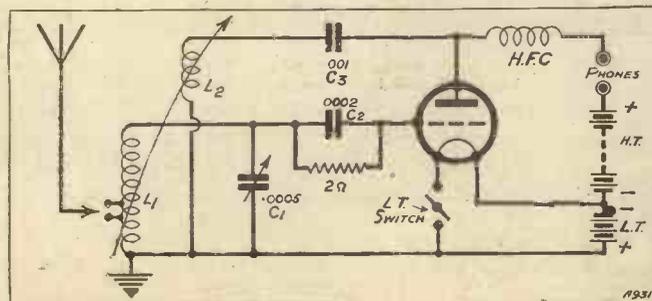
**COMPONENTS.**

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- 1 Cabinet to fit, with baseboard 7 in. deep.
- 1 .0005-mfd. variable condenser, preferably slow-motion or with vernier dial.
- 1 Two-coil holder for baseboard mounting with long control spindle and knob for panel.
- 1 L.T. switch.
- 1 .0002-mfd. grid condenser and clips.
- 1 2-meg. grid leak.
- 1 Sprung valve holder.
- 1 H.F. choke.
- 1 .001-mfd. fixed condenser.
- 8 Terminals.
- 1 Terminal strip, 8 in. x 2 in. x 1/4 in.
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Following from this feature we have as a natural consequence another advantage: if a low-frequency stage is later added to permit a loud speaker to be used, all H.F. currents are prevented from straying into the L.F. circuits and causing instability and bad quality.

The rest of the circuit is on quite normal lines. To obtain a fair degree of selectivity, an auto-coupled aerial circuit is used, this being obtained quite simply by means of an "X" coil in the tuned circuit. These coils, of course, are standard lines which many experimenters will have at hand.

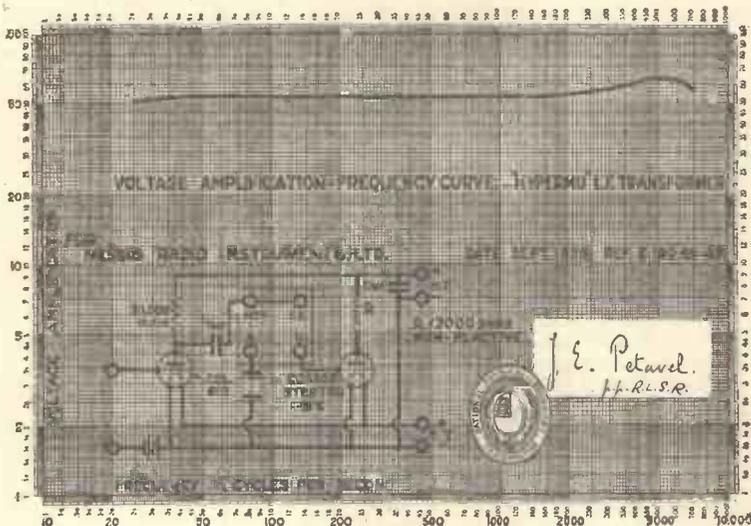
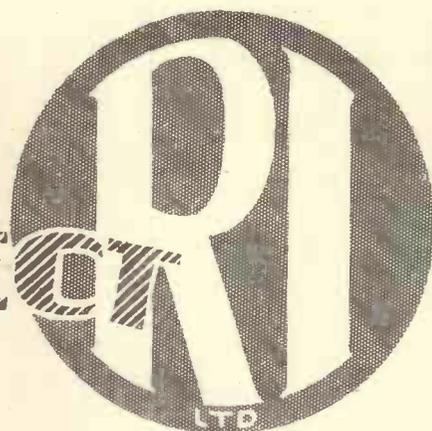
Two different degrees of selectivity are obtainable by means of a variable tapping on the X coil, as you will see in the circuit diagram. The X coil has two terminals or





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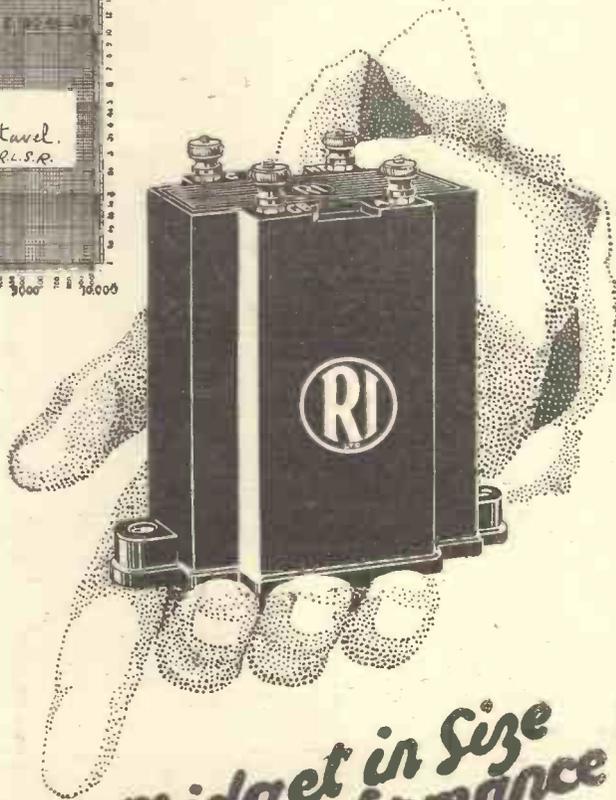
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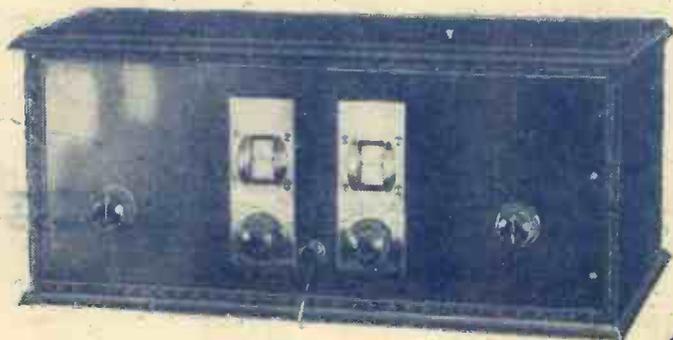
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