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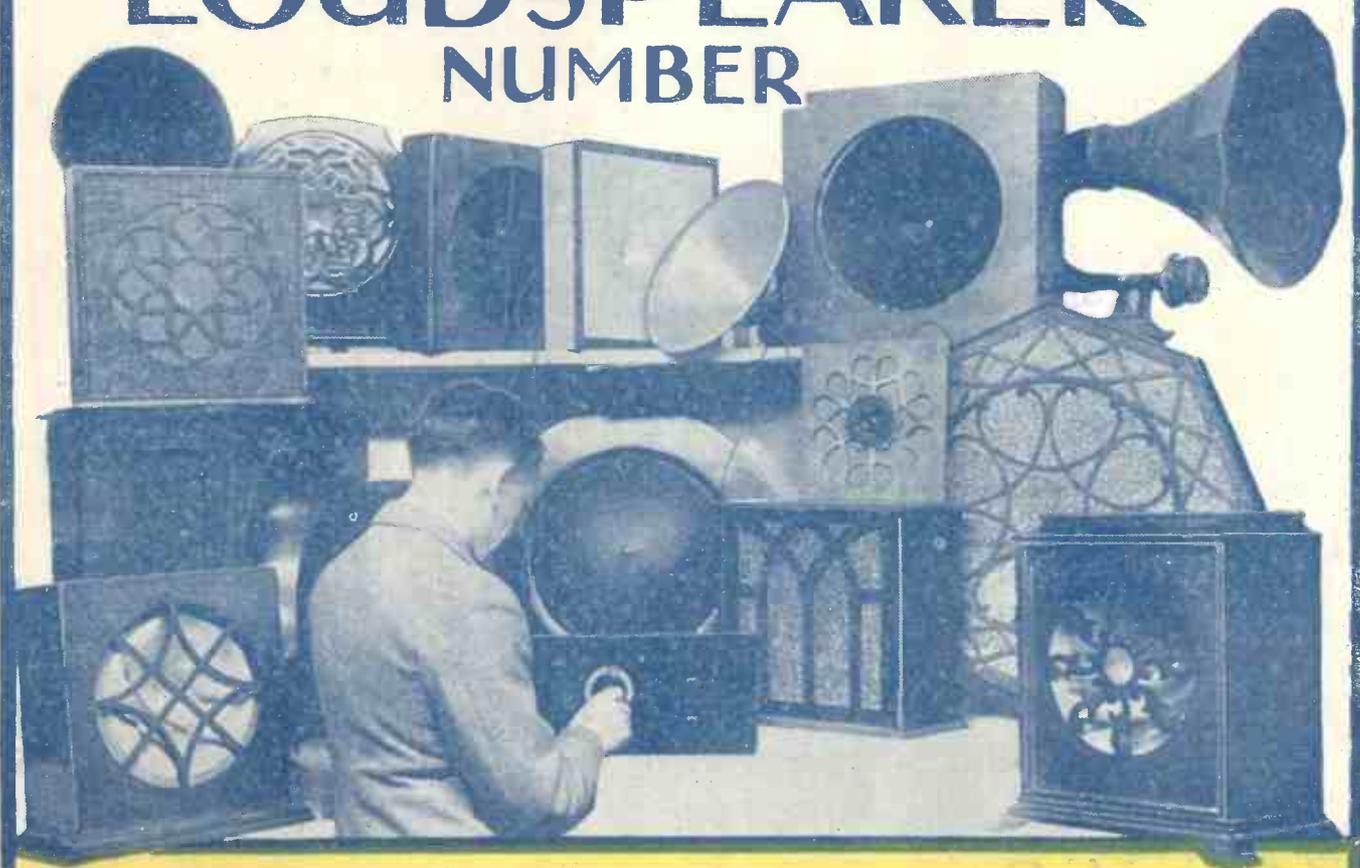
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INCORPORATING "WIRELESS"

August 31st, 1929.

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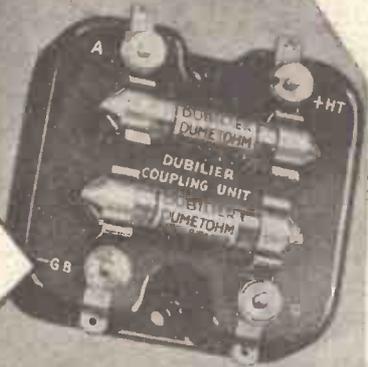
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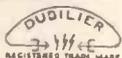
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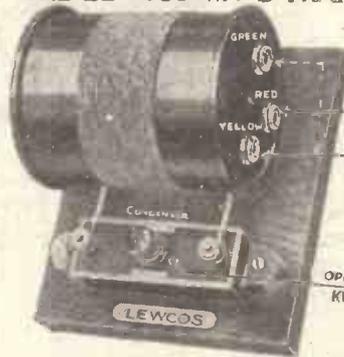
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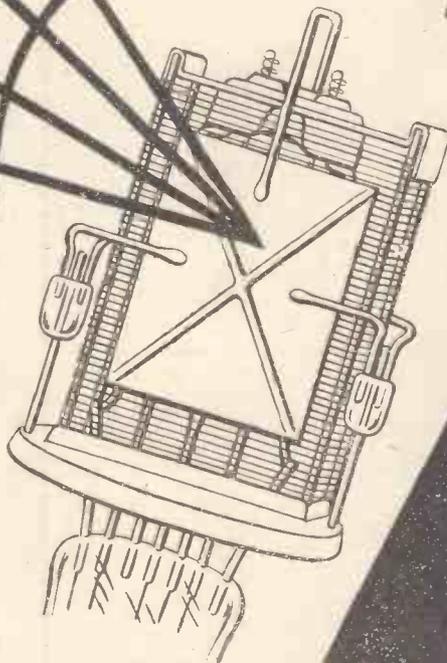
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# Popular Wireless

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THE HUN.  
 LECLANCHÉ CHARGING.  
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 GRAF ZEPPELIN.

THE SCHNEIDER CUP.  
 SIX-FOLD RECEPTION.  
 THE NEW 2 L O.  
 MADEIRA HOLIDAY-  
 MAKING.

## RADIO NOTES & NEWS

### Millions and Billions.

WE can always rely on the U.S.A. Department of Commerce to give us walloping figures such as delight the minds of Americans. It tells us that one billion persons are within range of broadcasting stations and that there is a potential market for two hundred million sets; twenty million sets are now in use, of which two-thirds emanated from the U.S.A. (Hooray!) In November, 1920, there was one broadcasting station and there are now more than 1100, some 600 being in the U.S.A. Anyway, there is only one Albert Memorial, and it is in London!

### The Hun.

THERE is apparently a man in Leyton, E., who plugs his valves direct into the mains or ties them to a 120-volt H.T. battery, with one F. on pos. and the other F. on neg. A. J. B. is this post-war hun, and he confesses to having cremated the filaments of eight valves in five weeks. But why take so long? He asks whether he holds the record and I think that the answer is that he has just beaten the man who burnt out six in a week and then wrote to the valve maker complaining that the valves had gaps in their filaments!

### Leclanché Charging.

I AM desolated to observe that the Standard Wet Battery Company should act like a Standard Wet Blanket and say such horrid things about Mrs. Flowers' Leclanché charging of accumulators as they did in their letter published in our August 10th number. "Merely waste of time and money." Oh, dearie me! So the "last word" has not been said on the subject after all and I hope that much useful information will come from the discussion which is bound to follow.

### A Question of Load.

IT seems to me that the best point made by the Standard Wet Battery Co. is that if the Leclanché battery can charge the secondary battery it might as well—in fact, better—run the valves direct. But no one has replied to my earlier questions as to whether the modern Leclanché cell gives a practicable discharge curve on a continuous load. That is to say, does not this type of cell polarise except when used for intermittent work? If not, I'd be very glad to learn the reason.

### The "Bremen's" Wireless.

I HAVE previously described this ship's equipment, and news of how it worked on its first trip is now to hand. During the last two days it was communicating simultaneously with three U.S.A. stations, exchanging messages in both directions with each. Fifty thousand words were handled during the voyage and the operating staff will eventually have to be increased to ten; though when the proposed brokerage

and will report. He has tagged 7 S W, U.S.A. 7th district, calling G 6 U U Bonnie Scotland, whose wave-length is about 44 metres. He is still waiting for a Q S L card from G 5 J O.

### The "Graf Zeppelin."

A. W. M. asks for data about this airship. Here it is. The wave-lengths underlined are those normally in use. Continuous wave: 2609, 2521, 2440, 2362, 2290, 2222, 2158, 2098, 2041, 1987, 1961, 1935, 1911, 1887, 1875, 1360, 1100. I.C.W.: 900, 800, 730, 705, 669, 600. Telephony: 900. All in metres. Call-sign: D E N N E. Pay your fee and take your choice, they're all milky. The Zepp. is said to carry D.F., and a picture transmitter—besides that gorilla and odd stowaways!

### Schneider Cup Race.

VERY careful plans are being made by the B.B.C. in order to ensure the success of its broadcast in connection with this event on September 7th. The two commentators will be Squadron-Leader Helmore and Flight-Lieutenant Ragg, who obliged in a similar way during the R.A.F. pageant. The talk will go from Ryde Pier by a new cable to Portsmouth, thence by land-line to Brighton and London where it will be S.B. to all stations. This commentary has been offered to Europe, and France, Germany and Italy have accepted it for re-transmission.

### The Indian Situation.

FROM Simla, India, M.M.B. conveys the news that even in that elevated and exclusive spot the loud-speaker fiend flourishes side by side with the demon oscillator. Pity Kipling is not still writing his "Plain Tales from the Hills"! It seems that the Calcutta and Bombay stations of the I.B.C. being only 3 kw. are having a desperate struggle to keep broadcasting alive. As is natural, short-wave work is  
 (Continued on next page.)

## ON A VOYAGE OF DISCOVERY.



The "Discovery," which has just left Wales on a new voyage to the Antarctic, has very up-to-date radio equipment. Here we see Mr. A. J. Williams acting as wireless operator, hard at work in the wireless cabin.

office is established twelve men will be required. One hour's telephony per day was done, the matter spoken being re-broadcast from Berlin.

### Notes from a Log.

OUR old but active friend, A. W. M. (Middlesbro'), weighs in with another of the sort of letter we like. Full of meat, and to the point. He warns us that the address of 5 A R R—U.S.A. 5th district, as given in the Radio Call Book, is wrong. He is trying to get the right one

## NOTES AND NEWS.

(Continued from previous page.)

popular, but as 5 SW begins at what in India is 11.30 p.m. it is not of much use there, a point the B.B.C. ought to consider.

### Lady Leclanché.

MRS. B. FLOWERS, to whom we were indebted for that tip about charging accumulators from Leclanché's, won't accept the compliment I tried to pay her when I hazarded the guess that she was a pig-tailed youngster when I tried my first coherer. No! In a delightful autobiography she does her darndest to reverse the picture and suggests that when 30 years ago she fitted her rooms with electric bells (Leclanché's, I bet!) I was cutting my teeth. It's a shame, and I will not allow her frankness to rob her of my bouquet. However, I look 49, feel like 29 and have 99 years of experience (s). (Her letter was fastened with a baby safety-pin!)

### The Fair Fan.

THIS lady is a fan in female form. She commands our respect for, *inter alia*, having taken "P.W." from No. 1, and our admiration for being what my housekeeper would call "a pr-ractical wummun." Her three-valver is a pot-pourri of "P.W." designs with a switch of her own devising. She believes in plenty of volume because it renders conversation impossible. *What a rara avis*, to be sure! One almost wishes that—ah me! too late!

### Battery-less Reception.

THAT letter from Mr. B. Gladstone, of Omagh (it was printed in "P.W." No. 375, August 10th issue), seems to have created an extraordinary amount of interest up and down the country. Shepherds watching their flocks by night have chuckled at it, technicians have fallen upon it, newspaper men have been hanging round me trying to get a story out of it (*What a hope!*), and altogether, the famous speech in '88 seems nothing to what Mr. Gladstone said in "P.W." about reception without batteries. "Did he do it, and if so how?" appears to be the general attitude.

### How It Was Done!

NOT this the attitude of one of our readers, though! He knows all about battery-less reception, and this is his view.

Heading his notepaper "Blue Heaven, The World, Universe," he sarcastically says: "Here is a well-tryed solution. Replace the two leads to the *expensive* voltmeter with two *sound* ones. (Suspected fault, fractured wire connection or connections, external to voltmeter.)"

What does Mr. Gladstone think of this anonymous Disraeli's view?

### Those Short-Wave Sleuths.

SOME of those energetic short-wave hams, sleuthing round on 17 metres, have been delighted to pick up an American programme there. Moreover, many of them, surprised at the transmission on this wave-length, have written me lately letters full of interrogation—why? wherefore? how come? and what about it? In self-defence I hereby announce that these transmissions were part of a special series

of tests between America and this country arranged with a view to the testing of interchange of programmes. The stations concerned were W 2 X A D, 31.48 metres; W 2 X O, 19.54 metres; and W 2 X K, 17.34 metres.

### Six-Fold Reception.

THAT is an interesting six-fold reception stunt which is being carried out by the B.B.C. in connection with transatlantic programmes. One station at Terling (near Chelmsford) and another at Keston, Kent, are linked together by land-lines each picking up America on three different wave-lengths.

The idea is that if fading affects one wave-length both Essex and Kent will receive it on the other wave-lengths used

## SHORT WAVES.

### WIRELESS FOR REMOTE VILLAGES.

From isolation to oscillation.—"Daily Mirror."

It is now suggested that the matrimonial broadcasts, which are becoming a regular feature in Japan, may result in something like this: "I got to know you through listening-in, and I've had a loud speaker ever since."

Shopkeeper: "No! We don't want no valves, nor we don't want no speakers, and we don't want nothing."

Sales Representative: "What about a cheap grammar book?"—"Mullard Mag."

"A friend in need is a friend to be avoided," says "London Opinion."

The writer of this must own a valve set.

Apropos of the concert-lunches which are now being broadcast by the B.B.C., the "Daily Sketch" writes: "To avoid too much clash between the rival claims of appetite and ear, the programme lasted only an hour."

Quite long enough to cover the soup course, anyway.

Vocalist: "I'm afraid I didn't do very well."

Wireless Announcer: "That's all right. As a matter of fact, through an error, you were announced as 'Farmyard Imitations.'"—"Pictorial Weekly."

A correspondent at Croydon writes: "Our house is close to a railway line, and every time a train passes the loud-speaker reproduction is drowned. How can I avoid hearing the noise of the train?"

Put some cotton-wool in your ears, and the annoyance will become negative.

"Improvement in the sharpness of a super-heterodyne may be had by HUNTING a '0005 variable condenser across the secondary of the filter transformer," we read.

But what about the "closed" season?

A wireless set with loud speaker has been installed in a Parisian shoe shop. Probably the idea is to drown the agonised "Ooh's" of women being forced into shoes that are too small for them.—"The Daily Mail."

at the same time, whilst if local conditions are affecting it at Essex, Kent will carry on, or vice versa, the two combined maintaining a satisfactory level of programme strength. In fact "Vot you loose on da swings, you gain ona da roundabout!"

### London's New Regional Station.

I HAVE, during the past few days, succeeded in picking up my first programmes from the new station at Brookman's Park, though tests without aerials connected have been going on for some time. (Those closed circuit transmissions carry only very limited distances, though perhaps some of the readers in the immediate vicinity of the station succeeded

in picking them up.) I hope that the B.B.C. will take us into its confidence about times and power and so on, now that tests have started, for, after all, we listeners are just as much concerned with the success of the transmissions as they are.

### The Annual "Vacation."

THE popular station of Radio-Vitus, Paris, has, like the rest of the world, been taking a holiday. During the whole of August there had been no regular transmission, but I understand that as soon as there is an R in the month, Radio-Vitus will take the air again.

### Madeira Goes Holiday-Making.

THIS talk of holidays reminds me that the 47-metre station at Funchal, Madeira, which has recently been rather a find for listeners searching for long-distance stations after programme hours, is at present off the air, and will not return again until September. Advantage is being taken of the temporary cessation to increase the power of the station, so when it resumes I expect that it will speak up for itself with great vigour.

### A Radio Fusion.

THIS month sees a gigantic radio fusion as the result of arrangements made between the Edison-Swan Electric Co., Ltd., and the British Thomson-Houston Co., Ltd. Edison's will take over the B.T.H. business in radio, wiring supplies, lighting, engineering, and electric refrigeration, and the Mazda radio valves will in future all be marketed by the Ediswan Co., Ltd., for the B.T.H. people. The effect of this big development in electrical merchandising in this country will be watched with great interest—for, as Jack Payne puts it, "What a wonderful wedding that will be."

### Fultograph Gets Going.

ALWAYS one of the most go-ahead countries as regards wireless, Australia has just fallen for the Fultograph. News which has just reached this country shows that (subject to ratification) the Fultograph agents have concluded a five year contract for the still-picture service with Amalgamated Wireless (Australasia), Ltd., who own the majority of the important broadcasting centres in Australia. Transmissions from Melbourne are expected to begin shortly.

### Those 3 LO Transmissions.

THAT well-known programme producer, Melbourne (3 LO), has been off the air lately, and well I know it, for there has been a good deal of hair tearing on the part of short-wave enthusiasts who have been determined to tune him in or bust. However, at the time of writing, it seems likely that he will shortly start up again, and Fultograph enthusiasts in this country are now hoping they will be able to receive still pictures from the Antipodes.

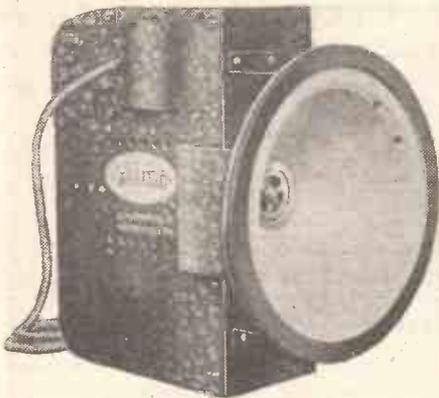
As both 3 LO and 2 SD, Sydney, on 31.28 metres are picked up pretty well in this country, there is no reason whatever why good reception of pictures from the other side of the world should not be possible.

# Operating Moving Coil Speakers

IT sounds from the title of this article that to work a moving-coil loud speaker requires an unusual amount of "wangling" in order to operate it successfully.

This, however, is not the case, though for real success with a moving-coil loud speaker there are one or two points that you have to watch rather more carefully than in the case with the ordinary speaker.

The first thing that you must be certain about when using a moving-coil speaker is that the output from the set shall be



Ferranti M.C. speakers are available in A.C. and D.C. types, the prices being £10 and £0 10s. respectively.

absolutely distortionless. Many sets which distort a small amount give results that are quite pleasing on the average cone speaker, which may not show up the distortion, especially that due to overloading, in the same way as does a moving-coil speaker. Where the latter is concerned, it is essential that overloading and such forms of distortion shall be absent from the receiver, otherwise very bad reproduction will result.

## A "Luxury" Speaker?

Furthermore, in order that the loud speaker shall work at its best it is preferable to have a fairly large output from the set. Super-power valves are almost essential, unless one uses a pentode, for moving-coil reproduction. H.T. voltages should be as high as possible, and it is best to use at least two stages of low-frequency amplification following the detector valve.

The moving-coil speaker is often described as a luxury speaker, but it is certainly far

Here will be found many practical hints upon getting the best possible results from moving-coil loud speakers.

By K. D. ROGERS.

and away ahead of the average loud speaker in the results which it will provide. When speaking of it as the luxury loud speaker we mean that it requires a slightly more elaborate receiver and freer use of H.T. and grid bias, and in the majority of cases (unless a permanent magnet type of loud speaker is employed) requires an energising current for the field before it can be used.

This current is usually of the order of 60 milliamp at 200 volts or so, or 1 amp. at 6 volts. If you have A.C. mains it will be necessary to rectify the current before passing it through the "pot" of the loud speaker, and it is really best to smooth the current somewhat also and not to rely on the inductance of the loud speaker to do all the smoothing.

Where D.C. is concerned, very slight smoothing is useful to get absolutely no hum at all, but with no smoothing only very slight hum is audible when no signals are coming through.

## The Output Valve.

In the writer's opinion the low-resistance loud speaker is preferable to the high-resistance type, although it necessitates the use of an L.F. transformer of the step-down variety between the set and the speaker. This transformer can be used as well as the ordinary output filter circuit of the set, or can take the place of the latter.

In many cases where a loud speaker which is employed is boomy, as some moving-coil speakers are, and lacking in the higher register, the use of a pentode output valve will give very pleasant results. This must be used very carefully in order that rather shrill treble shall not result, and for the average man perhaps the best type of valve to use in the output circuit for moderate room volume is the P.625.

The placing of the loud speaker in the room has a great deal to do with the results obtained from it. Do not jam it right up close in a corner, nor stand it on the floor or near the floor. It should be well up,

at about 4 or 5 ft. from the ground, and should preferably be as far away from a wall as is convenient. It should certainly not face dead on to a straight wall, or reflection troubles will set in.

It will be understood by most of my readers that the baffle-board is an essential part of the moving-coil speaker if it is to bring out any bass, and an ordinary straight baffle-board should not be less than 2½ ft. across.

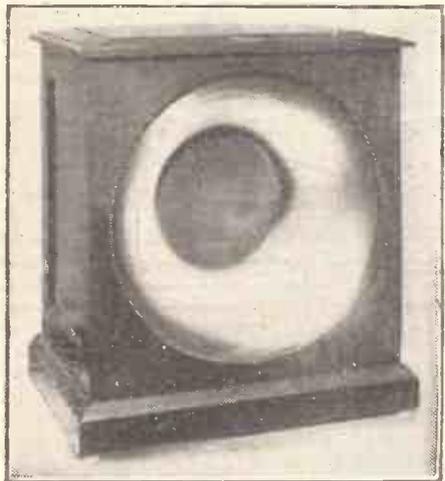
This being rather inconvenient, it is usual to bend the baffle-board backwards, as it were, and to form a backless box. On no account should the back of box be shut, but should be wide open to allow a passage for the sound-waves out of the box.

## Straight Baffle Best.

If you can arrange to have a straight baffle in your room without spoiling the appearance, then certainly arrange to do so. The straight baffle certainly does give more natural results, and the box is merely a convenient way of getting a baffle in a smaller space.

Whatever you do, keep your moving-coil speaker dust free. Dust in the pot and between the pot and the moving coil itself will cause a tremendous amount of distortion and may be very difficult to remove.

Further, treat your loud speaker with every care. It is a delicate piece of mechanism, but, well treated, it will give long and faithful service.



A moving-coil speaker of unusual design is the "Brown."



By J. R. WHEATLEY.

**T**HE filter choke about to be described has a low direct-current resistance, its inductance is high, the cost is low, and, lastly, it can be easily constructed at home.

The former for the windings is the first part to be constructed, and the dimensions for this are given by Fig. 2. The end

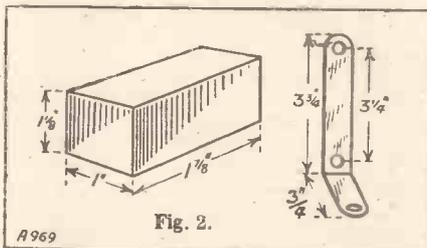


A choke you can build at home.

cheeks and centre tube can be made from thin cardboard, ebonite, or fibre; cardboard, however, proved quite efficient in the choke shown.

#### Preliminary Preparations.

To prevent the cheeks of the former from being forced out when winding, strips of paper are taken through the bobbin and



stuck over the face of the two end cheeks. These strips can be clearly seen in the photograph.

One of the reasons for splitting up the former into four sections is to prevent large voltages being set up between adjacent layers of wire. There are, of course, other

reasons, but we will not worry about these here.

It was found that it was advisable to round the corners of the cardboard discs forming the bobbin so as to prevent the wire catching on same during the winding operation. After the former has been assembled the whole should be dipped into thin glue, for this will ensure that the bobbin is quite rigid.

#### Winding the Choke.

Now comes the only real point at which a certain amount of ingenuity is called for—in actually winding the choke. It is surprising how easily this is accomplished if a block of wood is obtained which just slides inside the former (Fig. 2). A fairly large screw is fixed into one end of the wooden former to act as a spindle. The head of this screw is then cut off with a hacksaw so that the screw can be held in the chuck of a small hand brace. The brace is then clamped to the edge of the table and the result is a very efficient little winding machine.

You will require 1 lb. of 32-gauge S.W.G. enamelled wire to wind the choke, and each slot should be filled in turn. The ends of the windings may conveniently be held in place by means of a little Chatterton's compound or sealing-wax until each section of the bobbin is full.

With the aid of a pair of 'phones and battery the windings should be tested to ensure that the wire has not broken during winding operations.

When you have completed each section they have to be joined in series—i.e. the end of one section to the beginning of the next, and so on. It is best to solder these joints. The actual start of the first section should be soldered to a small length of flex, and to prevent a strain on the wire, at the point of connection to the wire, stick the flex to the bobbin with some Chatterton's or sealing-wax.

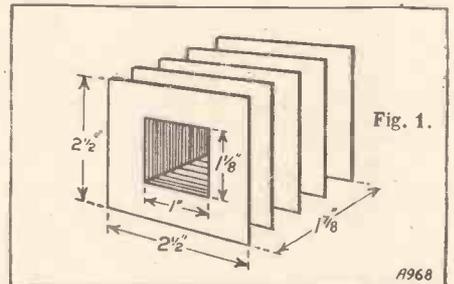
Having assured yourself that the wiring is correct, each section should be covered with a layer of insulating tape so as to prevent possible damage to the windings.

The core itself consists of approximately one-half gross pairs of No. 4 Sankey stalloy stampings. It will be seen from the photograph that there are two different stampings, one "T"-shaped, and the other "U"-shaped. Assuming that the "T" piece is on the left for the first layer, at the next layer the "T" piece is placed at the right-hand side and the "U" piece at the left. The core is therefore built up so that the "T" piece is alternately left and then right.

#### Laminations Must Be Tight.

Pack the centre of the former to its maximum extent, for if the laminations are left loose they will tend to vibrate. Four suitable angle pieces to the dimensions given in Fig. 2 must now be constructed. You will probably find that small angle brackets of approximately the correct size can be obtained from a local ironmonger.

Before clamping the core together by means of these angle brackets and the



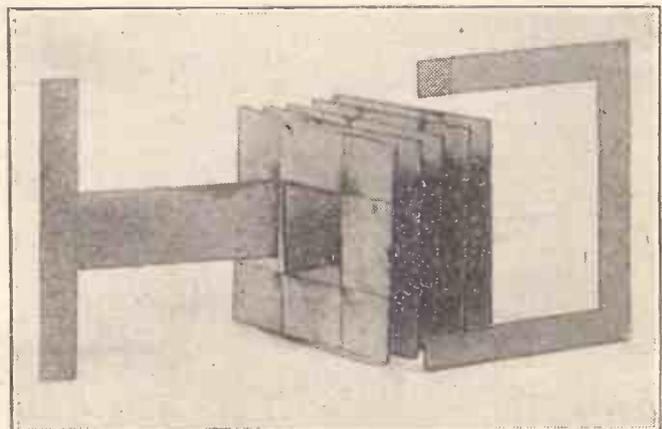
four bolts, a piece of ebonite should be cut, so that when the choke is finished this strip of ebonite is held in place by the clamping pieces.

#### Useful for Filter Circuit.

The two terminals on this ebonitic strip must, of course, be arranged so that the nuts holding them do not come into contact with the core. The screwing up of the four bolts holding the core together completes the choke.

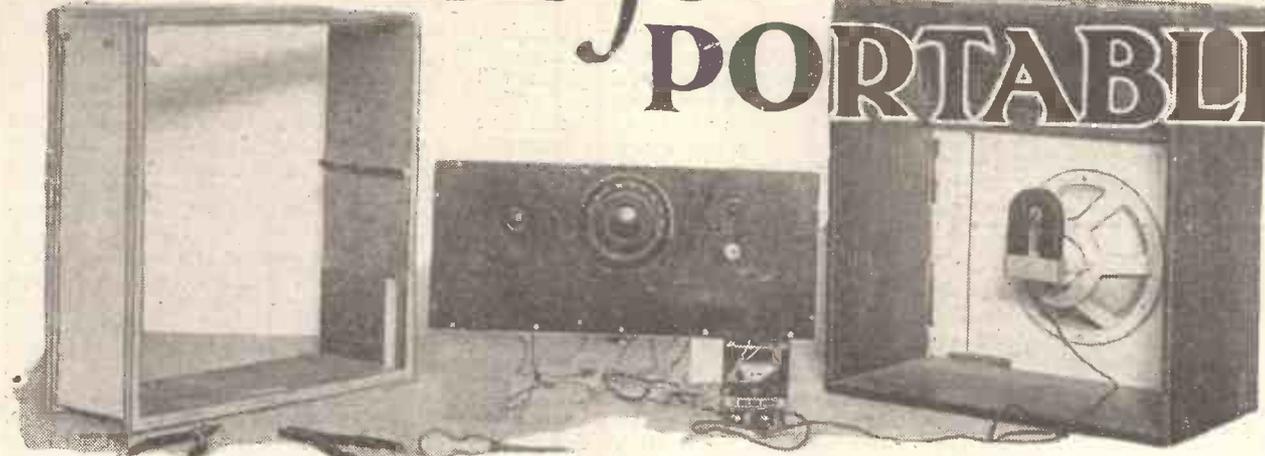
The choke will be found to be quite suitable for smoothing in mains units and for filter output circuits. Here, of course, it should be used in conjunction with a 2 or 4-mfd. fixed condenser, the choke being placed in series with the plate of the output valve and the H.T. positive terminal.

The condenser goes in series with the loud speaker between the plate of the valve and earth.



Showing how the core is assembled with Stalloy stampings.

# SPEAKERS for PORTABLES



ONE of the most remarkable events in radio during the past year has been the accession to high popularity of the portable set. I am rather sorry that this has been the case, for there are remarkably few portables that illustrate what radio really can give in the way of speech and music.

By sacrificing quality of components in order to keep down price some of the makers of the cheaper portables have perpetrated ghastly travesties of wireless receivers.

## A "Cheap" Unit!

You see, a portable set has to make up with extra valves the loss of "pick-up" that a small built-in frame aerial necessarily entails and every added valve means a number of extra components.

A very well-known manufacturer, and one whose reputation is of the highest, told me not long ago that the cost price of the speaker unit in a quite well-known portable set is 1s. 9½d. Here you have an example of "building down to a price" at its worst.

Everybody knows that there is a very great difference between any cost price and its equivalent selling price, but even a mighty organisation of Ford calibre could not produce a decent quality loud speaker unit for 1s. 9½d.

Some of these portables are not so very cheap after all when one begins to examine their make-ups. The radio trade, as a whole, is an exceptionally honest one, but as with all large families there are black sheep who will trade on the common good will.

## An Indication of Quality.

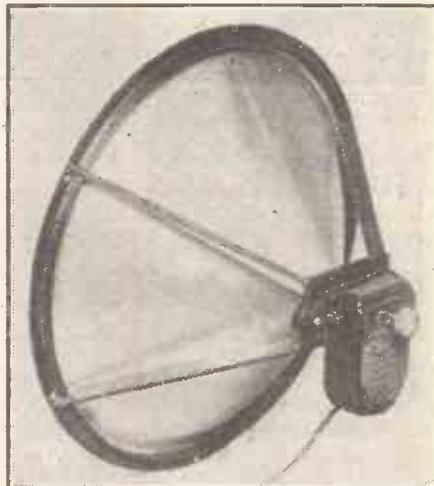
It is a good rule always to inquire closely about the loud speaker of a portable should you be purchasing a receiver of this kind. The circuit and the components will be tightly boxed up and practically inaccessible, but the loud speaker will be fairly easy to examine.

And if the loud speaker is of vague antecedents you can be fairly sure that the set has other doubtful points. Mind you, the fact that the set has a good loud speaker is no complete proof that it is a good outfit, but it is a "good bet" that it is.

Builders of portable sets often experience trouble in the selection of suitable loud speakers. Here are some practical hints on the subject.

By G. V. DOWDING, Grad.I.E.E.  
(Technical Editor.)

Nearly all portable sets have cone-type loud speakers and these are generally mounted in the lids of suitcase models. Inasmuch as the set will generally be placed on the ground it is an advantage to have the loud speaker tilted upwards. That a receiver's design does not include this as a



Nearly all portable sets use loud speakers of the cone type, and this should be well made, with a robust drive. The above is one of the famous Brown "Vee" Units..

feature must not be regarded as a serious fault, because in practice one does not find any difficulty in tilting the whole set.

A portable set is used out-of-doors, and, for this reason, must be capable of providing more volume than an ordinary household receiver. The loud speaker needs to be of the type that can handle hefty inputs and get these away crisply and without "woofiness."

It should be able to hand out plenty of bass or the reproduction will sound horribly thin and reedy in the open air.

Now, I can't say much about the set side of the question in this short article and, in any case, this is a Special *Loud Speaker* issue of "P.W.," but this I must say, it is waste of time worrying about the loud speaker if you are uncertain as to the receiver.

## Home-made Outfits.

The loud speaker cannot repair broken notes. On the other hand a bad speaker can break notes! The constructor of a portable has a wide choice of loud speakers suitable for building into a set. Among makers of completely satisfactory assemblies are Brown, Marcomphone, Squire, Amplion, and others of equally high repute.

As an alternative to the purchase of a complete cone chassis, the constructor can build his own assembly. The most important and the only item costing "real" money is the unit.

There are numerous makes available, and they are all good. First-class examples are the Brown "Vee," Gecophone, Lissen, Loewe, Bullphone, Goodman's, "Blue Spot," and W.B.

The materials for fashioning the cone itself are readily obtainable. These consist of a stiff paper or fabric and ring or sections of a ring of some "anchoring" substance, such as thin and pliable leather.

## Suitable Materials Essential.

The cone should present its concave side to the front, as it is from this side that the higher frequencies will be more or less directionally projected.

As a portable set is generally moved about a great deal the loud speaker must be of substantial construction. Also it should be made of materials that can stand damp or dry conditions. Thus, that rather greasy type of paper is to be recommended for the cone, while wash-leather is hardly as suitable as it might be for the support.

By the way, don't forget to refer to the adjustment of the loud speaker should the unit be provided with a "sensitivity" control. Travelling may tend to jar the instrument out of adjustment. A "domestic" loud speaker can generally be left "set" for very long periods.

## LATEST BROADCASTING NEWS.

**BROOKMAN'S PARK TESTS.**

**FATE OF BIRMINGHAM—ANOTHER BLACKPOOL NIGHT—THE ULSTER GRAND PRIX—SCHNEIDER CUP, Etc.**

**B**ROOKMAN'S PARK will work mostly on closed circuit until the middle of September; it will then go to the aerial after midnight until the end of September. During the first half of October, the new station will be radiating London programmes after 10.30 every night. Then on or about October 15th, barring accidents, all transmission will move over from Oxford Street to Brookman's Park. A similar gradual introduction of the second wavelength will follow later in the year.

**Fate of Birmingham.**

The battle about the future of Birmingham in the B.B.C. system seems to be going badly for those who have been striving to retain the established characteristics of 5 G B. It seems pretty certain that Sir John Reith has accepted the recommendations of Mr. R. H. Eckersley to wash out Birmingham and concentrate the Midlands on London.

Anyway, from hints that have been passed to members of the staff at Birmingham, there can be no doubt that headquarters in London contemplate getting rid of the orchestra and practically the entire staff. If this policy is carried out it will deserve to be described as a perfect example of the deliberate destruction of perhaps the most valuable single asset the B.B.C. has on the entertainment side.

The argument against Birmingham is that with the Regional Scheme all programmes can be better done from London. This line of argument reveals an alarming failure to appreciate an important situation. It also reveals an almost unbelievable ignorance of the value to the B.B.C. of 5 G B programmes as arranged and inspired at Birmingham. And finally, it involves a wholesale breach of pledges to the Midlands.

**Another Blackpool Night.**

Northern listeners will find another "Blackpool Night" in their Regional programme on Wednesday, September 11th. Like its predecessor and the other relays from this famous coast resort during the summer months, the "Night" promises to be well up to standard in popularity, including, as it will, scenes from Julian Wylie's revue, "The Show of Shows," running at the Palace.

These scenes, in which Billy Danvers and Mona Vivian take part, will be followed by music by Spiero's Orchestra, Bertini and his Band, and Max Bruce, the organist at the Tower. Altogether a lively night such as Northerners like and expect from Blackpool.

**Scottish National Players at Aberdeen.**

The Scottish National Players will soon be making their annual tour of the Midlands and the North of Scotland, in the course

of which they will visit the Aberdeen Studio to give a presentation of a one-act play, "The Grenadier," which deals with the domestic side of Highland life on the banks of a loch.

The date chosen for the play is Tuesday, September 10th, and this will be the only occasion during the tour that the players will leave the highways and by-ways. At other times their theatre will be a tent and their living quarters a caravan, this being the only way of presenting their entertainment with the least possible expense to the small towns and villages in the remotest parts of Scotland.

**The Ulster Grand Prix.**

Belfast listeners are to have running commentaries on two important sporting events on Saturday, September 7th. One is on the seaplane race for the Schneider Cup, which, as we have already stated, is to be broadcast from all stations, and the other is on the Ulster Grand Prix Motor-Cycle Race, which takes place in County Antrim.

It is claimed that the Ulster Grand Prix is the fastest road race in Europe. Certainly

it attracts the finest riders, and both C. J. Dodson and Graham Walker, who last year raced neck and neck at over 80 miles an hour for lap after lap, have entered again. A fine wind-up of the commentary will be some short speeches before the microphone by the winners of the various classes.

**Schneider Cup on Sunday?**

By the way, we ought to mention that a running commentary will most likely be broadcast on the Schneider Cup race should the event for any reason be postponed from Saturday, September 7th, to the following day.

A Sunday broadcast of a sporting event is, of course, a hitherto unheard-of thing in this country, though they are given regularly by Continental stations. The B.B.C. are not likely to make any general departure from the policy that has always governed its Sunday programmes, but the Schneider Cup race may present an occasion, which for once will justify such a change without unduly offending the Sabbatarian principles of those who look to the B.B.C. to do the right thing for the majority of listeners.

**A COMPETITION FOR LOUD SPEAKERS.**

Members of the "Eec Radio Society," Tooting, at a comparative loud-speaker test held recently, when voting for quality of reproduction was carried out.

**TECHNICAL NOTES.**

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

**LOUD SPEAKERS.**

QUALITY AND QUANTITY, ETC.

**A**S special attention is being given this week to the important question of loud speakers, I have been asked to devote a portion of these notes to this subject. It happens, as a matter of fact, to be a subject to which I have frequently referred, largely owing to the fresh inventions which are continually cropping up in connection with loud speakers and the ever-changing designs and improvements which are from time to time brought forward.

Naturally, any subject which is rapidly changing forms an appropriate topic for these notes. Another reason why I often touch on the question of loud speakers is that it is a matter of great interest to my readers, as I know by the number of letters which I receive, asking me all manner of questions relating to the operation of loud speakers.

Quality and Quantity.

The design and operation of a loud speaker seem to depend in actual practice upon a compromise between *quality* and *quantity*; in other words, between purity of reproduction and loudness or volume. I suppose every experimenter strives after quality, but at the same time I have always found that people are not satisfied with quality unless they have with it a fair volume.

It is curious how one cannot help being dissatisfied with a small volume in reproduction; this was proved in the very early days of the gramophone, when people simply *would* have plenty of volume even though this might be—and in those days usually was—at the expense of quality.

Fortunately, in these days of improved

(Continued on page 792.)

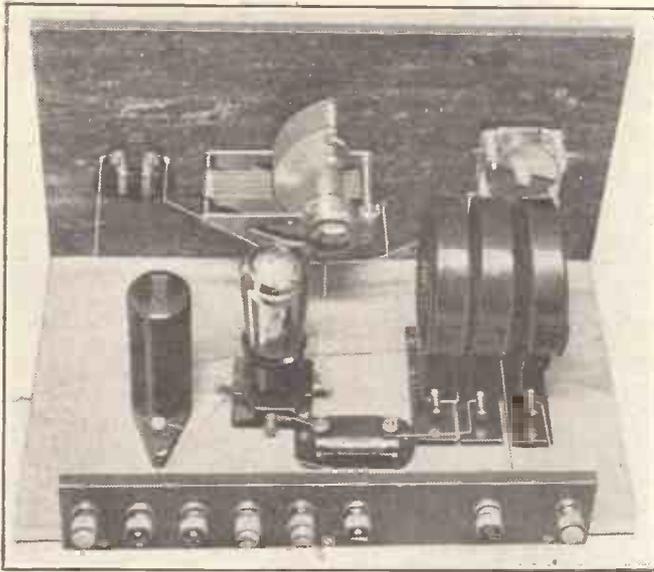




## THE "REACTO" ONE.

(Continued from previous page.)

smoothly or not, so be careful not to do this with the receiver tuned to a station or you may make a nuisance of yourself. If you want to be extra careful and considerate of your neighbours you can do this part of the testing with the aerial disconnected.



A neat layout and direct well-spaced wiring give this little set a very workmanlike appearance.

Now for some miscellaneous points. You will notice that the usual safety "blocking" condenser in series in the reaction circuit has been omitted, and you may be interested to know why this was done. Well, the reason is to be found in the fact that the differential reaction condenser used is of a type in which insulating material in thin sheets is interleaved between the vanes, and so a short-circuit due to the plates touching becomes practically impossible.

In some makes of differential reaction condensers you may find that this interleaving is not used, and in such cases you should certainly add the usual fixed condenser as a safety device. This is how you should do it. Examine the wiring and you will see that there is a lead coming from the plate terminal of the valve socket and going to one side of the reaction coil  $L_3$ .

### A. Simple Modification.

This is the one in which the safety condenser should be inserted. Cut the lead, and take the two ends thus formed to the terminals (one to each) of a fixed condenser of any capacity from .001 mfd. upwards (any odd size you have will serve so long as it is not less than .001 mfd.).

Some people, by the way, seem to be a little puzzled as to the capacity needed for this blocking condenser, and an explanation may be helpful. Well, what we want here is a condenser of such a size that its electrical "resistance" (speaking rather loosely) to high-frequency currents is negligibly small in proportion to that of the reaction condenser.

If we make the fixed condenser seven to ten times the capacity of the reaction condenser we shall have amply complied with this requirement, hence a capacity of .001 mfd. is more or less standard. Larger capacities are not necessary, and are of no advantage, but merely serve just as well, so you can always use up any odd large size you may happen to have. The point is that any size will do provided that it is not so small as to affect the control of reaction. A small point, but a good example of the way a little knowledge will help

you to economise in building sets!

A very interesting feature of this little receiver is its possibilities for successful work on the shorter wave-band. We actually tried it out on quite low waves (down to 20 metres or thereabouts), and although it was not really intended for this sort of work it seemed extremely promising.

### Wonderful Control.

The special feature of the set, namely, the fact that alterations of reaction do not upset the tuning, is preserved to a considerable degree even under these severe conditions.

In the ordinary short-wave set, of course, this is one of the main difficulties, for the slightest touch upon the reaction condenser may send a weak station completely out of hearing, so that one has to search for it all over again. Consequently, to get such a station accurately tuned in and the reaction just right takes quite a bit of knob-wangling, and a certain amount of practice and skill is called for with even the best of short-wavers. This is a point that those who have ever succeeded in tuning in 3 LO will appreciate only too well!

Now, with the "Reacto" One, this does not happen to nearly so great an extent.

True, the effect is there, and it does not behave so perfectly as it does on the broadcast waves, but there is a distinct improvement over the more usual circuits. This feature is one which seems well worth following up.

To use the set on short waves is quite a simple matter. Obtain some of the special short-wave plug-in coils, insert suitable sizes in the sockets, and you are ready for

a first test. For convenience in tuning, however, a .0002-mfd. fixed condenser is desirable in series with the tuning condenser.

## RADIO WRINKLES.

For good quality loud-speaker work a power valve, or preferably a super-power valve, must be used in the last valve socket.

Do not suppose that because the filament of a valve is not broken it must necessarily be capable of giving satisfactory results, for this will not be the case if the valve has lost emission.

One of the best rules for quality is to put "plenty on the plate" of the power valve.

The B.B.C. states that insufficient high-tension voltage is the commonest cause of indifferent reproduction.

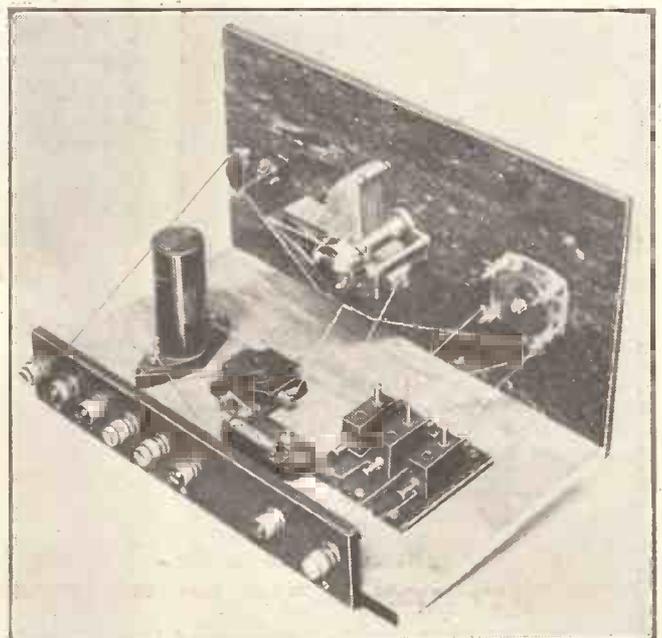
Do not attempt to use an H.T. supply unit unless this has been properly constructed on "safety first" principles.

The H.T. current taken from a dry battery should always be less than the safe discharge rate which it is intended to supply.

When a battery has been in use some time, its internal resistance increases and it is liable to give rise to howling and distorted reception.

Faulty switches in the house wiring often give rise to loud clicks and roars on the loud speaker, which disappear when the switch contact is attended to by an electrician.

If you are mounting a component in a rather inaccessible position, time will be saved in the long run if you test it before mounting, as endless trouble can be caused by a loose screw or similar slight fault.



Here you can see the special type of "differential" reaction condenser used in the "Reacto" One.

# BROADCAST BREVITIES.

By "ARIEL."

IT came as rather a surprise to me the other day to see in the Press a story which made it pretty obvious that the B.B.C. has not yet given up the silly idea of asking people to broadcast for a low fee because the "publicity value" is so great.

This has been a form of inducement ever since broadcasting began in this country, and is one of the most undignified methods the B.B.C. ever adopted for getting programme talent.

A case was quoted in the Press the other day about a novelist who was asked to give a talk on a Scottish subject for the benefit of Scottish listeners. He replied that the fee offered by the B.B.C. was considerably less than he was accustomed to receive for writing an article of the length of, say, an ordinary broadcast talk; and, furthermore, that he would have the extra trouble and expenditure of going to Savoy Hill to broadcast the talk.

According to the "Evening Standard," the author received the plea from the B.B.C. that the broadcast would help the sale of his books, and consequently the author would benefit! Quite rightly, the author, however, refused to accept this inducement.

It is probably true that when a famous person broadcasts, and he is the author of a book or the composer of a piece of music, public interest in him is stimulated to the extent of increasing the sales of his work. But it can hardly be said that this justifies the B.B.C.'s action in trying to obtain programme talent at what may be called "cut rate" prices.

## Stimulating Interest.

Apropos of the effect of publicity methods on the sale of books, it is interesting to note that the idea that wireless would lead to a decline in public interest in books and music, has been pretty well disproved, for recently the Ilford Public Library Committee stated that the music section of the library has been increased by the addition of extra musical scores of Symphonies, Overtures, etc., which are in considerable demand because, of the B.B.C. Symphony Concerts which are broadcast from time to time.

The Croydon Librarian stated, also, that when Sir Oliver Lodge broadcast a series of lectures, the library simply could not deal with the public demand for his works; the same applied when Mr. Bernard Shaw gave a reading of "St. Joan."

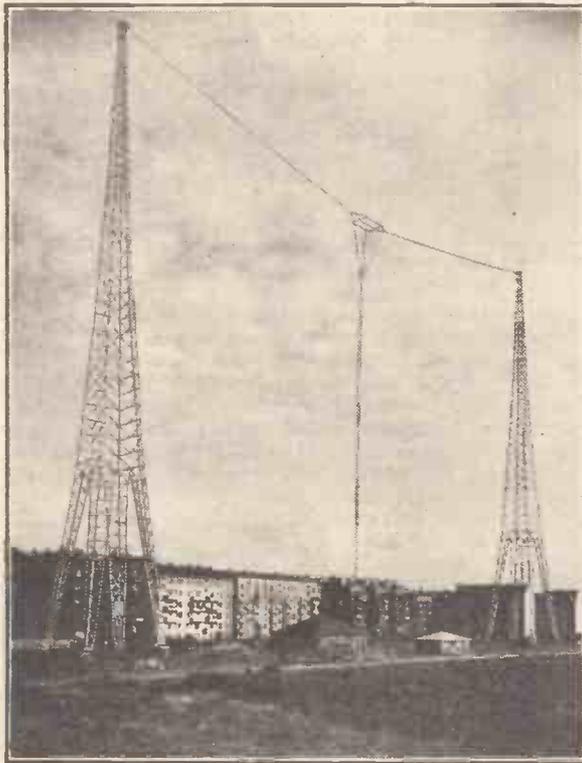
It seems, from an analysis of the reports made by librarians, that popular-science

talks bring in a very large demand for books of a scientific interest, while literary talks usually lead to many people making inquiries about works of fiction and biography which they have heard discussed on the wireless.

That some of the B.B.C.'s broadcasts do stimulate interest of this nature is undeniable, but to wheedle an author into broadcasting a talk because it is going to help the sale of his book is, to say the least of it, undignified in a Corporation which controls an income of £500,000 a year.

## The "Story" of Tatsfield.

It was reported in the Press the other day, as an item of "new news"—as a matter of fact it was at least two months old!—that



The transmitting aerial masts at Hamburg. This broadcaster operates on 372 metres with a power of 2 kw. It can be heard quite easily in this country.

the B.B.C. had built another listening-in post at Tatsfield to replace the old Keston Experimental Laboratory. Readers will remember that this story was given in full in POPULAR WIRELESS some time ago now, but the other day several newspapers printed long accounts of the Tatsfield Station as an item of novelty.

Of course, as our readers know, the B.B.C., some two or three months ago, found that Keston was not big enough to serve as a research laboratory and listening-in post, and so a new site was found high up on the Surrey hills near Tatsfield.

Tatsfield will now become a sort of policeman of the ether, and every night engineers

will be on duty carefully checking the wavelength of each B.B.C. station, and also checking Continental ones. The station will also be used in due course, it is hoped, for picking up United States broadcasts, and relaying them via British stations.

When the President of the United States National Broadcasting Company was over here recently, he hinted that great developments might be expected shortly in connection with the swapping of American and British programmes, and if this desirable arrangement comes about, Tatsfield will play a very prominent part.

## B.B.C. "Ticked Off."

The B.B.C. does get its knuckles rapped sometimes quite unfairly. The other day there was a note in the newspapers to the effect that Captain Barnard, who flew to India and back in record time with the Duchess of Bedford, stated to his regret that he did not know of any British aeroplane which could have done the feat. The B.B.C. happened to broadcast this statement, but, to put it bluntly, got very severely "ticked off" in one evening newspaper for being indiscreet.

But surely it was indiscreet for any newspaper to publish Captain Barnard's expression of opinion. Captain Barnard may be right or he may be wrong, but it doesn't do for newspapers to correct the B.B.C. when they themselves publish news which is not likely to enhance the prestige of British aeronautics. But still, from what we know of the B.B.C., they can well look after themselves!

## FOR YOUR NOTE BOOK.

Bad results always go with bad insulation.

If your set is situated near to a B.B.C. station a large aerial may not be necessary or advisable.

One advantage of using a small aerial is that you will stand a better chance of picking up foreign stations than when a large aerial is being "swamped" by a nearby transmitter.

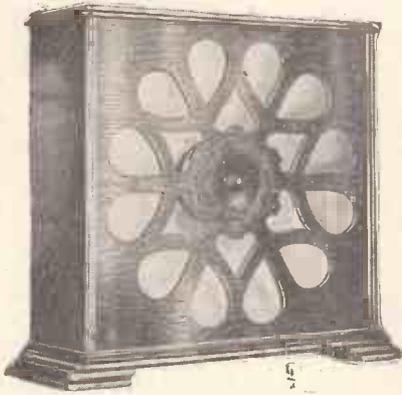
Always bring the lead-in from the aerial straight to the set where it is possible to do so, so as to keep the aerial and earth leads as short as possible.

If you are going to listen in several rooms at once, keep the set itself in the room to which the aerial comes, as it is easier to extend loud-speaker leads than to carry the aerial itself through to the set.

Avoid the same earth connections as is used by a neighbour because, although in some cases this practice is O.K., it is often one of the causes of interaction between sets.

It is not safe to assume that ordinary coils can be used anywhere instead of binocular coils, for the latter are often employed by designers specifically on account of their relatively small fields.

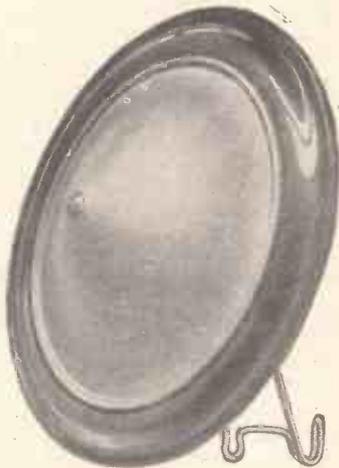
If a home-made anode resistance of Enameline rubbed on "P.W." paper is cut into strips 2½ in. by ½ in. wide this will make quite a good grid leak when suitably mounted.



**THE JUNIOR CABINET CONE.**  
Height 13½ in. Base 14½ in. Depth 6 in.  
A.C.4. (Oak) £3:0:0  
A.C.4M. (Mahogany) £3:3:0



**THE SWAN NECK.**  
Height 20 in.  
Flare 12 in.  
A.R.9. 27/6.



**THE STANDARD OPEN CONE.**  
12-inch Cone. Overall diameter 16½ in.  
A.C.21. 39/6.

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**BETTER**

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**18 MODELS  
21/- to £16**



**ON AN**

**AMPLION...**

## SHORT-WAVE NOTES.

Our contributor gives a further list of short-wave broadcasters and discusses the rapid development of the ultra short waves.

By W. L. S.

SINCE the publication of the last authentic list of short-wave stations, which was in POPULAR WIRELESS for May 4th, I have collected a certain number of other particulars, all of which may be regarded as quite reliable, and these are published in the form of a small table herewith.

I have had a very interesting letter from a reader this week. He raises too many points for me to deal with them all herewith (I have already answered him by post), but one query struck me as particularly interesting. He says, "I regularly meet two kinds of short-wave fans. One lot says that

14-83	D G W	Nauen	2 p.m. to 9 p.m. Telephony with Buenos Aires.
15	W 2 X A W	Schenectady	
15-03	L P 3	Monte Grande	Telephony with Nauen, as above.
18-8	P L G	Bandoeng, Java	Weekdays, afternoons.
27-8	P L R	Bandoeng	Afternoons, 1 p.m. onwards.
31-6		Copenhagen	Afternoons and evenings.
33-7		Posen, Poland	Late evenings, irregular.
37-8	D O A	Doberitz	4 p.m. to 8 p.m. Music and speech.
47	C T 3 A G	Funchal, Madeira	Saturdays, after 10 p.m.
49-5	W 8 X A L	Cincinnati	Relays of W L W at various times.
84-25	O Z 7 R L	Copenhagen	Irregular times.

short waves are like nothing else in wireless, that you have to use screening, extension handles, etc., etc., if you want to get anything at all, and that the whole thing is hopeless for a novice; and the other says that short waves are just the same as broadcast waves except that you have to use your common sense and take a little more care. It seems to me as if the first lot have a grudge against the short waves because they are not too successful themselves."

### Not Really Difficult.

I think that has hit the nail on the head squarely and truly. Those who make one or two alterations to their broadcast set, get it oscillating on 20 metres, style themselves short-wave experts on the spot and listen for Australia the same night will not be very successful. But those who take their time over it, think things out for themselves, and bring a little brain to bear on the matter, simply can't help making a good job of it.

On thinking over my own case, I cannot say that I have ever experienced any diffi-

culties connected with short-wave work that were not directly connected with some perfectly stupid little trick of my own, or any that could not have been spotted at once by a little cool, collected thought. Of course, being somewhat of an old-stager, my short-wave experience has been gained slowly and by gradual degrees.

The first taste of it was the strain of getting down from 365 metres to 180 metres or so, whither all the amateurs migrated when 2 L O started up in 1922 on the 365-metre wave. It was fairly easy, though, and after that the trek to 125 metres was a reasonable procedure, and the next step to 90 metres positively simple. And so it has gone on, with the result that I don't know where long waves start and where short waves begin, as far as designing a set is concerned.

It is, I suppose, quite logical, therefore, that I build my broadcast receivers on the lines of short-wavers, and that for that very reason they are all the better as broadcast receivers, and, also, all the easier to convert into short-wavers when I want to do so.

Short waves, after all, are a serious test of efficiency, and if a broadcast receiver, with the right coils and the right condensers, refuses to behave like a gentleman on the short waves—well, it is either the fault of the receiver or of the operator. It's not a bit of use growling and calling the short waves names—it isn't their fault!

Where the short-wave business will stop there is, of course, no knowing at all. The amateur transmitters in the United States are allotted by the Government a wave-length band in the neighbourhood of  $\frac{1}{2}$ -metre (75 cms.!), and this band has been officially opened by a transmitter and receiver already! And who dares say that this is the limit?

### The Ultra-Short Waves.

Even below 7 metres or so we strike some very funny effects, although apparently 5 metres is capable of acting as a rational

radio wave. Incidentally, I believe two British amateurs still hold the officially confirmed record for communication over 50 miles or so on 5 metres—G 6 T W of Nantwich, and G 2 D T of Burgess Hill. This distance is of the order of 200 miles.

The coming Radio Exhibition will have much in the way of novelty to offer the short-wave enthusiasts, unless I am much mistaken. I know for certain of two receivers that will be exhibited, both of which are very advanced in design and somewhat revolutionary in some ways. Also the number of broadcast receivers convertible for short-wave work is far greater than at any previous show.

Y I L M, operated by Mr. C. D. Conneron, Box 117, Baghdad, Iraq, is running a regular schedule of transmissions on 10 metres, and would be grateful for reports from this country. His times are: Mondays and Fridays at 04.45 to 05.00 G.M.T. Tuesdays, 17.00-17.30 G.M.T. Saturdays, 10.00 to 10.30 G.M.T., and 14.00 to 14.30 G.M.T.; and Sundays from 07.30 to 08.00 G.M.T. It will not be possible for him to receive on this wave-length until October, on account of interference from electric fans!

I also understand that Mr. F. L. Hogg, of G 2 S H, is going to Iceland in September, and hopes to be operating with the call T F 2 S H on 40 and 20 metres. He also hopes to operate T F 3 T F on about 192 metres.

### Limited Telephony.

The amateurs in this country seem mutually to have agreed to limit the amount of telephony and gramophone transmission that they carry out on the 40- and 20-metre wave-lengths. In fact, I believe those of Northern Ireland have agreed not to use telephony on these waves on Sundays at all, in order to give the low-power man a chance to carry out long-distance tests.

This is certainly the right spirit, for there is no doubt that telephony (especially over-modulated telephony) is a deadly source of interference in the narrow wave-bands that the amateurs have been allotted. Unfortunately it is impossible to persuade the amateurs of foreign countries to agree upon the subject, and the French craze for "raw A.C." now seems to have given place to a fresh craze for heavily modulated "phonie."

Incidentally, why is the 150-175-metre band so deserted nowadays? I have had my own transmitter up there several times and let off a few test records, but never have been fortunate enough to hear more than about three other stations working at the same time. I should be glad to see some evidence of interest on this band, as it is very useful for local working and very interesting in more ways than one.

### THE "ANTIPODES ADAPTOR."

The Editor, POPULAR WIRELESS.

Dear Sir,—One Saturday night I "hooked up" this circuit; the wiring was so rough that I did not expect results. As I did not have a '0005-nfd. fixed condenser I used a '0003-nfd. variable condenser. The results were very good. Between 00.30-02.00 G.M.T. I logged the following (in addition to reading commercial stations and listening to 2 X A D on 19.56 for half an hour): W 3 P F, W 2 A E F, C W 1 B M, W 1 D A, W 1 A N S, W 2 B K S, W 2 J A W, W 1 A F D, C E 5 A G, W 2 V O U, W 2 A O G, W 3 J A, W 9 F B W, W 2 D K S, W 1 G S, C E 1 A B, W 3 M F, W 9 D B, W 2 S J—all at Q.S.A.5.

On Sunday I rebuilt the set, but arranging the layout differently, and on test in the afternoon heard W 2 X A D (America) giving phonograph records. The speech could be understood easily two feet from the 'phones, when fading allowed it to come up to strength. Unfortunately the accumulator retired from active service, and I have not had another go yet.

I forgot to mention that I tried the old circuit on the first test and the "ham" signals were all (save

### CORRESPONDENCE.

#### THE "ANTIPODES ADAPTOR" PENTODE AS DETECTOR.

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.

one or two) Q.S.A.3. while careful tuning was required to fetch in W 2 X A D.

I have wound fresh coils of superior design (?), and will forward a further report on the "A.A." at a later

date. The "A.A." to my mind converts a Q.S.A.1 to Q.S.A.3. Yours faithfully,  
Calne, Wilts. B. HANHAM,

### PENTODE AS DETECTOR.

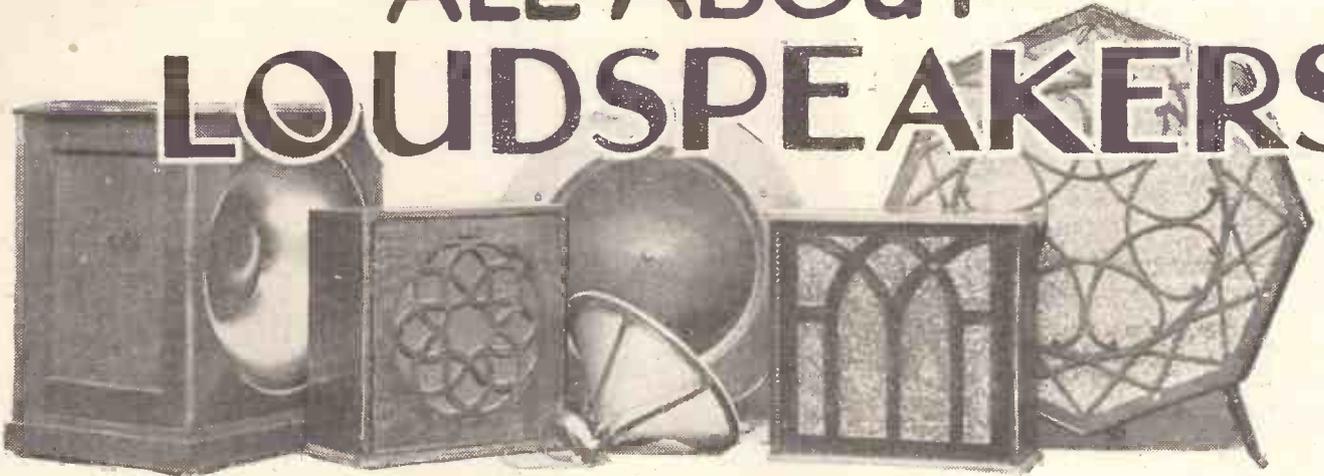
The Editor, POPULAR WIRELESS.

Dear Sir,—Some short while ago a circuit called the "Depeu" Two appeared in your paper. Desiring to make a one-valve set, I made this set up as far as the high-frequency choke. I got excellent results, tuned in 2 L O, 5 G B, 5 X X, and several foreign stations, of course using the earphones. Having a pentode valve on hand I inserted this into the set, and am now getting good quality reception on a small loud speaker. 2 L O comes in well, 5 G B quite good, and 5 X X well. I use 60 volts high tension. I am 30 miles from 2 L O and over 80 from 5 G B.

I shall be interested to learn whether any of your readers have used a pentode in a one-valve-set, working a loud speaker.

When using the earphones I am able to get as many stations with the pentode as with an ordinary detector. I enclose my card and remain Yours truly,  
"WEEKLY."

# ALL ABOUT LOUDSPEAKERS



MUCH has been written about loud speakers, and still more will need to be before most of us will be able to get a true understanding of these remarkable devices. For they are remarkable, even though they have long since passed the stage of novelty.

As an intelligent inquirer, you are probably asking yourself—and others—a string of important questions. “Which is the best loud speaker?” “Which is the best value for money?” “Are the expensive speakers really worth the price?” “Why does the So-and-so loud speaker, which sounded so well on Mr. Jones’ set, seem so poor with mine?”

**“Shut Your Eyes.”**

These are but a few of the questions which arise in everyone’s mind. A simple answer cannot be given to any one of them, and I doubt whether all can be answered satisfactorily even if a book were devoted to the task. But we can, by studying the facts, form certain conclusions, and I hope in this article to be able to give you at least a little guidance.

I want you, then, first of all to picture in your mind a broadcasting studio with an orchestra grouped around the microphone and playing a selection. Imagine yourself standing just behind the microphone, or in some other favourable position for hearing. Shut your eyes, and you will

In this article the whole question of loud-speaker reproduction is discussed in an interesting and practical manner.  
 By PERCY W. HARRIS, M.I.R.E.  
 Editor of “The Wireless Constructor.”

still have no shadow of doubt that you are listening to a real orchestra.

Now transfer yourself to your home, where you have a wireless receiver and a loud speaker. Stand as far away from the loud speaker as you were from the orchestra in the studio and shut your eyes once more. Could you honestly say that the results are indistinguishable from the real orchestra? If not, just wherein lies the difference?

**Is it the Real Thing?**

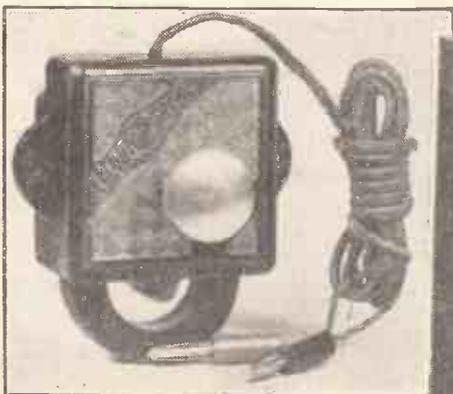
I wish every investigator would adopt this attitude of mind, for it would remove many prejudices and would help us to get so much nearer the truth. As it is, a number of people have become accustomed to a certain kind or type of distortion, and mentally compare any reproduction they hear, not with the original sounds of the studio, but with this false standard that they have set up.

Every one who makes any pretence of judging loud-speaker reproduction should periodically take the opportunity of listening to bands, orchestras, and speakers of the type they hear over the wireless. I know for a fact that many critics of loud speakers have not listened to the “real thing” for so long that if, by chance, they were to hear perfect reproduction, they would measure it up against their own false standards and call it bad.

**The Question of Direction.**

Perfect reproduction is not as yet obtainable, although something approaching it can be had, and you must not forget that even if the sounds issuing from the loud speaker were a perfect copy of those originating in the studio, the effect upon your ear would not be the same as those issuing from the orchestra, for the simple reason that sounds from a loud speaker all come from one point (or, at least, from a relatively small area), whereas in a full orchestra the sounds arrive from several angles. The difference is comparable to that between an ordinary flat photograph and a stereoscopic picture. Indeed, there are some signs that future developments will come along what may be called “stereophonic” lines, so that the illusion of

*(Continued on next page.)*



The Loewe loud speaker drive is shown above, and the centre photograph shows a typical portable set with cone loud speaker incorporated.

Above is shown the well-known “Blue Spot” unit, that is easily fitted to drive a conical diaphragm.

# WHEN YOU ARE CHOOSING A NEW LOUD SPEAKER

different sounds coming from different directions may be produced.

The next point I want to make is that the loud speaker must not be considered as a musical instrument. "Quite so!" I can hear you say. But, believe me, I do



The "Magnavox" version of a dynamic loud speaker

not say this in any sarcastic spirit, but only to emphasise a vitally important point. The fallacy that a loud speaker must be considered as a musical instrument has, perhaps, done more harm in design than any other of the many fallacies in radio.

### Free from Resonance.

The function—and the sole function—of a loud speaker is to convert the fluctuating electric currents fed into it into corresponding sounds. The perfect loud speaker

must have no character of its own, and must impart no individual coloration to the music. It must be completely free from resonances, which means that it must not tend to accentuate certain frequencies at the expense of others (although, as a matter of fact, far too many speakers are designed to make up for woeful deficiency in low-note reproduction by just such a box resonance). While a pleasing effect is sometimes obtained in this way, it is a false effect and one which is fundamentally unsound.

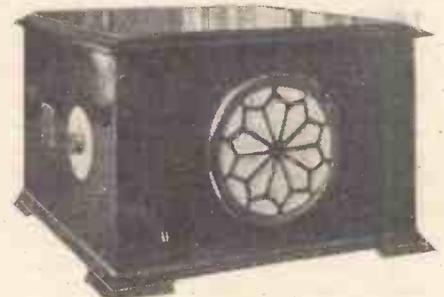
### The Naked Truth.

Loud speakers should be as characterless as a sheet of glass. When a loud-speaker maker tells you that his speaker "imparts a certain tone" to the reproduction, he means well; but, to use a plain phrase, "he is talking through his hat." If you went to a glazier for some window glass, and he told you his glass "imparted a pleasant pink coloration to the view," you would probably say, "Yes, that is very nice for those who want pink, but I want to see the view as it is." If such a loud-speaker manufacturer really knew the facts—which he probably does not—and by some stroke of magic were made to tell the naked truth, his statement would probably be: "My loud speaker gives a fairly uniform response to frequencies between 400 and 1,000, and falls off very badly after about 3,000. At the lower end of the scale, it gives nothing at all below 100, precious little at 150, and begins to wake up about 200. Somewhere about 250 it is abnormally sensitive, with a tendency to accentuate frequencies round this figure, and this gives it that slight boominess which I like to think is good low-note reproduction, but is not." No; a loud speaker must not "impart," but only reproduce.

You may think I am drawing a very pessimistic picture, but all I want to do is to place before you the basic facts about loud-speaker reproduction, and to re-

move, if I can, some misleading impressions. We shall never make any real progress unless we face these facts, and it is to the credit of a large number of loud-speaker manufacturers that they are now doing so, with the result that loud speakers, on the whole, have improved tremendously within the last year or two. Indeed, the range from which we can make our choice nowadays and the remarkably good value offered, is one of the best signs of progress I know.

At one time sets worked considerably in advance of loud speakers, and were able to respond to frequencies much lower and much higher than those which the best of the loud speakers could render. Nowadays the boot is often on the other foot, and unless we carefully design our sets, or choose them well, we may be in the position of owning a loud speaker which is much better than the set feeding it. After

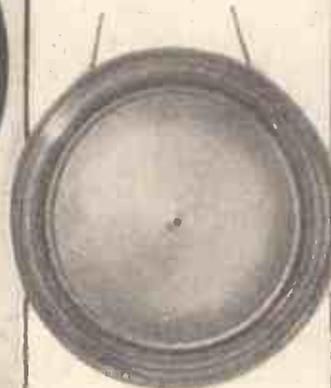
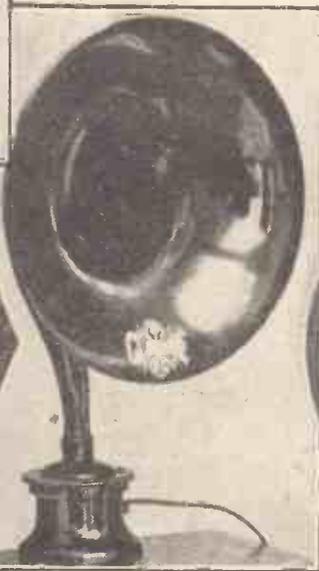
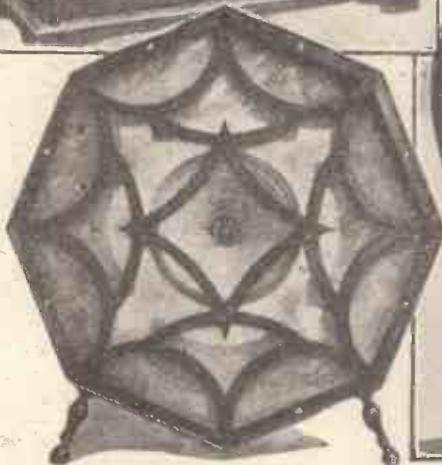
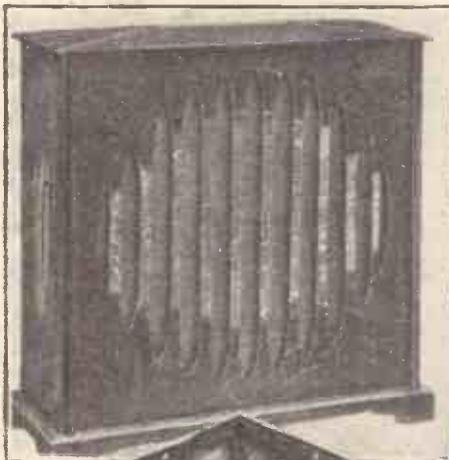


This is the famous B.T.H. Junior R.K. (Moving-Coil) Reproducer.

all, no loud speaker can reproduce tones which are not present in the output of the set, and the value of a uniform response curve in a speaker will be lost if the output of the receiver used with the speaker is not correspondingly uniform.

### High Notes and Low.

All loud speakers which come into my laboratory are tested for frequency response, sensitivity, and ability to stand a good load, which reminds me of another prevalent fallacy—that certain makes of speaker easily overload. My experience



Here many famous loud speakers are shown grouped together, the models covering a variety of designs for standing upon the table, or hanging from the wall. Reading from the left: Amplion plaque loud speaker. The last of the left-hand page photographs shows the M.P.A., the handsome cabinet model to the right of this being the Amplion "Lion." Next is the

# ER—MAKE SURE YOU GET A DEMONSTRATION.

goes to show that there is hardly a loud speaker sold which will not give, without overloading, a strength of reproduction far in excess of that which is comfortable in any ordinary living-room, and that the sounds put down to loud-speaker overloading are almost invariably due to overloading of the output valve.

So far as frequency response is concerned, we have to remember that it takes far more power to reproduce low notes than high. All loud speakers whether of the moving-coil type, balanced armature, or clamped diaphragm horn type, produce sound by imparting certain vibrations to the air. Only a small amount of energy is required to give a loud high note, but a surprising amount of power is required for those deep organ notes in the neighbourhood of 50, 75, or 100, if the same strength is to be obtained.

### “Moving-Coil Boom.”

If you have the opportunity and are able to listen to a first-class moving-coil loud speaker fed from a properly designed and operated amplifier, reproducing the low notes of an organ, you will actually see the diaphragm moving in and out quite a considerable amount in order to impart sufficient energy to the air to give the necessary low tones. The ordinary reed type of loud speaker is totally unable to respond to these very low notes, but by responding to harmonics of these notes, gives a suggestion of them which often passes for the real thing.

The good low note reproduction given by moving-coil loud speakers has rather tended to divert our attention from certain important upper frequencies, and quite a number of home-made moving-coil loud speakers are woefully deficient in the upper register, while having an accentuation of certain low tones which gives the characteristic “moving-coil boom.”

At this point, it may be said that “woolly” reproduction, making speech difficult to understand, is a sure sign that the reproduction is badly deficient in the higher frequencies. Speech depends for

its clarity almost entirely on the higher frequencies and if these are absent in the reproduction no amount of bass can make up for them.

I am not one of those who think that proper bass reproduction can only be obtained with moving-coil loud speakers.



This famous loud speaker is the C12 Celestion, which for more than two years has been one of this firm's standard models, and recently has been greatly reduced in price.

Indeed, if I had the choice between a speaker which is good on the low notes and deficient on the high, and one which was good on the high and deficient on the low, I would choose the latter. Peakiness, or tendency to accentuate a certain narrow band of frequencies at any part of the scale, must always be avoided, however, if pleasant reproduction is to be obtained, and, after all, most of us are looking for pleasant reproduction.

### Those “Metallic” Types.

There are three main types of loud speaker—the horn, the cone, and the moving coil. The old horn types were very deficient in the low notes, and good in the upper register, but nearly all of them peaked very badly somewhere about 1,000 or 2,000, and this over-accentua-

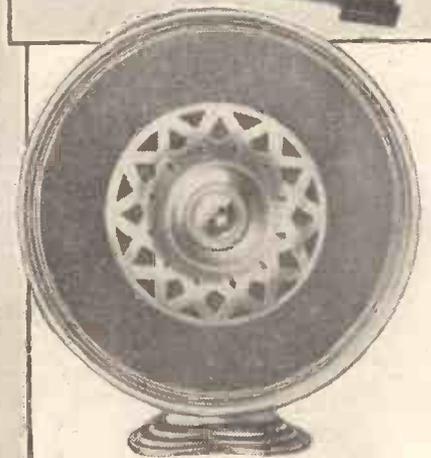
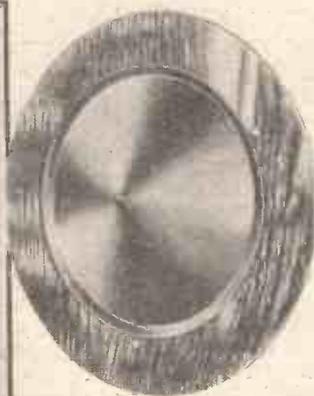
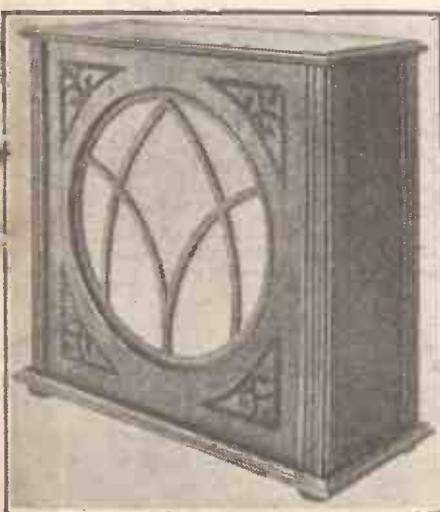
tion of a narrow band of frequencies gave a “metallic” sound to the reproduction which was quite erroneously attributed to the metal of the horn. A metallic sound will always be given to a reproduction if certain frequencies are over-accentuated, whatever the horn be made of, and the real trouble here was that the comparatively small diaphragm had its own natural frequency roundabout that point, and this, combined with the shape of the horn, gave the poor response.

### The Frequency Factor.

Improvement in the horn shape soon followed with greatly improved reproduction, and later the size of the diaphragm was increased with a corresponding alteration of the natural frequency of the diaphragm. This also helped.

The response curve of the cone loud speaker proved to be far better, and indeed a good cone loud speaker, properly designed so that there are no bad peak resonances, is a very pleasing instrument, provided it is properly fed. The fairly uniform response curve over the part of the scale it is able to reproduce is a valuable feature, although many cones unfortunately fall off badly in the upper register, and this

(Continued on next page.)



The upper photograph shows a Six-Sixty Cabinet design, and below it is the Squire Moving-Coil model. Next to this is a Claritone (Ashley Wireless Telephone Co.) and beside it is the B.E.C. plaque loud speaker, and beside it is a distinctive Ferranti design of the horn type. The end photograph illustrates the Marconi Cone, and above it is an “Orphean” cabinet model.

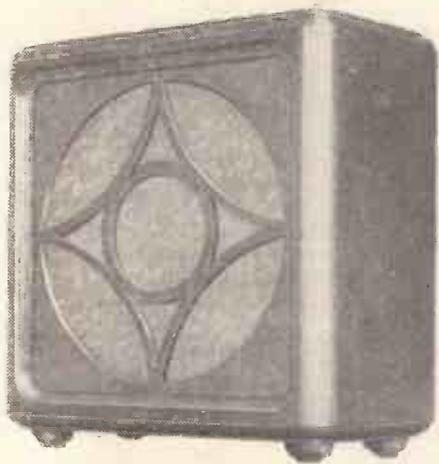
## ALL ABOUT LOUD SPEAKERS.

(Continued from previous page.)

means they sound woolly. A good cone, however—and there are many now available at very reasonable prices—is a thoroughly satisfactory instrument for all general work.

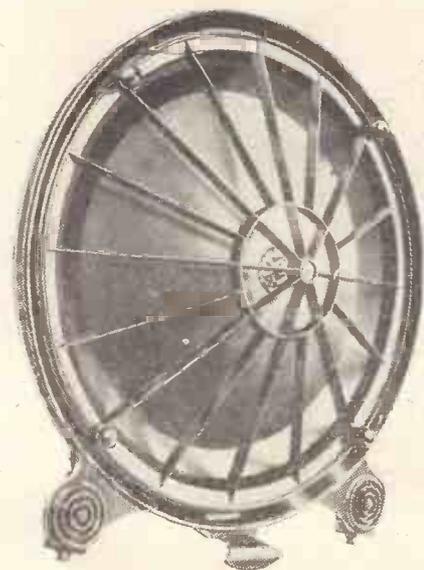
### The Best Possible.

For the very best reproduction possible at the present time a good moving-coil speaker is required, but it must not be forgotten that such a speaker is actually inferior to many other types unless properly fed with distortionless input, and because



This handsome cabinet model is a "Blue Spot."

the best moving-coil speakers are extraordinarily good it does not follow that all moving-coil speakers are superior to the cone types. Unless a moving-coil speaker is well designed it will tend to boom in the bass and be woolly and lacking in sharpness of reproduction due to deficiency in the upper register. Again, the moving-coil speaker needs a special current supply for energising the field magnet.



A striking new Mullard loud speaker.

Moving-coil loud speakers vary considerably in their sensitivity and, while the best are strictly comparable with a good cone in sensitiveness, many fall a long way behind the average cone in this regard. This is a very important point to remember when choosing a loud speaker, for if you have a sensitive instrument the output valve will be well below the overloading point when giving adequate strength for an ordinary living room, whereas with an insensitive instrument it is probable that distortion will arise through valve overloading some time before you are able to bring the set up to a point where adequate strength is obtained. I would strongly advise all readers of POPULAR WIRELESS who contemplate buying a new speaker to have an actual demonstration of the speaker, preferably on their own set.

### Cone Considerations.

Very remarkable low-note reproduction is now obtainable with some new loud speakers of the balanced-armature type with very large diaphragms, and one I have been using for some time goes down as low as any commercial moving-coil loud speaker I have tried, while giving an excellent response to the upper register.

The larger sizes of cone loud speakers in several makes are also excellent in low-frequency response, and indeed many people with a discriminating musical ear, who have heard some of the best of the modern "non-moving-coil" loud speakers, have expressed the opinion that the slightly better low-frequency response obtainable with a moving coil seems scarcely worth the additional complication due to the need of special energising current.

And now for a further point of considerable importance which has caused many excellent loud speakers to be unjustly condemned. The better and more faithful the loud speaker, the more easily it will show up defects in the receiver, and in particular valve overloading. A very big grid swing on the output valve or valves is needed to give proper low-note reproduction, as everyone knows who has watched the milliammeter in the plate circuit of an output valve during passages of music containing really low tones. The needle may be quite steady during most of the music, but directly the deep notes of the cello or the low notes of an organ come through, the needle may flicker violently, showing distortion.

### The Reason Why.

Now, if your loud speaker is totally incapable of responding to these very low tones, then distortion at this point of the scale will not be heard by the ear, but if, on the other hand, the speaker really does "go down" you will hear quite a nasty sound in your loud speaker. The distortion given by valve overloading is most irritating, and, as it may occur periodically when one speaker is used and not at all with another, you may be led to say of the better instrument (that showing the overloading): "I don't know what it is, but I don't like that loud speaker!" whereas the trouble is really in your set.

When you go to choose a new loud speaker have it demonstrated to you adequately. By this I mean, do not be in too much of a hurry to judge it, for the music on which you may be hearing it at the moment may



A fine example of Philips L.S. design.

be deficient in either high or the low tones. Try and hear it reproduced on music over a good portion of the scale, try and mentally compare it with the real thing rather than with the reproduction to which you are accustomed with your present loud speaker, and always have a test on speech, for if this is clear, sharp and distinct, it will give some indication that the upper frequencies are properly attended to. If speech sounds woolly and plummy or in any way muffled, then the reason is probably a deficiency in reproduction of the vital upper register—always assuming, of course, that the set feeding the loud speaker is reasonably good.

Remember, if you are making tests on your own set, that they should be made with a minimum of reaction, for when the sensitivity of a set is increased by the use



The new Ultra Air cone loud speaker employs two linen diaphragms—one large and one small.

of reaction (particularly when the set is worked near the reaction point), the higher frequencies will be considerably reduced and the reproduction will sound woolly. The same effect is obtained in a set which, through battery coupling, bad layout, or other causes, is working near the verge of low-frequency oscillation.

Lastly, buy the best you can afford, and don't expect a new loud speaker to cure defects in your set.

# Have you got your copy?

**DO** you want to improve your reception of the programmes?

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## FROM THE TECHNICAL EDITOR'S NOTE BOOK

# Tested and Found-?



## THE "MAGNUM" "MAGAFILTER."

THE opening of the Brookman's Park station is being awaited with great interest. Whatever the benefits dispensed there are sure to be quite a number of listeners who will hear too much of this new London regional. They will hear so much that alternative programmes will cease to be available. That is, unless they take steps to cut out their very powerful local when they want to.

Of course, there are people even at present who get one station at the expense of all



The Burne-Jones "Magafilter."

others. It is in such cases as these that the "Magnum" "Magafilter" will prove of value. This is a series wave-trap type of instrument recently produced by Burne-Jones & Co., Ltd. You will see what it looks like from the accompanying photograph.

There are three sockets on the large circular base, and into either one of two of these you plug the aerial, the other socket being for connection to the aerial terminal of the set. Then, as with any ordinary wave-trap, you tune in the unwanted station on the set and slowly revolve the "Magafilter" adjustment knob until your interfering transmission is eliminated.

### Well-Made Article.

The price of the "Magafilter" is 12s. 6d. It is a very well made article, and its base is provided with two screw holes so that it can be mounted on a baseboard or other convenient position. Its height is 3½ in. and its diameter 4½ in.

It is designed for the elimination of any

station between 200 to 600 metres, and on test we found it very satisfactory.

With a very inselective set close to 2 L O we were able to cut that station out entirely and receive 5 G B with no appreciable diminution in strength.

## THE B.T.H. PICK-UP.

One can use one's radio set to reproduce gramophone record music. Everybody nowadays knows that a "pick-up" can replace the soundbox and make the reproduction an electrical instead of wholly acoustical business. But what are the advantages of this scheme?

Obviously they are negligible apart from the possibility of getting better quality and a better quality under exact control in regard to volume. But if we can get better quality the "pick-up" is an extremely attractive thing.

### Unsatisfactory Productions.

Now, of the dozens of pick-ups available, there are not a round half-dozen that enable the electrical to beat the acoustical in regard to quality. That is, an ordinary good-class gramophone could be made to give worse instead of better results if the wrong kind of pick-up were obtained. On the other hand, it is only fair to say that there are some gramophones which even the worst of pick-ups would improve!

But the B.T.H. Pick-up definitely does make the Radio Gram, or electric gramophone, very well worth while. It enables one to get results not to be approached by the best mechanical method.

One's first impression is of a very neatly-finished piece of work, obviously designed to form a homogeneous whole, rather than the more usual and separately designed pick-up stuck on the end of an arm with which it in no wise harmonises.

The whole assembly is finished in gilt, and the pick-up fits into the end of the

arm with a form of joint which also provides the necessary electrical connections. The length of the arm is adjustable within limits, and this feature, together with the off-setting of this pick-up on the end of the arm, permits a very close approximation to perfect tracking to be obtained. In this connection, it must be conceded that the instructions-cum-template card provided make the job of correct mounting a very easy and simple one.

On actual test the pick-up gave an exceedingly good account of itself, with an unusually wide range of frequency response, and a very pleasing tone. Reproduction was very "brilliant," indicating a good

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.

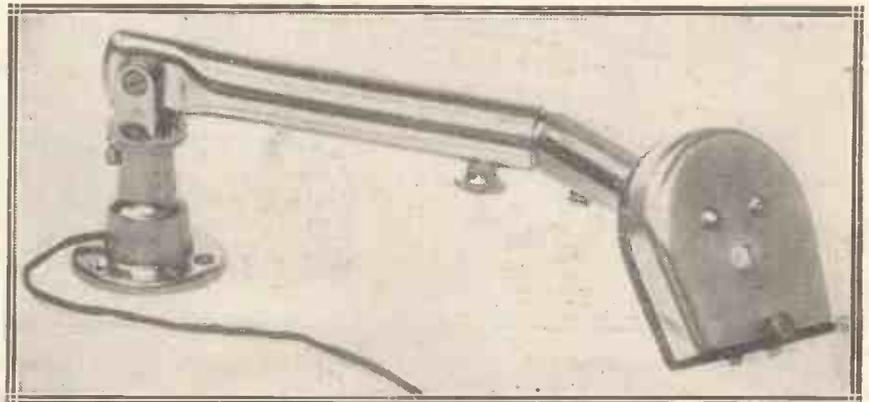
high note response, yet there appeared to be ample bass as well, and the general balance was excellent. Altogether, the pick-up sets a very high standard of reproduction, and represents remarkably good value at £2 5s., complete with the arm.

We found only one or two small points to criticise as regards the practical use of the pick-up. We noticed first that the leads provided are rather short, and when we came to try it out it seemed something of a weak point that the method of carrying does not permit the pick-up to be turned back to give free access to the underside for needle changing. This latter drawback, however, proved to be more apparent than real, since with a little practice one can change needles by "feel" quite easily.

### The Response Curve.

In conjunction with a moving-coil loud speaker and a first-class set, the B.T.H. Pick-up gives you music comparable with the best of radio, and that implies a remarkably high standard these days.

The effect is as close to reality as it is possible to imagine electrical reproduction getting for some time. And in any case the response curve of the B.T.H. Pick-up is vastly superior to that of the best loud speaker that we have come across.



This is the B.T.H. Pick-up and Tone-Arm reviewed on this page.

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		H.T.	G.B.		D.C.	A.C.	
<b>ALL-POWER UNITS.</b>							
C 1. A	60	L.T.		Completely Electrify your Radio Set with no alteration whatsoever to Set, Wiring or Valves. Westinghouse Rectifier in all A.C. Models.	£9-15-0	£17-15-0	
		S.G.: 0-120: 120/150: POWER.	Up to 21.				D.C. Up to 6 amp. A.C. 2-6 volts from 3 amp. min. to 1 amp. max.
C 2. A	20	S.G.: 60: 120/150.	Up to 12.	D.C. 2-6 volts from 2 amp. min. to 35 amp. max. A.C. 2-6 volts from 2 amp. min. to 5 amp. max.	£5-17-6	£10-17-6	
<b>H.T. UNITS.</b>							
1 F.10	10	120.		For 1 to 3 Valve Sets, or those not requiring more than 10m/a. Westinghouse Rectifier in A.C. Models.	17-6	—	
2 F.10		60 and 120.					£1- 9-6
2 A.10		60 and 120.					£3-10-0
3 F.20	20	S.G.: 60: 120/150.		For 1 to 5 Valve Sets, or those not requiring more than 20 m/a. Westinghouse Rectifier in A.C. Models.	£1-17-6	£3-19-6	
4 V.20		S.G.: 0-120: 120/150.					£2-10-0
4 T.60	60	S.G.: 0-120: 120/150: POWER.		For Multi-Valve Sets, or those not requiring more than 60 m/a. Valve Rectifier in A.C. Model: Philips 505. Westinghouse Rectifier in A.C. Model.	£3-15-0	£7- 5-0	
5 T.60		S.G.: 0-120: 0-120: 120/150: POWER.					£4-15-0
<b>RECTIFIER UNITS.</b>							
R. 20	20	For attaching to D.C. Units for use on A.C. Mains.		Valve Rectifier: Philips 373 or 505	—	£3- 7-6	
R. 60	60			Valve Rectifier: Philips 505	—	£5- 0-0	
<b>L.T. UNIT.</b>							
L.T. 1	2-6 Volts from 3 amp. min. to 1 amp. max.		Westinghouse Rectifier		—	£8-15-0	
<b>TRICKLE CHARGER.</b>							
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I. Tr	For isolating Loud-speaker or 'Phones from set where a Power Supply Unit is in use.				—	15s. 0d.	

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A.C. ALL-POWER UNIT C.2 A  
Just "Plug-in—That's All!"

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C.12	7	5	0	5	12	6
C.14	13	10	0	11	0	0
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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 specialities 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.

### DOES A VALVE DETERIORATE WITH AGE?

A. T. A. (Arundel, Sussex).—"I have one of the M.O. valves of the type D.E.L.610, which has never been used but which is about eighteen months old. Does a valve deteriorate if it is put aside in this way? If not, what are the correct grid-bias voltages for this type of valve?"

A valve does not deteriorate in any way whatever as a result of storage, so that you can treat yours as a newly-purchased valve. With regard to the grid-bias volts required, you do not say in what position you are going to use the valve, which makes all the difference to the grid bias to be applied to it.

The makers recommend that it can be used either in a high-frequency amplifying stage with some form or other of stabilising, or as a detector valve using grid leak and condenser, or with transformer or choke coupling for low-frequency amplifier (not for the output stage).

If you use it as a low-frequency amplifier it will require a negative grid-bias voltage of from 1½ to 3 volts. The grid bias is always somewhat dependent upon the anode voltage, and in general the greater the H.T. supply to the plate the greater should be the grid-bias voltage applied to the grid. Thus, if the plate is supplied with only 80 volts, you will probably require 1½ volts negative bias, whilst if the plate has 120 anode volts you will be able to go up to 3 volts negative with advantage.

When used as a grid leak detector your valve requires a slight positive voltage on its grid, but there is no need for a separate battery to supply this as the correct effect will be obtained if the grid leak return to filament is connected to the positive side of the filament.

When used as a high-frequency amplifier this valve requires either no grid bias at all, or else quite a small positive or a small negative bias, depending upon the method of stabilising or damping the circuit in which it is operated.

### THE MARKINGS OF TRANSFORMER TERMINALS.

M. J. (St. Leonards).—"On the blue print it says a ratio of 3 to 1 L.F. transformer, and I have got that, but the markings on it are different to the blue print. There are five terminals on the transformer in all, one of them being marked E, and the other IP, OP, IS, and OS. The blue print only shows four terminals, namely G, GB, A, and H.T.+. Will the transformer do, and if so how should it be connected?"

The transformer is quite suitable, the connections being as follows: The point marked H.T. + on the blue-print corresponds with IP on the transformer. The wire which goes to A, etc., on the blue print goes to OP on the transformer. The wire which goes to GB on the blue print goes to IS in your case, and the wire which is marked G goes to OS on the transformer.

This leaves one terminal unaccounted for, as your transformer has an E terminal in addition to those

shown on the blue print. As a matter of fact, it is not necessary to use this at all, but it is provided for those who wish to earth the cores of their transformers, as it is sometimes found to be an advantage in operation to run a wire from this terminal to the earth wire, or to any other wire connected directly to earth.

### IMPROVING RESULTS WITH REINARTZ REACTION.

D. M. F. (Stratford-on-Avon).—"An acquaintance of mine with whom I often talk about wireless circuits, knowing me to be a Reinartz enthusiast, asked me the other day if I had tried your new scheme for improving reaction? I admitted I had not done so, and he told me it was a winner, but unfortunately

## "P.W." TECHNICAL QUERY DEPARTMENT

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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?

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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.

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before I could get the full details from him I was called away and I have not been able to get hold of him since to find out more about it. What is the stunt, and does it apply to 'Everybody's' Three?"

"Everybody's" Three, and, in fact, practically any circuit where the detector valve has an H.F. choke in its anode circuit and in which reaction is controlled by means of a variable condenser is eligible for this improvement.

All that is necessary is the insertion of one screw-down compression type of semi-variable condenser such as the "Igranix," "Pre-set," or the "Formo-densor." The maximum capacity of this condenser should be of .0001 mfd. or .00015 mfd., and it should

(Continued on page 788.)



(On left) The wireless receiving and transmitting set on the airplane "Yellow Bird" shewing the "Dario" Valves.

**T**HE Yellow Bird's and its heroic occupants' flight from New York to Santander, Spain, is already well known. All the time on this journey wireless communication was maintained with Dario Valves. Why not use Dario Valves yourself—they've proved themselves in a matter of life and death—they will improve your set beyond all expectations. Dario prices are little short of marvellous—they are due to one of the biggest and most modern valve outputs in the World. Ask your dealer or write direct for full particulars.

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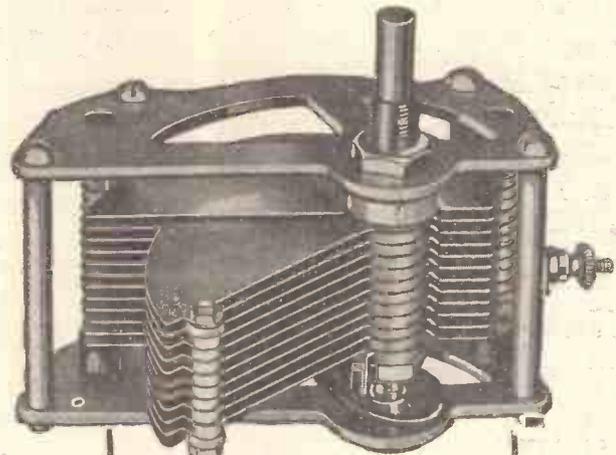
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.00035 condenser .. .. .	5/7
.0003 condenser .. .. .	5/6
.00025 condenser .. .. .	5/3
.00015 condenser .. .. .	5/-

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ADVT. K. RAYMOND

## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 786.)

be screwed down on the baseboard in a convenient position close to the socket of the detector valve.

Wire up one of the terminals of this new condenser to the anode terminal of the detector valve socket and the other terminal of this condenser to the negative filament of the valve socket (or to any point directly connected to this). To adjust this added condenser start with the knob fully unscrewed (that is to say at the minimum capacity) and gradually screw it down until you find you can only just obtain reaction effects over the whole tuning scale when the reaction condenser is full in (ordinary reaction condenser).

After this you can leave the added condenser alone and tune in on the set as usual, and you will find that there is a very definite improvement in sensitivity, particularly on the long waves.

### FLASH-LAMP BATTERY CONNECTIONS.

"INQUISITIVE" (Warwickshire).—"I know that if you take two flash-lamp batteries and connect the two long strips together they form a negative pole, and with the two short strips connected together they form a positive pole, of a battery in parallel. In the same way, if you take one of the long strips on the battery and connect it to a short strip in the next battery the two remaining strips will give you double the voltage for cells in series; but what I do not know is this. If you connect the long strip of one cell (negative) to the short strip of the next cell (positive) and then join up the remaining strips likewise (negative to

Certainly, all ordinary cases of grid choking can be cured by one or other of these, or by both in combination.

### THE "P.W." "ELECTRO" UNIT.

For exceptionally bad mains a choke may be fitted (to eliminate any remaining hum) in the lead direct from one of the "L.T." terminals. The choke being mounted conveniently on the baseboard, one terminal—say L.T.—is joined only to the choke, the other side of this going to the lamp and to the electrolytic condenser.

If it is to be placed instead in the L.T. neg lead connect one side of the choke to L.T. neg. terminal on the unit, and the other side of the choke to one side of the electrolytic condenser and to the neg. mains lead.

An ordinary L.F. choke will not be suitable owing to its high resistance, and low current carrying capacity. What is required is a choke capable of safely carrying up to 1 amp., and of very low resistance, but only in extreme cases would it be necessary to use a choke. If there is a tendency to hum try removing the earth lead altogether from the set or mains unit, as no earth at all is necessary with such a scheme, and the use of an earth wire may easily give rise to a slight hum or ripple.

We have received a large number of queries in regard to the "Electro" unit which has undoubtedly aroused great interest. Further installation notes regarding the device will appear in these columns next week.

### CONNECTIONS FOR A TAPPED CRYSTAL SET.

M. T. F. (Bicester, Oxon).—"I should like to make up a crystal set in which the new scheme of tapping the aerial and tapping in the crystal as well is incorporated. I have a 3-in. diameter coil former, and should like to wind my own, using my favourite No. 24

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positive), taking off leads in the usual way, what sort of battery is that?"

If you connect up in the way described you are merely placing the cells in opposition to one another instead of in parallel or in series. And if they were of exactly the same voltage and quality they would simply cancel one another out and nothing would happen. But as there are always small variations in cells, what would happen is that one cell would "overcome" the other and slowly discharge itself through it, until both were useless.

### ATMOSPHERICS AND GRID CHOKING.

G. S. (Warrington).—"My set has just developed a curious fault. To-day we have had a thunderstorm and consequently there are plenty of Xs about. When listening to 5 X X every time I get a whopping atmospheric the set goes off. If, however, I switch the set off and then on again, it works all right.

"On the medium wave-length the big Xs have no effect. I wonder if it could be that the grid condensers get choked? I should be very pleased if you could tell me how to cure this fault."

Apparently yours is a grid-choking effect as you suspect. There are several ways of curing this trouble, but before trying them we should warn you that thunderstorms are in the vicinity it is best not to listen in at all, but to earth the aerial until the storm has passed.

In climates where thunderstorms are practically continuous, and lightning is quite so, it is usual to connect a very high inductance choke from the aerial terminal to earth, placing it in parallel with the set's input. If it's self capacity is low, this in itself helps to clear the aerial from any atmospheric charges, but in your case we do not think anything so drastic as this is required. Probably a small increase in the value of the grid condenser would completely remove the trouble, or failing this, a slightly lower value of grid leak.

gauge wire. What would be about the right number of turns to cover the ordinary wave-length, 5 GB, etc., and what are the connections?"

A very good circuit of this kind in which both aerial and crystal are tapped on the main coil is the one in which the centre of the coil is earthed and it is tuned by a '0005 variable condenser. In addition to the panel and cabinet all you need is the variable condenser '0005 mfd., as well as a good crystal detector, four terminals ('0005 mfd., one aerial and one earth), and a couple of tapping clips of the crocodile variety.

The coil is a straightforward one laid on with the turns side by side in the usual manner, on a 3 1/2 in. length by 3 in. former, a total number of 60 turns being laid on. In addition to the two ends of the coil taps should be arranged for at the following turn numbers—5, 10, 15, 30, 45, and 50.

These points should be brought out to some convenient point on the panel or each point should be twisted so as to make good contact for the clip referred to above, and then the aerial terminal should be provided with a flexible lead terminating in one of the clips. One of the crystal terminals is wired in the same way, the flex being long enough to reach any of the tappings described above.

In addition to these the following permanent wires will be required. One wire connects the remaining side of the crystal detector to one of the telephone terminals. The other telephone terminal is joined to earth and to the centre tap on the coil, i.e. the 30th turn. Finally one end of the coil is joined to one side of the '0005-mfd. variable condenser and then the other side of this condenser is joined to the other end of the coil, thus completing the connections.

One of the interesting features of this set is that for maximum results both of the clip positions must be varied with any particular aerial or with any particular detector until the best position for reception is found. Consequently there is plenty of scope for the experimenter and for those who like to try and get the best out of a set.

(Continued on page 790.)

# DO YOU REMEMBER?



What a night that was—November 14th 1922—the night of 2L.O.—London station's debut from Marconi House. How we listened!—Everything sounded good—it was good for those days. We had no room for criticism then, we were just enthralled—listening to “wireless.”

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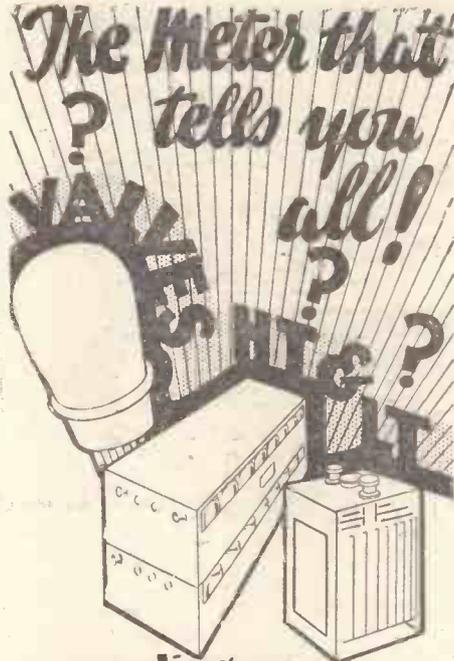
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## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 788.)

Another advantage of this tapping scheme is that the selectivity may be varied to the required degree by altering the aerial clip's position.

### HOW TO MAKE THE "P.W." STANDARD WAVE-TRAP.

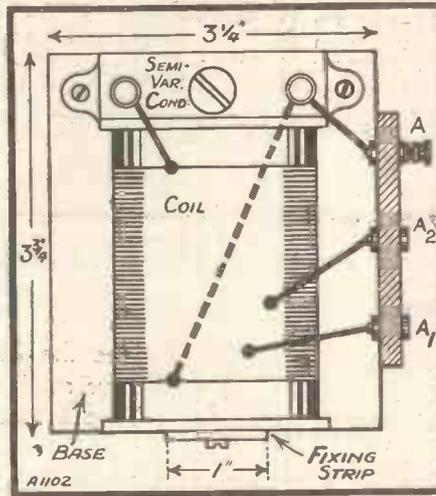
S. C. (Switzerland).—"How I construct the Wave-trap? 'P.W.' Standard?"

The "P.W." Standard Wave-trap, a plan of which is shown herewith, is assembled upon a small wooden baseboard measuring 3 1/2 in. by 3 1/2 in., and about 1/2 in. thick, the intention being that this baseboard shall be screwed down directly upon the wooden base of the receiver.

The coil is mounted on this in a horizontal position, with its centre at a height of 2 in. above the bottom of the small baseboard. This point of the height of the coil is of importance in cases where the trap is screened, the position of the trap inside whatever screen is used naturally being a matter which must be watched.

The coil is wound upon a piece of ebonite, Paxolin, Pirtoid, or similar good material, 2 in. in diameter and 3 in. long, and this can be mounted in any convenient fashion which does not entail the use of large pieces of metal. One method is to fix an ebonite end disc into the tube and attach this by means of a screw to an upright strip of 3-ply wood, whose lower extremity is similarly secured by means of screws to the edge of the little baseboard.

The coil consists of 64 turns in a single layer of 28 D.C.C. wire. As the coil is wound, tappings are made in the 16th and 24th turns, these being the



alternative positions for the aerial tap, the ends of the winding being secured by the simple procedure of passing them through two small holes drilled in the tube at the correct points, while the two tappings may be made in a variety of ways.

For example, the whole coil can be wound without making any tappings whatever, and then the 16th and 24th turns can be prised up slightly with the blade of a pocket-knife and two short pieces of matchstick about 1/2 in. long slipped under them. The wires thus lifted up can be scraped bare of cotton covering by means of a knife, and the appropriate ends soldered on to them.

Mounted upon the baseboard immediately beneath the end of the coil is a small variable condenser of the compression type, which is now becoming so popular for work of this sort, the capacity of this component depending upon the wave-length of the station it is desired to eliminate.

If the wave of your local station is below 400 metres, a .00025 mfd. or .0003 mfd. will be required, while if it is 400 metres or over, one of .0005 mfd. should be chosen. The alternative capacities of .00025 or .0003 mfd. have just been given because in some makes only a .00025 mfd. is available, whereas in others .0003 mfd. is produced and, as a matter of fact, either will serve.

These components have a screw-down adjustment, which can be performed by means of a screwdriver, and, of course, the condenser can be left permanently set to the correct capacity once this has been found.

Screwed to the edge of the baseboard of the trap is a small piece of 1-in. thick ebonite, 2 1/2 in. by 1 1/2 in., carrying a terminal and two sockets, such as the Clix or Eleex-types, these being for the external connections to the trap.

In use, the lead from the set to the trap will be connected to the terminal, while the aerial lead will terminate in a plug which will be inserted in one or other of the sockets, according to the number of turns on the coil which it is desired to use for coupling purposes.

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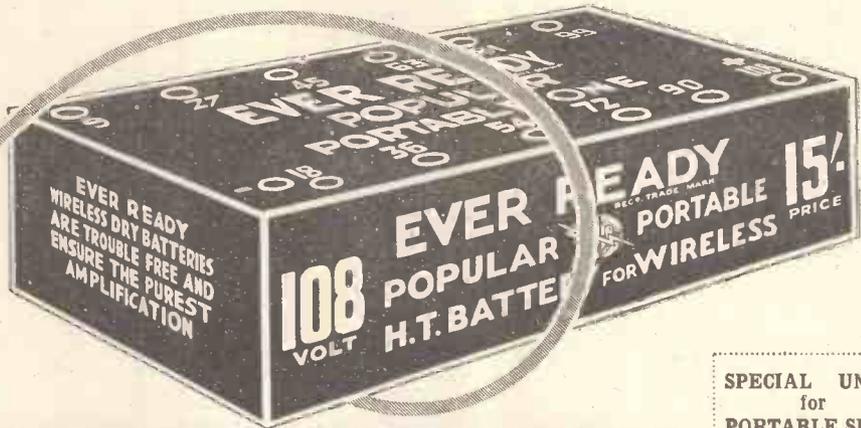
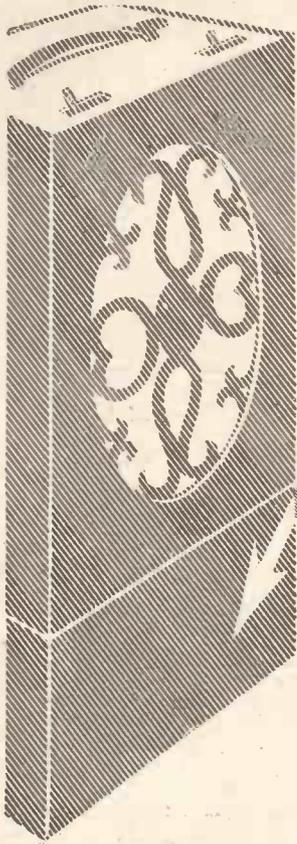
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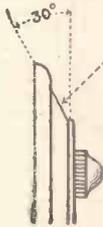
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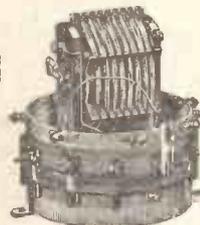
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## TECHNICAL NOTES.

(Continued from page 772.)



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amplifiers and very much improved loud-speaker movements, it is possible to obtain quite a reasonable volume with excellent quality at the same time. But no matter how good the loud-speaker movement may be, increasing the volume beyond a certain point always brings with it impairment of quality.

### Talking Pictures.

Digressing for a moment from the main question of loud speakers this fight, as it were, between quantity and quality is one of the main practical difficulties with talking pictures in the cinematograph theatres. Obviously, a very large amount of amplification has to be used in order to obtain a volume big enough to fill a large-size hall, and therefore the talking picture engineer is "up against" the question of amplification and volume at once.

Attempts have been made to overcome the difficulty by the use of multiple loud speakers, each loud speaker, therefore, delivering only a fraction of the total volume of sound. This system has merits but has not by any means proved to be a complete solution of the difficulty.

Indeed, apart altogether from the performance of the loud speaker itself, the large amplification which is necessary, prior to the loud-speaker input, throws a heavy burden upon the valve amplifiers, and, as you know perfectly well, not only clever design but also skilful manipulation is necessary to get really good results from a heavy-duty amplifier.

### Changing Fashions.

Loud speakers form one of the best examples of how ideas and fashions in radio come and go. The first loud speakers were provided with trumpets or horns; then these horns were improved in shape and material; then a great revolution took place, and horns were completely out of fashion, the cone diaphragm being "all in favour."

The cone enthusiasts would have none of the horn type of speaker and considered the horn completely obsolete. True, the cone type of diaphragm has made for itself a permanent place in popular esteem, but it cannot be said that the horn speaker has gone by the board. As a matter of fact, for heavy volume, special types of horn, including the so-called "exponential" horn, have been very much developed during the last year or two, and appear to have certain advantages not possessed at all by the diaphragm type.

### Coil Drives.

The coil-drive loud speaker was in great favour perhaps a couple of years ago, and its particular exponents saw the end of all permanent-magnet types of loud-speaker movement. The coil-drive movement undoubtedly has advantages peculiar to itself, one of which is its capacity for handling a very large volume, especially in certain parts of the register, but the necessity for a large baffle, also the great weight of the "pot" and the need for a separate current to excite the field windings, have proved serious drawbacks to the general use of this type of speaker.

(Continued on page 794.)

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## TECHNICAL NOTES.

(Continued from page 792.)

Personally, I have a great liking for the coil-drive type of speaker, and I still use one regularly. But many people have found the improved types of permanent-magnet unit much more convenient, and as these are very much more compact and very light in weight and do not, of course, require any field exciting current, it is easy to see why they should appeal to a large number.

### Operating Speakers.

Incidentally, the cost is also very much less than that of a coil-drive unit. The great improvement in permanent-magnet units is largely due to the advances which have been made recently in the production

of magnet steel of very high permeability and retentivity.

I should like to refer to one or two points in regard to the operation of loud speakers which are often overlooked by listeners.

One is the fact that the horn or diaphragm of a loud speaker is *only part* of the actual sound-reproducing means and really the reproduced sound is affected by all the surrounding objects, including the walls of the room. Consequently, it is important to place the loud speaker in such a position that the effect of surrounding objects is to improve rather than to impair the reproduction.

A few very simple experiments in placing the loud speaker in different positions in a room will serve to show you how greatly the reproduction depends upon conditions entirely external to the loud speaker itself, and in many cases it will be found that the

position in which the speaker has ordinarily been used is by no means the best one.

### Care of Amplifiers.

The loud speaker, even under optimum conditions, can only reproduce, in the form of sound, the impulses which are communicated to it in the form of varying electric current. If these incoming impulses are lacking in the proper characteristics, the out-going sound impulses cannot possibly improve upon them. Consequently it is just as important to make for high quality in the amplifier (and, for the matter of that, in any parts of the receiver preceding the amplifier) as in the loud speaker itself.

To use a mixed metaphor, the loud speaker cannot "make bricks without straw"; it cannot possibly give out better quality than that which it takes in and so it is only logical, whilst giving all possible care to the loud speaker, to give at the same time equal care to the amplifier and to the receiver.

### Aerial Circuits.

When a number of circuits are being simultaneously tuned by means of ganged condensers, a difficulty sometimes arises owing to the natural capacity in the aerial circuit due to the aerial and earth; the H.F. transformer or aerial tuning coil is apt in these circumstances to become tuned to a higher wave-length than the other circuits, and some method has to be found for overcoming this effect.

There are various ways in which this can be achieved, partially at any rate, but perhaps the simplest of all is to leave the aerial circuit untuned and to introduce instead a choke coil (or a resistance), connecting this between the grid and filament of the first valve. The H.F. inter-valve coils are tuned by the condenser and consequently it is a very much simpler matter to arrange the settings. This scheme will not be applicable in all cases, but in a large number of cases it provides a very easy way out of a difficulty and gives perfectly good reception.

### Television.

We often hear that television, I mean amongst amateur experimenters, has made much greater strides in the United States than here. In this connection the following extract from the well-known U.S. Journal "Radio World," issue of July 13th, will be of interest. The article starts with the following question: "Television was much heralded six months ago and the technical press had many articles about it, some of them even constructional. But now next to nothing constructional appears. Has television made any advance? If the subject was interesting then, advance or no advance, why is it not interesting now?"

To this the above-mentioned journal replies as follows: "The articles you refer to dealt with the reception of television movies, that is, of transmitted film recordings of silhouettes. It was interesting indeed to receive these, although they were small, about 1½ in. square, and none too clear. Pursuit of this line was retarded by two main factors; (a) disagreement among transmitting agencies as to types and arrangement of discs, and as to speed of rotation of discs, with consequent embarrassment of experimenters, who had to provide

(Continued on page 796.)



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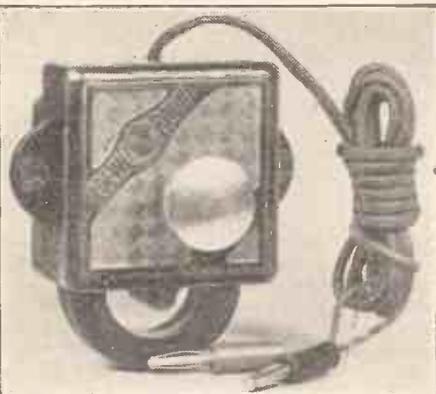
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Minimum Radius 3 ft. 6 in.	<b>GUARANTEE</b> Money refunded without question, if not satisfied, and within 7 days.	The easiest Mast to erect
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## TECHNICAL NOTES.

(Continued from page 794.)

themselves with a variety of discs, and (b) lack of entertainment value, due to smallness of the image, obscurity, lack of variety, absence of detail, and confinement to "canned" pictures. What the public, even that part of it which is experimentally inclined, seems to want is television that has entertainment value rather than novelty value. Having been educated to fine results from original, not "canned" aural radio, that public demands somewhat commensurate results from visual radio. The interest is as high as ever in the entertainment value of television, but the interest in the novelty branch of it has subsided quite effectively."

### A READER'S EXPERIENCES WITH "P.W." SETS — OLD AND NEW.

The Editor, POPULAR WIRELESS.

Dear Sir.—This letter is written as an appreciation of your publications and the excellence of the circuits contained in them. I have taken in POPULAR WIRELESS and "Modern Wireless" almost from their births, and have tried out most of the circuits described in them.

At present I have three sets in constant use, the latest being the "Titan" Three, with a pentode in the L.F. stage, a set which I think, for simplicity in handling and all-round efficiency, is likely to remain unbeaten for some time. My main object in writing, however, is in praise of a circuit which has been in use since 1924, and is still unbeaten for purity and volume, and is only lacking in selectivity to be easily the best thing I have yet heard or made up. This is the "Twelvetees" three-valve Reflex, which I made up from your instructions in "P.W." of March, 1924, with the difference that it was housed in a sloping-panel cabinet instead of a suitcase, and that two sets of coils, balanced to give the same dial readings for my local and 5 X X, operated with a switch, were fitted to the top of the cabinet.

#### The Hale Circuit.

I wrote to you shortly after fitting it up giving my experience and the results obtained, and offering to help anyone who found any difficulty in getting the same from it. Unfortunately, I left England shortly afterwards, and spent several years in Persia, China, India, and Africa, where I had no opportunity of replying to a number of letters, even after they had been received. Indeed, what with the heat and damp, and a few other things, the letters were unanswerable; so if this should meet the eyes of those who asked for assistance, I trust they will take this as an apology for receiving no reply.

It was difficult to carry out experiments with the circuits published during my travels, for material was practically unobtainable and H.T. batteries rarely lived more than a month. My greatest success during this period was with the various forms of the Hale circuit, but they have since passed into oblivion. I arrived home expecting to find the "Twelvetees" Reflex (which had been fixed up as a family set) hopelessly out-of-date, in view of the improvements in components and circuits, and the congested state of the ether. However, after several months' experience under these conditions, and having heard the moving-coil speakers, etc., which are now all the rage, I have decided to retain it, as it is certainly the purest and most powerful set I have yet dropped across.

For anyone who is satisfied with four or five stations, with a minimum of tuning, low consumption and voltage of H.T. (60 volts only is required), this circuit would amply repay for the trouble in making up. The crystal in use is the same as started with and gives no trouble whatever. The only change I have made is to the coils, to bring the local station in at the same dial readings as 5 X X after the wave-change.

This set operates two loud speakers at full volume, a large "Sparta" and a 15-in. cone in series, which together, for purity, tone, etc., has the moving-coil L.S. beaten to a frazzle. The other two sets in constant use are the "Olympic" Three ("Modern Wireless," October 28th, 1928) and the "Titan" Three, both of which are extremely good sets, and are particularly suited to the positions they occupy.

With the "Titan" Three I have received 37

stations on the L.S. at Cromarty (N.E. Scotland) in one hour without the slightest trouble, the time really being taken up in waiting for announcement of the station's call-sign.

I have for some time considered writing to you, as I thought it would interest you to know that a set made up from a circuit published by you five and a half years ago has been in constant use for that time, and is still superior to the majority in purity and volume, and can hold its own with quite a number in several other respects.

Should you care to publish a portion of this letter, please withhold my name, as my last experience of writing to you brought me in over 600 letters asking for replies; and though I am perfectly willing to demonstrate to anyone interested in the set, I am afraid my time is somewhat limited.

Hoping this may be of interest to you, and wishing you every success.

Yours sincerely,  
Devonport, J. M. R.

## YOUR ELIMINATOR CONDENSER.

A CONDENSER for use in eliminator circuits must be of reliable make.

There should be no difficulty in ascertaining this point. Secondly, it should have passed a voltage test of at least twice the maximum voltage which it will be called upon to withstand when in daily use. Actually, a condenser is tested at a maximum voltage equal to twice the voltage it is intended to work at.

Thus, a condenser in an eliminator circuit which is required to serve under 200-volts maximum is tested at 400 volts D.C. Whether this is a large enough factor of safety is a point open to question. Even the practice of testing condensers at twice the normal working voltage is not always a satisfactory solution to the problem of condenser breakdown.

#### "Peak" Voltages.

When, for instance, the circuit in the eliminator is suddenly broken, we have peak voltages set up which are applied across the condensers in the circuit; with many eliminators the voltages thus developed may be as much as three times the normal voltage. Unless, therefore, the condensers employed have been designed to withstand these sudden rises, a breakdown will be the inevitable result. To allow for such emergencies, the factor of safety should be more than 2, and preferably in the neighbourhood of 3 at least.

In many instances it will be found that a condenser has been tested on A.C. Where this is the case it should be remembered that then the conditions of test become different in that the maximum value of alternating voltage is 1.4 times the rated value. Thus a condenser rated to have passed a 200-volt A.C. test has actually withstood a maximum voltage of 280. Of the two condensers, therefore, the one tested at 500 volts D.C. and the other at 500 volts A.C., the latter will have withstood the higher value—that is actually 700 volts.

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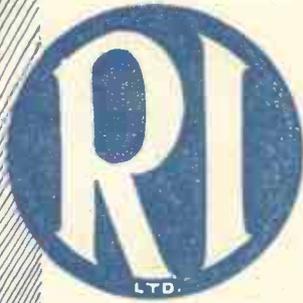
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