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The Wireless Magazine

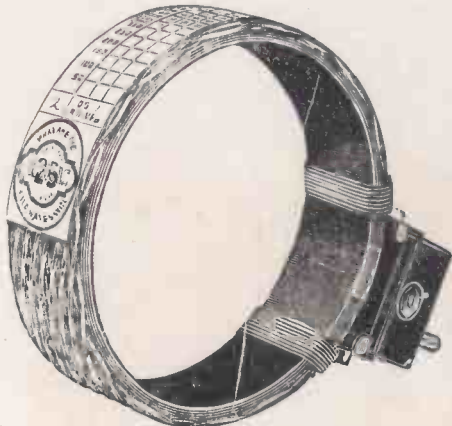
Edited by
Bernard E. Jones

VOL.1, NO.3.

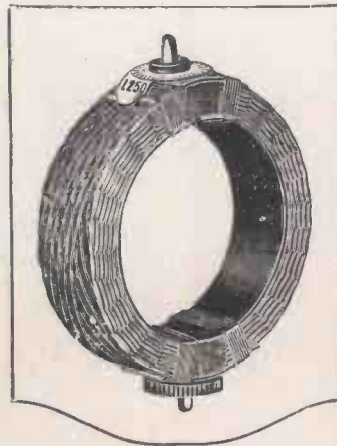
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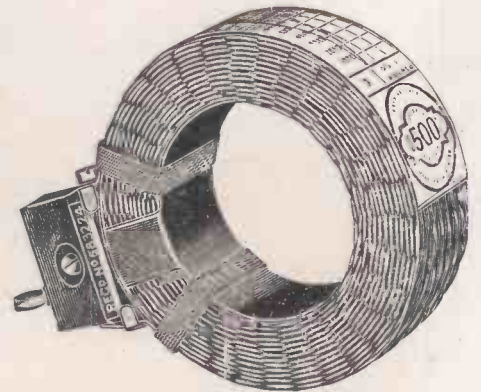
F. K. DUNN



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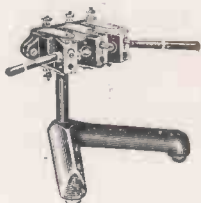
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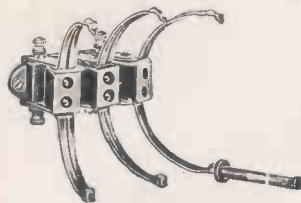
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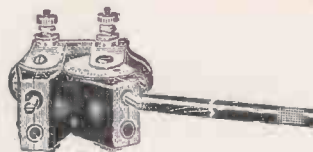
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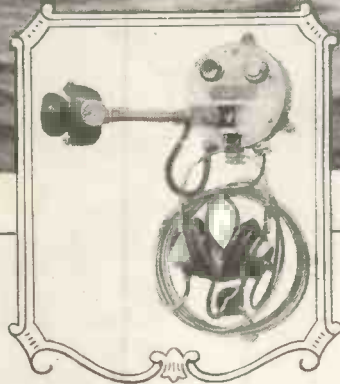
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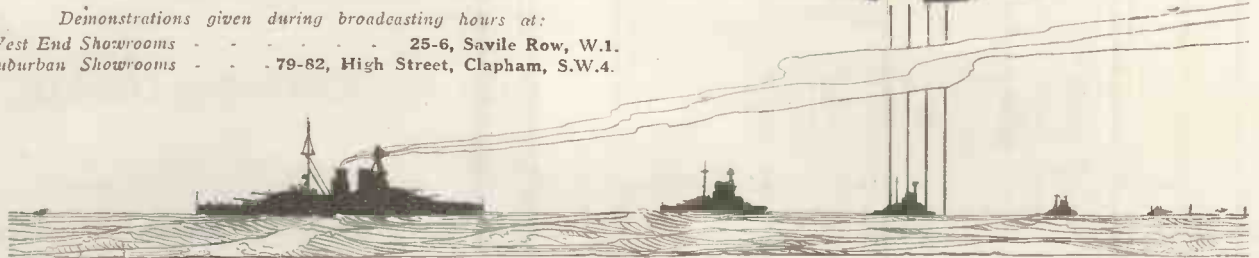
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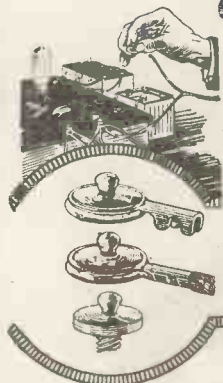
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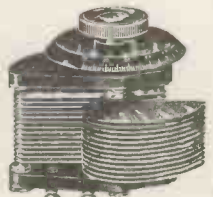
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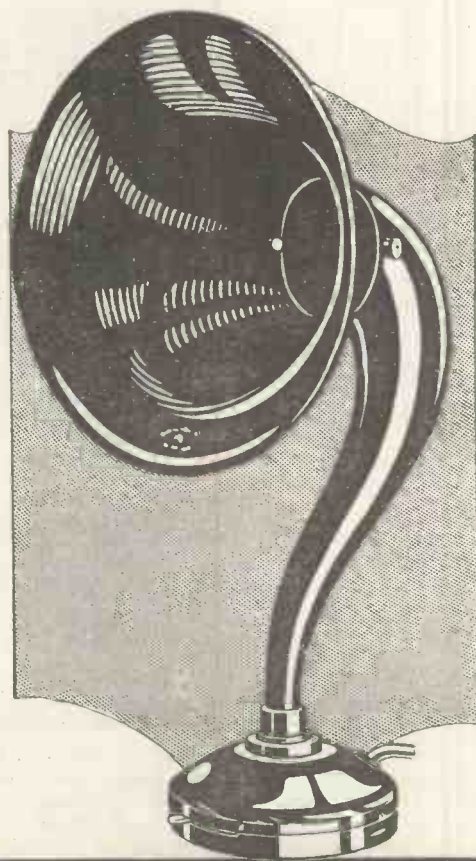
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The Wireless Magazine, April, 1925

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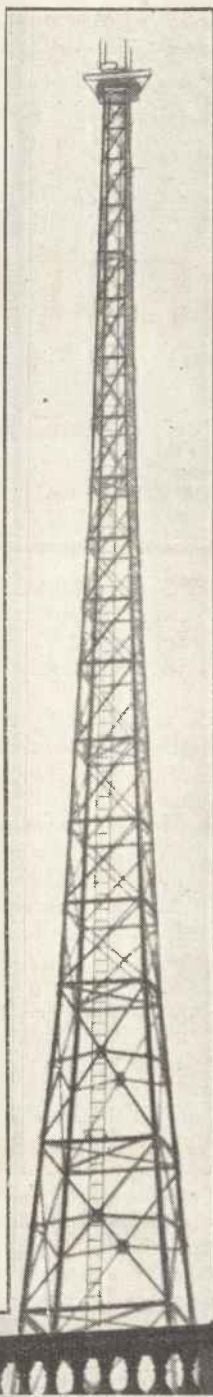
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ANNOUNCEMENTS :

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An Aerial Mast of the New London Station.

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ANNOUNCEMENTS :

Contributions, whether MSS., drawings or photographs, are invited ; they must have a wireless interest, and if accompanied by stamped addressed envelopes will be promptly considered. Every contribution to THE WIRELESS MAGAZINE will be paid for. All editorial communications should be addressed to The Editor, THE WIRELESS MAGAZINE, La Belle Sauvage, London, E.C.4.

"Variety's the very Spice of Life, it gives it all its flavour"



Critics of the Programmes

MR ARTHUR BURROWS.
B.B.C. Director of Programmes
has a confidential Chat
with readers of ..
THE WIRELESS MAGAZINE

WHAT a tedious world this would be if we all had the same way of thinking! What should we talk about? How could we live or play?

Just imagine every person living in houses of exactly the same design; every man leaving home at the same time in the morning for the same kind of job in the City, and each one greeting the other with the same remark upon the weather!

Fortunately such things don't happen; we are all just a little bit different.

Some Differences

Brown spends his week-ends gardening. He is an authority on wireworms, green-fly, sweet peas and phosphate of lime. Jones haunts the golf course. He can and does explain each Monday in the minutest detail how he came to "foozle" a vital mashie shot in approaching the fifteenth green; he'll be out of temper for a week.

Smith has just gone off to pay the inevitable fine for driving to the public danger, etc., on the Portsmouth road on Sunday afternoon. Robinson, good citizen, ever desirous of raising his efficiency, spent Saturday afternoon—and dare we say part

of Sunday?—in completing a ten-valve anti-capacity heterodyne, with wavetrap for oscillators, wherewith he hopes to hear carols in South Carolina.

Brown's musical tastes lean towards Beethoven; Jones has always favoured Mozart (George); Smith pins all his faith to "Invictus," with which his bathroom rings each morning; whilst Robinson is divided in his admiration between the composers of "In a Monastery Garden," and "Last Night on the Back Porch." Their names he has forgotten for the moment.

These varied tastes—"the very spice of life, it gives it all its flavour"—make particularly interesting the programme side of broadcasting. Brown, Jones, Smith and Robinson represent but four varieties of outlook; there are dozens in every street.

As they each pay an annual licence fee for the reception of our programmes—or we hope they do—they expect, and reasonably so, that they will hear from time to time something which is, or approaches to, their idea of good entertainment.

This means for the B.B.C. programme staff no moment of rest, but an unceasing exploration of

the field of human interest and of corresponding activity in the provision of acceptable material. It also means certain and unending criticism.

Criticism Not Annoying

This criticism is not an annoyance to us. Contrary to the belief of some writing to us for the first time, every criticism is *most carefully examined*, for frank constructive criticism is most helpful and is not infrequently a source of inspiration.

Readers of THE WIRELESS MAGAZINE will undoubtedly be keen on learning how best they can help in the perfection of British broadcasting.

In order to give a maximum of assistance it is necessary for the critic or author of suggestions to imagine himself, as far as he is able, in the position of the programme staffs.

Peculiar Conditions

We work under peculiar conditions; there is no exact parallel. Although some of our transmissions take place in daylight hours, we are always working metaphorically "in the dark."

The newspaper editor learns day by day, through his circulation

manager, the general effect of his editorial policy or the special appeal of distinctive types of news over certain areas or amongst certain classes.

The theatrical manager watches carefully the box-office, not only for a rise or fall in receipts, but for an indication of the type of persons to whom his production appeals.

The concert manager and concert agent has one eye on the box-office and the other on the response of the audience to each performer and individual item.

We broadcasters have no circulation figures in the commonly accepted sense, we have no nightly box-office receipts, and we never see our audience, nor does our audience see the broadcaster. Neither can we judge in how many homes the material broadcast is received under ideal conditions.

We are reliant, therefore, to a considerable degree, on the impressions which reach us from listeners. Some can be gathered in the morning train (they are quite embarrassing at times); others come through conversations with all sorts and conditions of people. The majority arrive through the post.

The criticism we most welcome is not that written in the heat of the moment when some slight departure from the advertised programme has taken place—for that departure is already only too well known to ourselves and (I will add) to our own annoyance—but one written as the outcome of close observation extending over a number of evenings. The exception to this, of course, exists in a departure from our standard in musical quality or good taste, when we do welcome immediate reports.

Criticisms written on the experience of a single night's transmission have less value than more considered ones, because in the majority of cases the subject of complaint is an exception rather than a common happening and has already been dealt with so far as future programmes are concerned, or because the item has no appeal to the author of the criticism.

In this case it may reasonably be assumed that many others, differing in taste and in outlook on men and affairs, have received some pleasure, and that these people in turn will be bored stiff when the author of our original protest is enjoying himself.

Moderation Necessary

It is quite unreasonable to expect that the broadcast programmes will give complete personal satisfaction

on 365 nights of the year. It is a mistake to attempt to listen to the entertainment side of the programmes for even seven nights in succession. By so doing one will be attempting what has never before been attempted in connection with any other form of amusement. Were one to do so there is no doubt as to the result. Broadcasting should be taken, like all the good things of life—in moderation.

Readers of THE WIRELESS MAGAZINE can also render aid to our programme staffs by specifying in their letters of criticism or appreciation *why* a certain item or incident annoys or gives particular pleasure. We know that on occasions the impression received in the home of the listener differs from that obtained by those present in the studio, even after a careful rehearsal over a telephone circuit.

We are most anxious to hear of transmissions which are considered to fall short of our standard, so that we can discover the contributory cause and eliminate it from future performances.

The most difficult criticism to meet in broadcasting, as elsewhere, is that of the individual who loses no opportunity for complaining in print that the fare provided is not consistently of the highest academic standard. These are the folk who convey the impression that the broadcast programmes should be a sort of non-stop symphony concert or a perpetual recital in the original Greek of the Iliad and Odyssey of Homer.

The B.B.C. has as its constant object the provision of the best in music, in science, literature, and the several arts, but it realises that unless it wishes to alienate the interest of the hundreds of thousands upon which the very existence of the service depends, this term "the best" must be interpreted on at least the majority of evenings as "the best within the understanding of the average intellect."

Our desire is that readers of such criticisms shall, by personal tests extending over some days and not an individual performance,

judge how far these are justified.

Let us forget Brown, Jones, Smith and Robinson as individuals with widely varying tastes, and think of them as members of a crowd. Here we arrive at perhaps the most fascinating problem which the programme department has to face.

The success of many a great artist depends upon the reaction between the artist and the audience in a theatre. There seems to be a mutual tuning-in

THE B.B.C. DIRECTOR OF PROGRAMMES.



Mr. Arthur Burrows as "The Wireless Magazine" photographer saw him.

process; the waves of artistic effort from the performer crossing simultaneously waves of approval and encouragement from distant parts of the building. The impressions arrive through the ears and eyes of the audience.

No such reaction is at present possible in the broadcasting studio. It is rare that anyone beyond the announcer is present, and death-like silence prevails. The broadcaster's best resource is to imagine that he is entertaining himself.

Such is the position of the performer. We have recently had a suggestion that the studio should be kept in darkness throughout performances by individuals, except for a bright ray of light such as is used upon the principals in stage production. The idea will be given a trial; it will probably prove helpful to those accustomed to the technique of the stage.

Let us now turn once more to Brown, Jones, Smith and Robinson, as a crowd.

These four, with perhaps a thousand others, enter a warm and cosily designed theatre after an enjoyable meal. Comfortably seated with nothing to annoy them, the curtain rises quietly to slow music and, amidst surroundings deliberately arranged to appeal harmoniously to each of the senses, the principal artist takes the stage. Brown applauds, and Smith, who is equally appreciative, but perhaps a little less demonstrative, waits for a few moments but soon follows Brown's example. By a similar process rounds of applause are built up, and finally Brown, Jones, Smith and Robinson satisfy themselves that because they individually, and everyone else, are outwardly expressing approval they are not only enjoying themselves, but incidentally are witnessing a first class entertainment.

In other words, the applause of persons other than one's self not only helps the artist but assists the listener in the enjoyment of a performance.

We broadcasters have audiences; ours are unquestionably the largest audiences known. Unfortunately these audiences are silent; they neither react upon the performer nor upon themselves.

The man at No. 7, for instance, maybe applauding as enthusiastically as his phones permit, but his neighbours at Nos. 5 and 9 hear nothing. No. 7's only reaction probably comes from his wife, who, having no phones, is not in the best of moods.

It is highly probable, therefore, that before broadcasting technique has developed much farther, we shall find it necessary to give all musical, humorous and dramatic performances in a studio built on the lines of a small theatre. The building will have to be sufficiently large to provide the ideal acoustic conditions for orchestral work, and a nightly audience will have to be encouraged.

There is an alternative, but I cannot let you into the secret—yet.

A. R. BURROWS.

TRANSMISSIONS OF CALIBRATED WAVES

THOSE amateurs who do not possess a reliable wavemeter often find it difficult to calibrate their sets accurately. The wavelengths of transmitting stations are not constant, varying a little from day to day, and a set which has successfully received a station one day will often require adjustments in the tuning before receiving the same station the next day.

Accurately Calculated

There are certain wireless stations which regularly send calibrated waves of certain lengths, in order that other stations may test the accuracy of their plant. These waves are accurately calculated before transmission, but even then it is not possible to guarantee that the wave is of the exact length advertised.

To ensure absolute accuracy, it is the usual practice among these stations to measure the actual wave they transmit (measured after transmission), but then at stated times send out a message giving the exact length of the wave. These later messages are known as "corrections."

In England, the principal station

transmitting calibrated waves is the Air Ministry (G F A). Transmissions are daily, and at the following times:—

Time	Wavelength (metres)
0745	1,400
0750	900
0800	1,680

The mode of transmission is first the call C Q V G F A followed by a series of figures for 30 seconds, and then a single dash of five seconds' duration. This dash is sent out on a wavelength as near as possible to the advertised wave, which may sometimes be exact. Should corrections be necessary, they follow the transmission of the wave.

The Eiffel Tower (F L) in Paris, also provides a very good service of calibrated waves. In this case transmissions are made only on the 1st and 15th days of each month, and the waves transmitted are of 5,000 and 7,000 metres. F L uses a power of approximately 60 kilowatts for these signals.

From 1800 to 1801 a warning signal is transmitted, and at 1801, follows a three-minute dash on 5,000 metres.

From 1810 to 1811 further warning signals are sent, followed by another three-minute dash at 1811, this time on a wavelength of 7,000 metres.

Lyons (Y N) is another wireless station transmitting calibrated waves only on the 1st and 15th of each month. In this case a power of 100 kilowatts is used. At 1821 a three-minute dash is transmitted on 10,000 metres. Corrections for all wavelengths (including F L's) follow at 1900 on 15,000 metres, when groups of figures are transmitted, giving the exact readings of waves previously sent as being 5,000, 7,000, and 10,000 metres respectively. These corrections are sent three times.

For Ships

There is one more station which may be mentioned, and this is Devizes (G K U). This station transmits daily a calibrated wave of 2,100 metres in order that ships employing long-wave apparatus may adjust their wavelengths. Transmissions are at the following times: 0444, 0844, 1244, 1644, 2044, and consist of a dash of one minute's duration on 2,100 metres. S. W.

A Beginner's One-Valve Set



THE one-valve set about to be described employs what is known as the Armstrong regenerative circuit. The variocoupler embodied in the original circuit has been omitted in order that the set

may be easily tuned by a beginner.

Reaction is obtained by tuning the grid and plate variometers to resonance. This method is much more selective than if the plate coil were coupled to the aerial coil.

The set can be adapted for the high-power station by plugging in suitable loading coils in series with each variometer. This, however, is not recommended, as the set is primarily designed for reception on the broadcast wavelength band of 300-500 metres.

A common fault in building this type of receiver is to buy two variometers with similar windings. The plate variometer should be one designed for secondary or anode tuning. It will then contain the extra turns required to make up for the loss of aerial and earth capacity. In the original set an Igranic type S.R. was used.

A box has not been built for this receiver, as many varied designs can be used. It would be possible to make the box large enough to contain both the H.T. and L.T. batteries, and if a .06-ampere valve is used there would be no external wires except the aerial and earth leads.

The battery leads could be brought from the terminals through holes in the side of the box.

Components Required

The necessary components are as follow :

- 1 ebonite panel 10½ in. by 7 in.
- 1 grid leak (2 microfarad) and condenser (.0003 microfarad) (Dubilier).

- 1 .5 microfarad H.T. bridging condenser (Ediswan).
- 1 .002 microfarad phone condenser (Lissen).
- 1 aerial tuning variometer (Igranic).
- 1 anode tuning variometer (Igranic type S.R.).
- 8 terminals (Refty).
- 1 valve window (Grafton Electric).
- 1 valve holder (Aermonic).
- 1 filament resistance (McMichael).

Drilling the Panel

The panel should first of all be marked out with a pointed tool and straight edge, and positions of holes

soldered. If the tops of the terminals are tinned the soldering of various leads to them will be a simple matter.

When the wiring is completed, the batteries and aerial and earth leads

must be connected and the valve plugged into the socket.

On turning the variometers a slight hissing sound will be heard. This denotes that the set is oscillating.

If no sound is heard take out the valve and make sure that the pins are making contact.

Results

On an indoor aerial one mile from London, 2 L O was picked up at strong loud-speaker strength. On an outdoor aerial at the same place Cardiff was received at just sufficient strength to be heard comfortably.

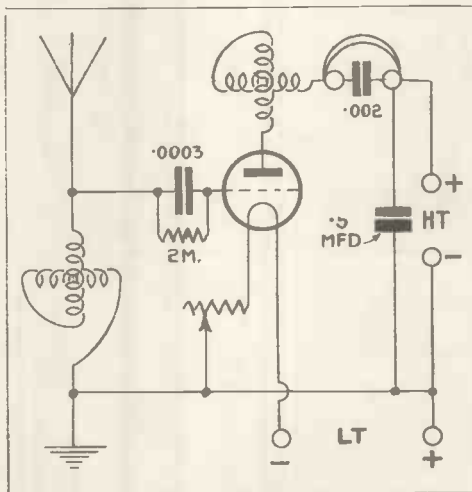
Croydon (on 450 metres) came in very loud. These tests were made in daylight. As previously stated, the set is very simple to operate, and in view of this should prove ideal for the amateur taking up wireless for the first time.

General Instructions

The operation of this receiver is so simple that a novice will be able to tune-in immediately the set is completed. Both knobs should be turned at roughly the same speed when tuning.

When a station is heard the aerial variometer (left-hand knob) should be turned until signals are loudest; then by turning the anode variometer (right-hand knob) the strength of the signals should be still further increased, until the set begins to oscillate (denoted by a hissing sound).

The receiver should not be worked in an oscillating state, as it will cause considerable interference to neighbouring listeners.



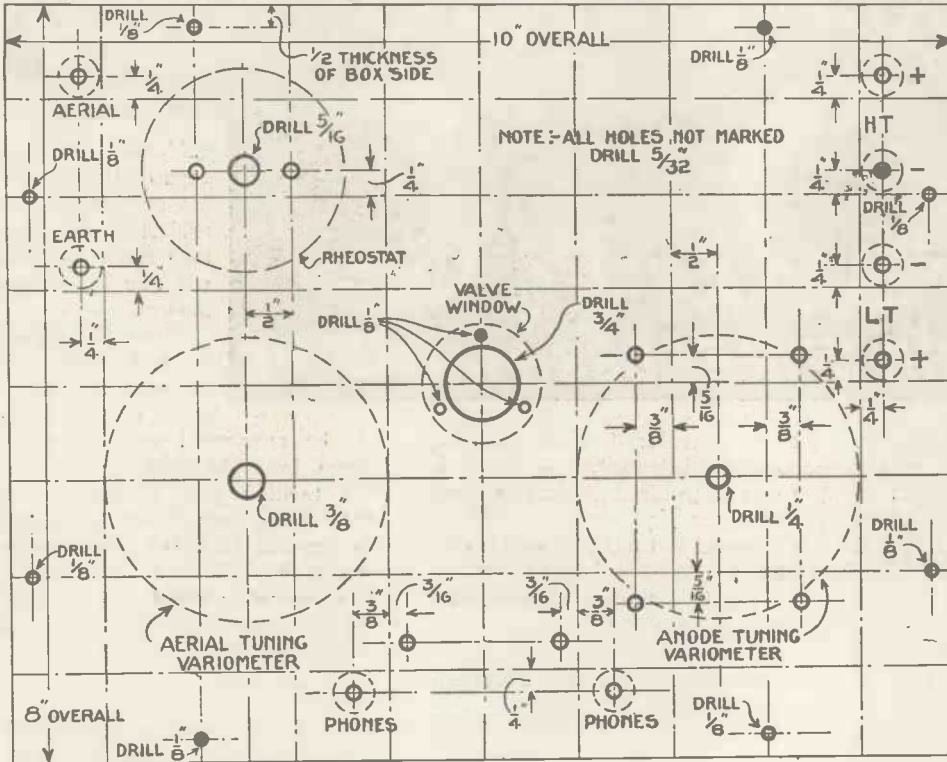
Circuit Diagram.

marked. If the components used differ from those described, a slight rearrangement may be necessary.

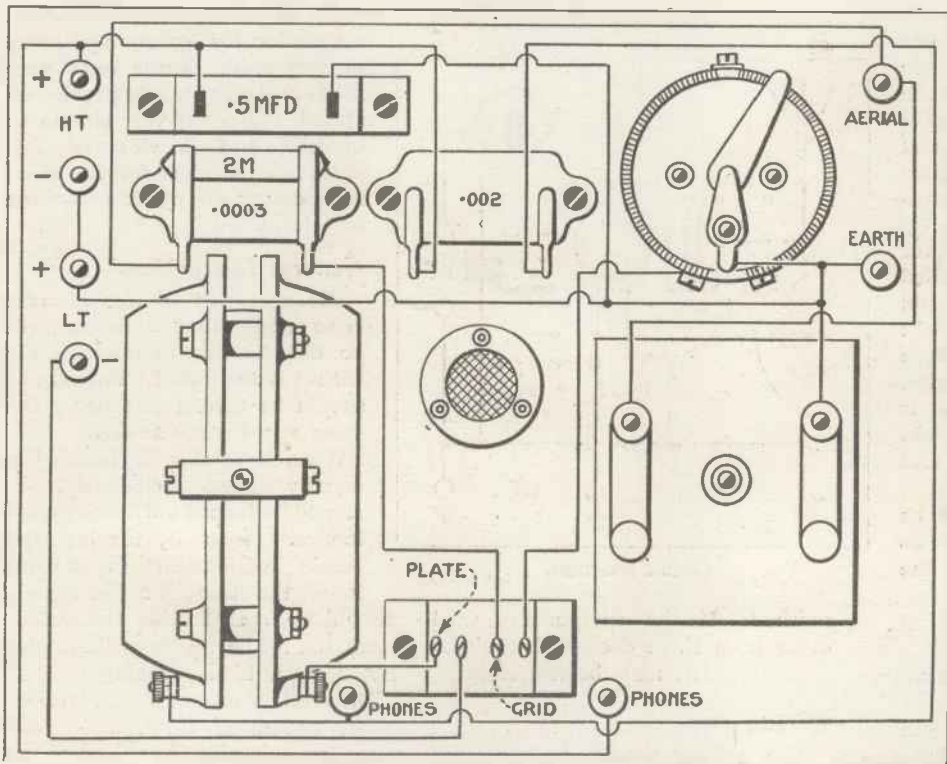
Wiring

The wiring should be carefully carried out, and all joints must be

A BEGINNER'S ONE-VALVE SET (Continued)



Layout of the Panel, showing Holes to be Drilled.



Back of Panel Wiring Diagram.

When the anode variometer is tuned to its most sensitive spot (just before oscillation commences) the aerial variometer may need slight retuning.

The possibilities of a one-valve set of this description are unlimited. By using a suitable anode voltage and a good detector valve there is no reason why most of the B.B.C. stations should not be heard at comfortable telephone strength.

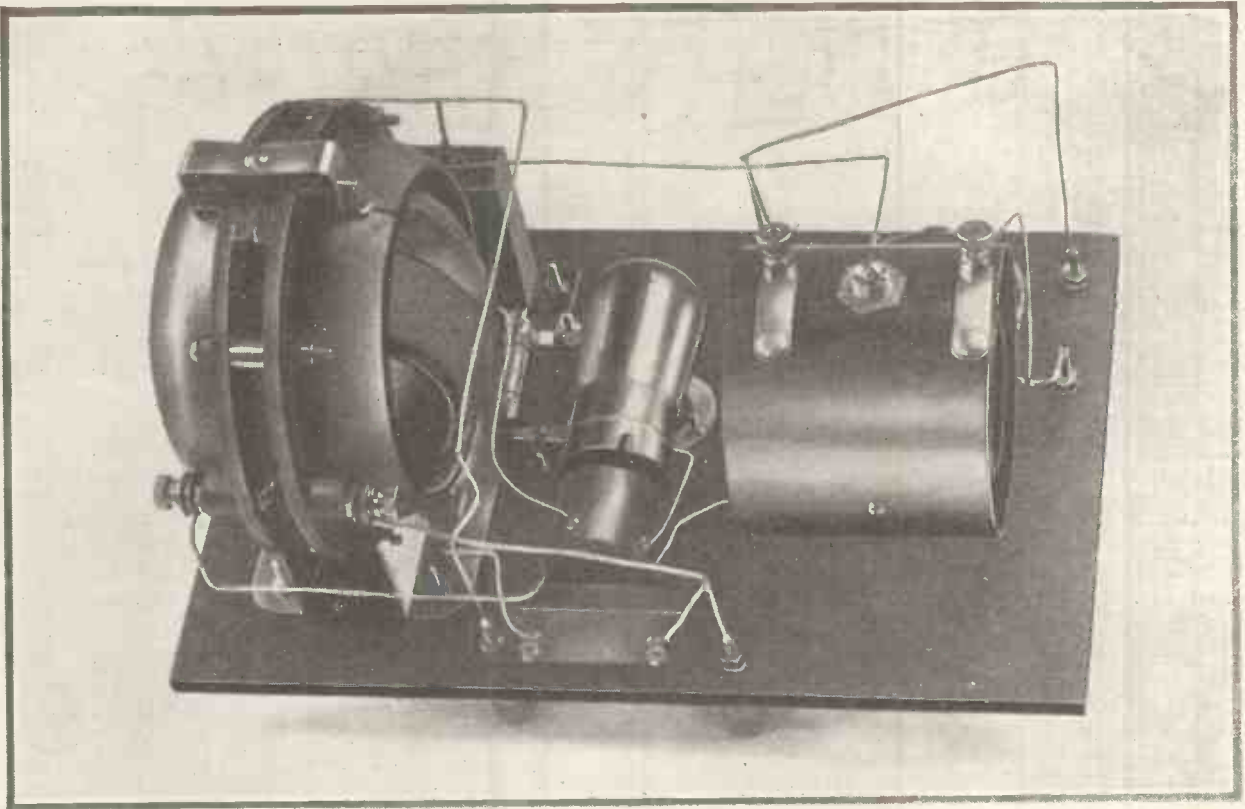
This receiver (as, indeed, is the case with all others), depends mostly for its operation on an efficient aerial and earth system.

The aerial should preferably contain only a single wire, as far from surrounding objects as possible, while the "earth" should be a good connection to a main water pipe, or, if this is nearer, to an earth tube sunk well into damp ground.

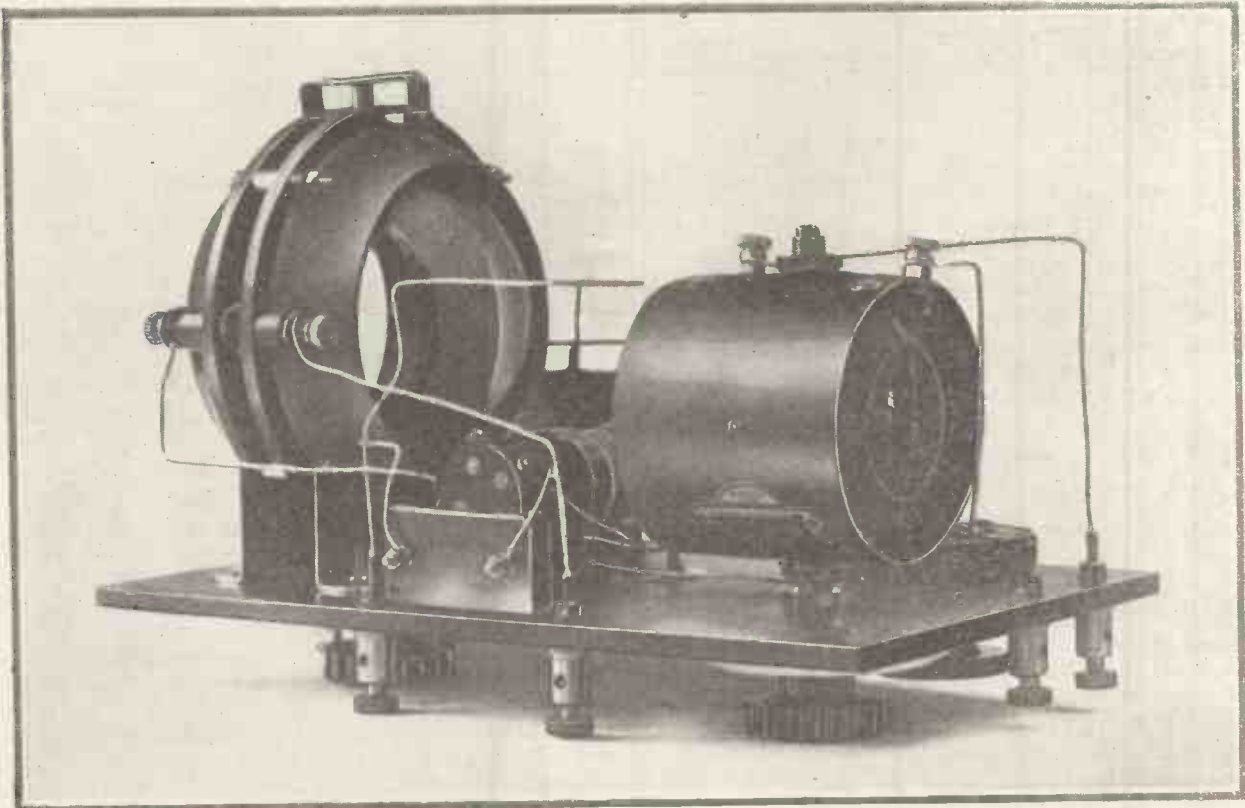
Those who live in flats near a broadcasting station, and who only require a relatively small range, can use an indoor aerial with advantage. This aerial must be well insulated.

For the listener who requires loud-speaker reception, a one- or two-valve amplifier will serve admirably.

A BRITISH traveller has picked up Bournemouth from the Red Sea. We understand that the explanation of his presence in those parts is that he is a disgruntled Southern Railway passenger endeavouring to discover a quicker route from London to the South Coast.



Under View of Panel showing Disposition of Components.



Another View of Panel showing Method of Mounting Valve.



A Great Mathematician

THE announcement of the death of the great mathematical genius Dr. Oliver Heaviside brought back to my mind a very curious thing with regard to this wonderful man. I had known for many years of the existence of Heaviside in the world of mathematical physicists, but somehow or other I had got the idea that Heaviside belonged to a past generation of scientists.

Even when I came into contact with several scientists whose names are known to all wireless experimenters, I heard nothing of Heaviside the man, although I frequently heard the work of the mathematician Heaviside referred to.

When, however, I was travelling in Canada I ran across a very well-known literary man who was a Canadian by birth and who had lived and worked all his literary life in Eastern Canada. One day, I do not remember how, the talk ran on Heaviside's work in wireless.

To my great amazement I heard there, for the first time, the story of Heaviside's life in the curious mode of retirement he had chosen for himself.

I was told of his friendship for the village postman (a policeman



"A Great Mathematician"

was mentioned in the press obituary notices), and I was told that Heaviside worked out his problems on the sugar bags supplied from the village grocery store.

There may have been a little exaggeration in the account of Heaviside as given to me in Canada,

but it did seem a strange thing that I had never heard of Heaviside here in England, and that what was little known of him here was common knowledge in Canada.



Low-loss Wiring

A wireless neighbour has been in to show me his latest three-valve set. After looking the set over carefully, I asked my good neighbour what



"Army Days!"

results he had obtained with the new receiver.

"Haven't tried it yet," he replied.

"Then what have you brought it to me for at this early stage? Something wrong with it?"

"Not at all."

"What then?"

"Look at the wiring."

"It seems all right as far as I can see."

"I know, but don't you notice anything unusual?"

"No nice right-angle bends. Looks as if you were short of No. 16 square tinned copper when you wired up."

"Not a bit of it. I had plenty of wire when I wired up the set, but I made up my mind to use as little wire as possible in the connections. I only used six feet of square wire altogether in wiring up."

"What is the idea, then?"

"Low-loss wiring, the latest idea in the low-loss line. I'm not quite sound on my theory, but I thought all those beautiful right angle bends we usually make in wiring up must

give these wireless currents a jolly old lot of work to do.

"Do you remember wheeling when in columns of fours in the army days? Always found it a pretty hard job to get round when I was on the outside. I reasoned out that the outside electrons must have a pretty bad time getting round all the corners in a wireless set, so I determined to give them no corners to go round in this set. I am expecting great things of it."

I wonder if my neighbour has struck a good idea. I am not quite certain of this theory, but if the outside electrons have to scuffle round the corners in the wirings of our sets I suppose there is a decent chance that some of them might slip off the edge. If they do, I wonder where they go to. Have you ever had to sweep up a bunch of lost electrons from the bottom of your cabinet?



A Dealer in the Country

Isn't it really amazing that, wherever you happen to find yourself, you run across wireless enthusiasts who can tell you things both new and entertaining?

I have just returned from a visit to a country district where I had



"A sailor can spin a good yarn"

many an enjoyable talk with the men of wireless in that quiet retreat. The best of the bunch was undoubtedly the local wireless dealer, himself an ex-service wireless operator—a submarine wireless operator, of all things.

There is no need for me to tell

you that a sailor can spin a good yarn. Get hold of an ex-submarine wireless operator, however, and what you will get is not a yarn, but a super-yarn.

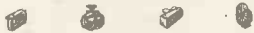
I am not going to repeat any of the service yarns I got from my ex-sailor country wireless dealer, but I must tell you what he said to me about valves. I asked him what he thought about the reduction in price of our British valves.

"Don't talk to me about valves," he said; "I'm fed up with selling the things. Last time I laid in a stock of valves, I got a lot of X—valves and a few Y—'s. Everybody wanted the Y—'s and the X—'s are still on the shelf. This time I got a lot of Y—'s and a few Z—'s, and now everybody wants the Z—'s, so I look like having the Y—'s left on my hands.

"One valve is as good as another to me. I don't know why there should be these fashions in valves. It's not so bad with crystals. You don't stand to lose so much.

"Speaking of crystals, do you remember the old carborundum detector? I was once out on the old—"

I must stop there if I am to keep my word over not repeating any of my country dealer's ex-service yarns.



Police

I cannot leave my country wireless dealer without telling you of the following little incident. I must explain that my country dealer's shop is a small wooden hut built by the side of a main road on the outskirts of a small town. At night the hut is locked up and my dealer goes off to his home, which is a mile and a half away.

One morning I happened to be whiling away a quiet hour in this wayside wireless shop when two wireless enthusiasts brought their accumulators to be charged. The incident, however, is probably best described by a reproduction of the conversation which took place.

First Accumulator Owner: "Here, I say, old man, when did you put these accumulators on charge?"

Dealer: "Eleven forty-five pip emma, last night."

Second Acc. Own.: "I thought they were not there at closing time last night."

First Acc. Own.: "I wish I had

known. I would have brought mine along then."

Dealer: "You'd have stood a good chance of being run in if you had done."

F.A.O.: "What do you mean, run in?"

Dealer: "Police, of course. It's a very funny thing, but I have only



"Police!"

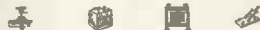
been down to this shop late at night with accumulators three times this winter, and each time, before I've been in the shop a couple of minutes, I've had a policeman in after me.

"It doesn't half give you a turn to be suddenly asked what you are doing here, when you are bending over the accumulators with your back to the door. I jumped up quick enough last night, I can tell you. Of course, it's all right once the policeman sees it's me."

S.A.O.: "Why are the police so watchful over your little place?"

Dealer: "It's the boys they are afraid of. They think it would be an easy job for anyone to break in here and carry off some of my stock. You see we are absolutely right beyond crystal range here.

"A local wireless burglar would have to lift enough stuff to make a valve set. *If we were within crystal range the police wouldn't bother half so much over my little place.*"



A Curious Coincidence

A few days ago I called to see my newsagent. After our business had been disposed of—that is to say, after I had obtained the cigarettes



"A low-frequency transformer"

I desired—the talk ran on wireless. My newsagent was very troubled over what he called his extraordinary, bad luck with low-frequency transformers.

He had, he said, recently bought a low-frequency transformer of a certain type on the recommendation of

a wireless neighbour. When he tried the transformer in his set, the loud-speaker did nothing but howl abominably. Accordingly, he borrowed one of the same kind of transformer from the neighbour who had recommended it.

When the borrowed transformer was put in the set the loud-speaker worked beautifully. My newsagent therefore felt justified in sending back his own transformer to the makers and asking for another in exchange. He got the desired transformer in exchange, but when this was tried results were as bad as ever. The loud-speaker did nothing but howl again.

"Why should one transformer of a particular make be so good and two others exactly like it be so bad?" he asked.

I evaded a direct answer, but I told him that I never bought cheap transformers and that for years I had sworn by a particular make and I had never known what transformer trouble was. I went out of the shop as my newsagent was making a note of the transformer of which I spoke so well.

That same evening I had a wireless visitor and I tried to make use of a three-valve set containing two of the transformers I had named to my newsagent. Only the smallest volume could I get out of my loud-speaker. As it was one I had lent to a friend and had only had it back again that day, I thought that the loud-speaker had been damaged.

I was really troubled about that loud-speaker. One of the rules I have made, only to break as often as to adhere to, is never to start to repair a faulty set after tea. On this occasion I kept the rule.

The next day I looked over the three-valve set.

"Ah!" I said to myself. "It's that barrel switch."

So sure was I of the correctness of my diagnosis that I took out the suspected switch and replaced it by one of more modern type. Confidently I tried the set, but the results were as poor as they had been on the night before. I began to get anxious about things. I tested all the soldering and the variable condensers, but found nothing wrong. Everything apparently was in good order. Quite by accident I took out from the high-tension battery the middle one of three positive high-tension wander plugs. There was a little difference in the signal strength.

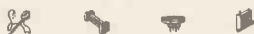
I thought I had it then. The lead from this wander plug to the terminal on the set was tested, but that, too, was all right. Oh dear!

After a few minutes' thought I drew the circuit diagram and studied it.

"Does that lead from the middle wander plug really supply the plate of the second valve *through the primary of the second transformer*? Yes, it really does. Is it the primary of the transformer? Of course it isn't, but we'll try it."

I did try it, and it *was* the primary of the second transformer. After taking out this transformer and replacing it with another one, the set worked as well as ever.

I must have forgotten to "touch wood" when I was bragging about my good luck with transformers to my newsagent. But it was rather a curious coincidence, wasn't it?



Coil winding

If you were asked to give a vote as to which you thought was the most fascinating branch of experimental work in wireless, I wonder what you would say. I am inclined to think that I should give my vote to coil winding.

The great fascination to me in coil winding lies in the fact that, in most cases, a hit-or-miss policy seems to be the best to apply. The reason for this is that nobody appears to have established a mathematical



"A thin excuse"

stranglehold over our familiar tuning coils.

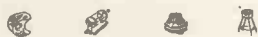
True, there are elaborate formulæ to be found in the advanced textbooks, but the one safe thing to assume about these formulæ is that, at the best, they are only approximately correct.

Recently my own activities in the coil-winding business have been directed towards improvement in the design of my home-made tuning coils. I approached the problem by reading all I could find on coil winding in both books and periodicals.

After an evening's solid reading on this subject, I came to the conclusion that my home-made coils

were about everything they should not be. They were wound with wire which, like many an excuse that is made, was a little bit on the thin side. The turns were not air-spaced, and the coils were broad and shallow, whereas they should have been narrow and deep.

On top of all that, the windings had been carried out in a fashion which could only be described as "any old how." When I came to sum up, I concluded that my coils were just about as bad as they could be, and that it was a wonder that I got any results at all with them.



The Super-lative Coil

After much consideration, I set myself the task of making a new type of tuning coil, one which should be absolutely the last word in such things.



"The super-lative coil"

First I built a new kind of former, of such a design that the winding on it was bound to be both narrow and deep. Then I made a journey to my local dealer to purchase wire for my new coils. As soon as I mentioned the word wire, my dealer placed a reel of No. 26 d.c.c., my old favourite gauge, in front of me.

"You can put that back, my good man," I said to him much to his astonishment. "I need wire of a thickness."

"Certainly, sir," he replied, "high-tension cable, sir? No. Er—barbed wire has its points, sir, but the dead ends are troublesome."

I ignored his idle chatter, and demanded again wire of a thickness. No. 20 was the best he could do for me.

Arrived back in my workshop, I debated long with myself on the manner of winding I should adopt for my new coil. Should it be of sweetest honeycomb type? Should it be spider, Shrove Tuesday, or Wilton pile?

Really, I gave tremendous deliberation to the type of winding I should adopt. Finally, I hit upon a manner of winding which I thought would embody the advantages of every one of the well-known types. I decided to call my coil the super-lative, and I wound just one coil.

Results

I looked over the one and only super-lative coil with the critical eye of the expert. The winding was narrow and deep on the former. The wire was good and of an inexcusable thickness. The winding was air-spaced, at the sides if nowhere else.

The difference in potential between any one turn and the turn next to it was nowhere greater than the difference in potential between the first and the last turns. Truly, I thought, the super-lative coil was a good coil well and truly coiled.

With the firm conviction that something good was about to happen I placed the super-lative coil in my set and switched on the batteries. Not a sound. Surely there was no flaw in the super-lative coil. Surely I had not—— No, I had not; I had merely forgotten to turn over the earthing switch.

After having switched in the aerial and earth I began to tune in one station after another. Results were good, quite good, but they were not revolutionary. I began to test the super-lative coil against my broad, stubby coil, of thin wire, with its "any old how" winding. The super-lative coil had it, but the difference was not worth writing home about.

I intend to continue my coil-winding experiments when I have forgotten all that I have read on the subject. Before leaving this fascinating pastime, however, I feel constrained to say that it would



"Results"

be a good thing if some mathematical genius would tell us the truth with regard to the efficiency of the many types of tuning coils.



The Loud-speaker Again

The latest charge to be laid against the long-suffering loud-speaker is that of two loud-speakers of identical make and resistance one may work well on a particular receiving set while the other may not. Instances have been given in which a purchaser of a loud-speaker has returned the instrument to the dealer as unsatisfactory and has taken another

one of the same type exactly and had found in this second loud-speaker an instrument as efficient as the first was inefficient.

I wonder what the manufacturers of loud-speakers think of all this. To me the story seems hardly in keeping with my experience of human nature. Do you think that any ordinary mortal who purchased a "Roaring Lion" loud-speaker and took it home



"Two loud-speakers"

with him only to find that his loud-speaker "roared him as gently as any sucking dove" would exchange it for another "Roaring Lion" of exactly the same type? Not a bit of it. He would exchange it for a "Bull of Bashan," crinkled horn type. Of course he would.

In such a wireless world as the present one it is possible to have a dud loud-speaker, I suppose. But isn't it just as possible to have a dud pair of phones? When somebody or other had a dud pair of phones years ago I wonder if they exchanged them for a pair of the same make. Granted that they did, I wonder if they wrote to the papers about it. Probably they did not, for it never has been the fashion to blame phones right and left as it appears to be the fashion to blame loud-speakers in these days.

Just recently I have been talking to the owner of a three-valve set.

"Will it work a loud-speaker satisfactorily?" I asked.

"Oh, yes," was the reply; "but I do not care for loud-speakers."

"What loud-speakers have you heard?" I then asked.

"Only one, the——"

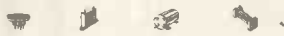
And the loud-speaker my friend mentioned was one I happen to know to be one of the very best for use with a two-valve set but one which does not seem to perform well with a three-valve set.

If I am ever asked to give an opinion on the choice of a loud-speaker, I always ask what type of set the loud-speaker is intended for. There are some loud-speakers which, in my opinion, only work well on a three- or four-valve set, and there are others which work splendidly on a one- or two-valve set but which are lost on a set with more than two valves.

I have four loud-speakers in the house just now. One, a small one, 120 ohms resistance, I always use with a one-valve set. The second, I invariably use with a two-valve set. The third, a much larger loud-speaker, is one I use in my own home with a three-valve set. The fourth, the most expensive one of the lot, is one I use when operating in a large room or out in the open where there is a large number of listeners and where volume is required above everything, especially above the noise of casual conversation.

Perhaps it is worth mentioning here that I scarcely ever use more than three valves in a receiving set. I do not care about loud-speaker reproduction with four or more valves.

I wonder what your secret of successful reproduction on a loud-speaker happens to be. Mine is the right fixed condenser across the loud-speaker terminals. I always find out the value of the fixed condenser a loud-speaker needs across its terminals before I have had it many minutes. If there is any doubt between two fixed condensers, I use the one with the bigger capacity of the two.



Two Opinions

Before leaving the subject of loud-speaker reproduction, I should like to relate a little experience which befell me when receiving the *Messiah* from 5 X X on the last Sunday in the old year. Two visitors came into my sitting-room while my loud-speaker was giving really good reception of the familiar music. The first was a man who possesses a two-valve set—tuned anode and detector. His comment on my set was:

"Very good—very good. But I

must say I prefer the phones. There's less of that—er—you know——"

I am afraid I did not know.

My second visitor was a lady who has herself often sung the contralto solo parts in the *Messiah*. She sat there for nearly an hour perfectly fascinated. Time after time I could hear her humming the music and singing the words softly. When she

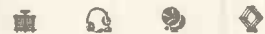


"Two Opinions"

finally went she could say nothing good enough about my set and my loud-speaker.

"It's perfectly wonderful," were her last words. "I had no idea wireless had reached such a stage of perfection. I do not think I have enjoyed a Sunday evening so much during the whole year."

Which of the two am I to believe? The first visitor was a musician who possessed a wireless set. The second visitor was a musician who did not possess a wireless set. Puzzling, isn't it?



Charging Accumulators

My accumulators have been charged for the last few weeks at an electrician's, where a dynamo is used for this purpose, and where the cells are tested by means of a hydrometer. Previously, for over two years, I had had my accumulators charged at a garage where use was made of direct current from a charging board, and where the test for a fully charged battery was the "gassing" of the cells. I do not know whether it is the dynamo, or the hydrometer, or both which is at fault, but I am certain that my accumulators have "gone off" considerably during the period they have been charged from the dynamo.

It has always seemed to me a risky business testing numerous accumulators with the same hydrometer. In testing a cell some of the acid in that cell is bound to stick in the hydrometer, and this is doubtless passed on to the next cell tested. A general mix-up of acids is the result, and this can scarcely be a good thing for the different cells.

HALYARD.

Mr. F. W. THOMAS

Will contribute to next month's issue of

THE WIRELESS
MAGAZINE

one of his
Characteristic Articles

We fear he will insist on
illustrating it!



Complete Heterodyne Wavemeter.

A WAVEMETER, preferably of the heterodyne type, is a necessity to the amateur transmitter and a very great convenience to everyone interested in short-wave reception. Heterodyne wavemeters are expensive things to buy, and most of the ex-W.D. gear now to be obtained does not deal with sufficiently high frequencies to be of any use to those persons who most require them. The instrument to be described can be built quite cheaply and, once it has been calibrated, is every bit as good as the very expensive factory-made article.

Range

The range of the meter will depend, to some degree, on the way in which it is constructed, but it should extend from just over 300 metres down to about 40 metres.

The materials required for constructing an instrument exactly as described are given below. The three essentials are (1) a really good condenser, preferably of the square-law variety; (2) well-spaced wiring; (3) an arrangement of the coils that places them at right angles to one another, so that the field of one does not cut the field of the other.

The materials actually used were as follow: Mahogany case, with lid.

Ebonite panel, $\frac{3}{16}$ in. thick, 5 in. by 6 $\frac{1}{2}$ in. Valve-holder block from ex-W.D. transmitter or receiver. (This can probably be obtained for a few pence from a dealer in ex-W.D. gear. If it cannot be obtained, a small valve panel should be cut from $\frac{1}{4}$ -in. ebonite. It will not look so neat but will answer equally well. It can

Tuning-in on the short wavelengths is not an easy matter unless the exact adjustment is known—and that can only be found out by the use of a wavemeter.

An accurately calibrated valve wavemeter allows of very sharp tuning. This article explains how to make such an instrument, which is no more difficult to construct than an ordinary single-valve set.

Care must be taken in the calibration of the completed instrument; that part of the work is fully explained.

be fixed to the main panel by two screws.)

Further materials used were one Bowyer-Lowe square-law .0005-microfarad variable condenser. One fixed condenser of .001-microfarad capacity. (This should be of the very best quality available.) $\frac{1}{4}$ lb. No. 18 gauge enamel-covered wire.

Cutting-out the 'Guesswork in Tuning

MAKING AND USING A VALVE WAVEMETER.

(The inside dimensions are 8 $\frac{1}{2}$ in. front, 6 $\frac{1}{2}$ in. front to rear, 6 in. deep. The case is made of $\frac{3}{8}$ -in. wood and is divided into two compartments. The bigger is 5 in. by 6 $\frac{1}{2}$ in. This contains the panel. The smaller division contains the batteries. The lid is 2 in. deep overall.)

(This will be more than sufficient. That left over can be used for wiring up.) 3 $\frac{1}{2}$ in. of ebonite or cardboard tube 3 in. in diameter. (This must be divided into two pieces, one 2 $\frac{1}{2}$ in. long and the other 1 in. long.) One double-pole double-throw switch, as small as possible. One "on and off" switch for the filament-heating battery. Two terminals. Two 1-in. 4 B.A. screws with three or four nuts to each. Two dry cells 2 $\frac{1}{8}$ in. by 2 $\frac{1}{8}$ in. by 6 in. overall, or thereabouts. One Siemens 15-volt unit for H.T. One D.E.3 valve.

Winding the Coil

The big length of tube should be wound with 25 turns of the wire, which should first be stretched to take out all kinks. A small hole about the diameter of the wire is bored in the ebonite to hold the end of the wire, which is then wound on as closely and tightly as possible. A hole is bored where the turns end for finishing off. As it will not be possible exactly to determine the position of this a 2 B.A. hole should be bored at the opposite side and end to that at which the winding starts, $\frac{1}{4}$ in. from the end of the tube. This will take the mounting screw, but can be used as a temporary hold for the wire whilst the finishing hole is being drilled in the right position.

Tapping

At approximately 12 $\frac{1}{2}$ turns from the start of the winding the wire must be cleaned and a tapping soldered on. It is as well to mount the coil and determine the best position for this tapping when the switch is in position. It should not be less than 12 turns nor more than 13 turns.

The small coil is wound with 7 turns of the wire, a tapping being taken at 4 $\frac{1}{2}$ turns. As this coil is

small it is as well to make the tapping as exactly as possible at the point mentioned. A 2 B.A. hole is bored in this former $\frac{1}{2}$ in. from the end remote from the start of the wiring. It can be used, as was that in the big former, to hold the wire whilst a finishing hole is being drilled. As the big coil will oscillate down to

club he should not have much difficulty in calibrating it against a standard heterodyne wavemeter. It is not necessary that this wavemeter should have a low range, as the calibration can be done very accurately against the "harmonics" of a known wave.

If a single-valve set or a heterodyne wavemeter is accurately tuned to radiate a wave of known frequency, say either 900 metres or 600 metres, and the phones are attached to the terminals of the wavemeter to be calibrated, on turning its condenser a number of small whistling notes, some louder than the others, will be heard. These notes come at definite fractions of the original wavelength (see table). The figures in the left-hand column represent the fractions of the original wavelength, as, one half, one third, one quarter, one eighth, etc.

will be little difficulty in distinguishing the fundamental or true point, for it will be much louder than any other.

For Transmitting

The phone terminals are for use when taking the wavelength of a

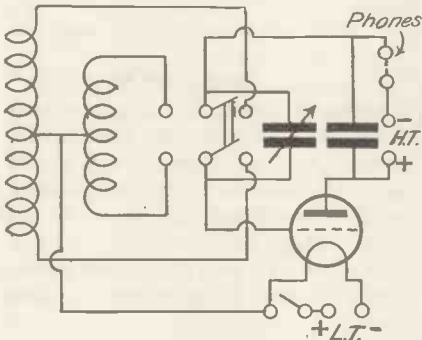


Fig. 1.—Circuit Diagram.

about 80 metres, this may be sufficient. In that case the small coil, which is rather difficult to get to oscillate, need not be made.

Circuit

A circuit diagram is shown in Fig. 1. As the panel is small for the size of the components that are to be got on it, very careful dis-

Checking Calibration

It is as well to use both wavelengths in calibrating, as one can be used to check the other. Some of the "points" are so faint that they are not heard, and if the calibrating is done from two or three fundamentals these missing points can easily be checked. In both cases the 300-metre harmonic should be the first to be heard working downwards from the maximum capacity of the condenser, but in some cases it may not be audible. If a square-law condenser is used, the wavelength chart, when plotted on squared paper, will appear as a straight line.

In use a heterodyne wavemeter is a much more accurate instrument than a buzzer wavemeter, as it gives very definite and sharp points. A buzzer gives very flatly-tuned points on its higher wavelengths, and is difficult to use with real accuracy. There is, however, one difficulty in using a heterodyne meter, and that is that one may tune-in on an harmonic instead of the real point. The meter should be taken a few feet away from the set, when there

Number of Harmonic	On 900 metres	On 600 metres
2	450	300
3	300	200
4	225	150
5	180	120
6	150	100
7	128.5	85.75
8	112.5	75
9	100	66.66
10	90	60
11	88.8	54.5
12	75	50
13	69.2	46.3
14	64.3	42.85
15	60	40

Table of Harmonics.

transmitting set. They can also be used for checking the heterodyne against a standard buzzer meter or for calibrating a buzzer against the heterodyne.

Good phones only should be used or some points may be missed when calibrating. There is, how-

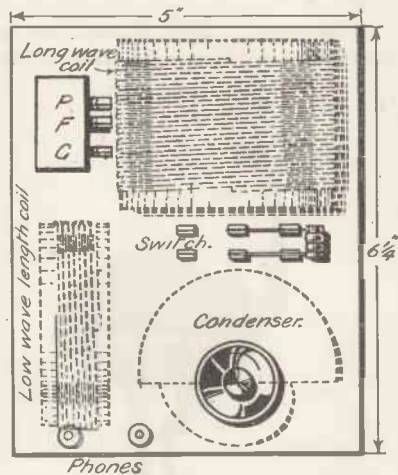
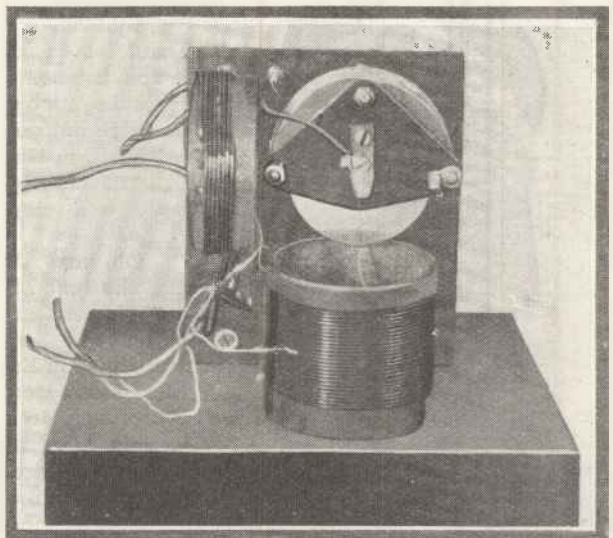


Fig. 2.—Position of Components.

position of the parts is necessary. The coil formers are mounted on the under side of the panel on 2 B.A. screws on which two or three nuts are threaded to hold them well away from the panel. They are secured by another nut tightened on when the former is in position. The disposition of the components is shown in Fig. 2.

The calibration of the instrument may present some difficulty. If the constructor is a member of a wireless



Under View of Panel.

ever, never any danger of missing the fundamental. 5 Y M.

SIGNALS are sometimes like old soldiers: they seem to fade away.

Foreign Exchanges

An Article by
E. V. KNOX
(“Evoe” of “Punch”)

MALLOTSON made a noise in his amplifier, threw out his vibrating armature, and caught me in his reaction coil. What I mean to say is that he buttonholed me at the corner of the street and said, “Hullo!”

“What d’you think I did last night?” he went on.

“I don’t know,” I said gruffly.

It was a bitter day of driving wind and rain.

“I picked up Guatemala.”

“Ha,” I said.

No, that is not quite right. “Ha” is not the word. The sound I made to Mallotson was a kind of nasalised, almost irreproducible, sound. Something between “Ha” and “Hahn” and “Hern.” Let us call it “Hhn.” It means either that the other man has said something which (as he is not a certified lunatic) you hope he will go on to explain, or else it means that he has made a statement about which you do not intend to express any opinion at all.

“Hhn,” I said.

I did not see how Mallotson could

I said “Hhn” again.

“I see you don’t quite understand what I mean,” said Mallotson, a little more kindly. “You know I tinker about with wavelengths a good deal.”

I did know it. I regard Mallotson as a man who is suffering from valvular disease of the cerebral tissues;



“The rhinoceros preparing to charge.”

a man afflicted by high-frequency of the nervous system; a man who, if he does not do something soon about the strain on his potentiometer, will have to go into a nursing home. He seems to me to emit sparks. I should not say that it was safe to allow Mallotson to go near a cat.

“Well?” I said.

“What I meant was that I got all those places I told you about on my valve set.”

“Guatemala, Honolulu, Buda Pest!” I exclaimed in amazement. “You listened to all those far-off places in your own home! And what on earth did you hear?”

“Well, in Guatemala,” he said, a little reluctantly, I thought, “somebody was playing a tune on the piano.”

“Oh, yes. And could you recognise the tune?”

“Well, as a matter of fact, I could,” he replied. “It’s a tune one hears fairly often in England, you know. It goes to some words about the weather being likely to improve. Not going to rain any more, you know.”

Here Mallotson hummed.

I turned up my overcoat collar.

“And in Honolulu?” I said.

“Perhaps you’d hardly believe me, but I picked up that very same tune in Honolulu as well. But I don’t know,” said Mallotson, “how the old folks tell——”

His valves began to howl horribly again.

“And in Buda Pest?” I said sternly.

“Well, as a matter of fact, in Buda Pest——”

“No, no, anything but that,” I broke in hastily. “If I hear you trying to transmit that tune again, Mallotson, I shall break down and cry. What I don’t quite understand is, how you knew the names of all these foreign stations. You say you just picked up this tune three times. How did you know where it came from?”

“The name of the station was announced quite clearly every time,” said Mallotson, “in six different languages. And English, of course, was one of them.”

“Hhn,” I said.

But of course Mallotson, although skilful, was unlucky. I know people who, by assiduous manipulation of their valve sets, have succeeded in picking up a French lecturer giving a lecture on French pronunciation in Polish to an audience at Warsaw. And people who have listened in to the Children’s Hour in Lithuania.



“‘What d’you think I did last night?’”

have picked up Guatemala. It was not a nut or a screw.

“And it was only yesterday,” he continued, “that I got Honolulu, you know.”

“Hhn,” I said.

“And a few days ago I had Buda Pest.



“The triumphant cackle of the ostrich.”

And people who have even caught the final sentences of a paper on Scandinavian entomology being read by the resident Swedish professor to a class of pupils at Omsk.

Meanwhile, I go on with my cat-whisker.

But what I really wanted to say

was that when we have got all this long-distance listening-in properly stabilised, so to speak, and when the people transmitting in all those far-away countries have begun to realise their responsibility, what wonderful things we shall hear!

What I am specially interested in myself is animal life. We get the home nightingale already, you know, and we get the home wild duck, and we get the Zoo. But what a vista opens (not that one can exactly listen-in to a vista), what a vista opens for long-distance receivers when the whole world of nature is properly roped in!

I do not consider that big game hunters and explorers should be blind to this. I hope to see a day when no one will go out into the jungle without a transmitting set: when we shall hear the heavy snorting of the wounded bull rhinoceros preparing to charge, the quick heart-beats of the hunter, the ponderous thud of the hooves, the whinny of rage, and finally the sharp report

of the final bullet that lays the mighty trophy at the hunter's feet.

I do not see why we should not hear the narwhal calling to its mate on the distant seas, or the maternal



"The sharp report of the final bullet."

scream with which the lesser ant-bear warns her scattered young. I would like to pick up the toucan in his primeval forest home, and hear the duck-billed platypus sifting slush through his beak by the side of some Antipodean stream.

I look forward, I say, with hope and confidence to the time when not only a man like Mallotson, but even a man like me, will think nothing of catching the snore of the sloth bear or the triumphant cackle of the hen ostrich that announces that she has hidden yet another of her eggs in the sand.

All that is needed, as I say, is that a certain number of properly-constructed and well-controlled transmitting stations should be set up in the wilder parts of the world.

This idea has haunted me so much since I first thought of it that I went in to tell Mallotson about it a few days ago.

"Hush, don't talk!" he said. "I'm just getting Terra del Fuego."

... Suddenly his face lit up. "I've got it!" he exclaimed.

"What is the message from Terra del Fuego?" I asked.

"Well, as a matter of fact, they're playing a piano tune," he began.

I rushed violently out of the house.

AN AMATEUR VISITS 2 L O

BEING a keen wireless enthusiast, and having come to London for a few days, it occurred to me that a visit to 2 L O would be of interest. So I rang up 2, Savoy Hill and fixed an appointment with one of the officials for the following afternoon.

In the Studio

On entering the building and ascending to the first floor, I was shown into the waiting room. My friend soon came in, and led me into the larger of the two studios. The walls of this studio are hung with draperies in order to render "echo" effects impossible. At one end stands the microphone, and at the other end is the piano. Each instrument has its own particular place in the studio for the best effects.

The control room where a loud-speaker was reproducing a musical item taking place in the smaller studio at the time, was next visited. Before the control panel a man sat with his hand on a knob, controlling the output of impulses to Marconi House, where the transmitter was installed at the time of the visit.

On the other side of the room is the "simultaneous broadcasting" switchboard, which looks something like a miniature telephone exchange, with valves added for amplification purposes.

As the smaller studio was in use, we could not enter it, but we watched proceedings through a window. Then the time came for me to go, and the official said he would arrange for me to look over the transmitter at Marconi House on the following day.

At Marconi House Mr. Van Roode was my guide. We ascended in a lift to the floor on which is situated the transmitter-room, containing the oscillating, modulating, and rectifying valve panels, together with the various measuring instruments, chokes, condensers, and other pieces of apparatus.

Mr. Van Roode informed me that the arrangement was entirely experimental, and had been arrived at after many experiments made by the engineers of the British Broadcasting Company. At one end of the wall in front of which the instruments are arranged is a panel,

with six large glass globes, the valves, situated thereon.

These are the modulator valves, into the grids of which are fed, by means of a 'choke, the impulses received via land-line from 2, Savoy Hill. Next come the tuning coils, large helical spirals of stout copper wire, with smaller spirals inside them which are capable of being rotated about a horizontal axis.

Oscillating Valves

The next panel contains the oscillating valves, which produce the wave modulated by the output from the modulating panel. The last panel has two valves for rectifying the alternating-current supply, and a system of condensers for smoothing the rectified current.

The high-tension supply is somewhere in the neighbourhood of nine thousand volts. In conclusion, I may say that, owing to the B.B.C.'s excellent motto of "Quality, not quantity," the efficiency of their transmissions is the highest yet reached.

A. J. S. W.

The Heaviside Layer

Wireless Waves
"bound" to Earth..

Wireless Waves
reflected by ...
Heaviside Layer

Heaviside
Layer.



WITH A NOTE ON THE
LATE DR OLIVER HEAVISIDE
An Explanatory Article
by A SCIENTIST

THE recent death of Dr. Oliver Heaviside, F.R.S., at the age of seventy-four years, removes a remarkable personality from the select circle of contemporary scientists whose names will outlive the present generation.

Dr. Heaviside's reputation is founded upon his brilliant work in the region of transcendental mathematics, more particularly in connection with the elucidation of Clerk Maxwell's fundamental equations on the phenomena of electromagnetic induction.

Not only did Dr. Heaviside throw open the significance of Clerk Maxwell's results to a wider public, but by virtue of his own profound grasp of what they involved he moved far in advance of his time amidst the growing problems of electrical and wireless science.

No Personal Profit

However, like many other men of genius, his efforts brought little personal profit. Giving freely to the world at large the results of his own investigations, he left to others the task of converting theory into practical application, and of gaining the resultant financial reward.

Although a Member of the Royal Society, a Doctor of Philosophy, Faraday Medallist of the Institution of Electrical Engineers, and the recipient of numerous other academic degrees and distinctions, this profound mathematician and brilliant thinker spent the greater part of his long life practically buried alive in the seclusion of a Devonshire cottage.

At the early age of twenty-four years he threw up a promising com-

mercial career and retired to the country with the definite object of devoting his entire energies to mathematical research. The later years of his life disclose a pathetic picture of the aged philosopher living alone in a neglected cottage surrounded by a desolate garden overrun with weeds, and dependent for his daily wants upon the kindly help of humble neighbours.

Although at the present time Dr. Heaviside's name is most widely known, particularly in wireless circles, in connection with the so-called Heaviside layer, this is by no means his only claim to recognition. First, perhaps, may be placed his work, both alone and in conjunction with Lorenz, in rationalising the Maxwellian equations, by means of the brilliant mathematical conception since known as the Heaviside-Lorenz Unit.

Practical Outcome

Next, one must refer to the practical outcome of his investigations into the difficult problem of the passage of electrical currents of varying frequencies over conducting wires. In the early days of ordinary line telephony it was found that currents of different frequencies—representing the corresponding sound waves of the human voice—did not all travel over the line with the same constant velocity.

Each particular frequency, in fact, passed over the wire at a certain definite speed of its own, somewhat

different from that of the other currents.

This curious effect was not of any great consequence where short distances were concerned, but it became decidedly important over a long line, giving rise to considerable distortion at the receiving end, and putting a definite limit to the range over which intelligent speech could be clearly transmitted.

Dr. Heaviside's Discovery

As a result of mathematical investigation, Heaviside came to the conclusion that by deliberately adding self-induction to the line not only would the velocity of the various currents become the same for all frequencies, but also the attenuation losses would likewise be made constant over the entire speech-frequency range, thus practically eliminating all distortion.

This contention was strongly opposed by the leading telephone experts of the day, who held that the presence of induction in the line was a disturbing factor and therefore prejudicial to clear speech transmission.

Heaviside's theory was, however, adopted and turned to practical account by an American professor named Pupin, who introduced loading coils at specified intervals throughout the line. At the present time practically every long-distance trunk line is Pupinised, with the result that clear telephone conversation can be successfully maintained (by the help of thermionic repeaters) over more than three thousand miles, that is, between New York and San Francisco.

Finally, in the region of wireless science we come to the ingenious conception of the Heaviside layer—a curious band or layer of ionised air located at the upper limits of the atmosphere. This layer forms a more or less insuperable barrier to the escape of radiated wireless waves, by confining them to the zone between itself and the lower conductive layer formed by the surface of the earth.

Early Wireless Days

In the early days of wireless, before the art had reached the stage of practical achievement, it was generally considered that wireless waves, when once generated, could not be confined or made to travel for long distances over the curved surface of the earth.

For this reason any method of signalling by wireless must be bound to fail. The radiated waves, it was thought, would travel straight outwards in all directions, and the bulk of the energy would soon be lost in the vastness of interstellar space.

Heaviside's Argument

Heaviside was the first definitely to controvert this opinion, supporting his argument by mathematical considerations founded on the Maxwellian equations.

In the first place, he argued that the surface of the earth would prove sufficiently conductive to bind the ether waves to it, in much the same way as a high-frequency current is "bound" to a metallic conductor, in spite of the fact that the bulk of its energy exists in the form of an inductive field of magnetic force, located outside the metal substance of the wire.

Action of the Sun

In the second place he advanced a reasoned contention that the action of the sun upon the atmosphere would result in the formation, at a distance of some forty or fifty miles above the earth's surface, of a definite stratum of ionised particles. These, he added, would prove sufficiently conductive to act as a barrier or trap, preventing the upward passage of the ether waves and reflecting them back upon the earth's surface.

The present generally accepted theory of the physical processes which give rise to the Heaviside layer can be outlined as follows:

The action of the shorter light

waves, particularly the ultra-violet rays, during the daylight hours sets up a bombardment of the molecules of air through which they pass and so liberates a certain percentage of electrons.

This action tends to make the air conductive, and incidentally to dissipate the energy of any wireless waves that may be passing, so that during the daytime the range of signalling is usually less than at night.

After sunset, the liberated electrons tend to re-unite with the original air molecules, so as to restore the perfect insulating properties of the atmosphere.

Effect of Pressure

This process, however, takes place more rapidly near the surface of the earth, where the atmospheric pressure is greatest, than it does in the upper regions where the density is less, that is, where the adjacent molecules of air are more widely separated.

At a certain height a point is reached where the process of re-combination is still incomplete when the sun rises again to recommence the ionisation.

This particular critical point of permanent ionisation constitutes the lower limit of the Heaviside layer, the upper limit being determined by the remaining thickness of tenuous air existing above. B.A.R.

SOLDER SORROW

Run, run! Thou soft alloy of t'n and lead!

My "bit" of copper into spirits dead

I dip; and then, its faces on thee rub—

And rub; and rub, and rub a-dub dub dub.

'S no use. On to my iron thou't not sweat.

O stick of solder! Why of heart so hard?

Can I not melt thee even with regret?

Know not, with screw joints, good reception's marred?

My tappings will not tap; my super-son'

Will not pick up the Leafield 4th harmon'.

I've scraped an easy path for thee to flow,

And singed mine eyebrows in my lamp of—*blow!*

O solder! Have I met my Waterloo?

Sal'moniac! Hard it is to eat the shucks!

My wireless life is o'er, ('twixt me and you)

Unless—I do beseech that thou *will* flux.

C. T.

THE ONLY POSSIBLE UNIT!



Lecturer: "One of the most efficient chokes I ever had was made from an old Ford spark coil."

Member of the Audience: "With a value of one henry, I suppose?"

Will Wireless Assist the Police?

Four Well-known Detectives Answer the Question

An Article by
"The Wireless Magazine"
Special Commissioner

ALTHOUGH wireless and entertainment are a very recent combination indeed, wireless and crime have been associated, in the best possible sense, for quite a number of years.

Whether or not criminals have used the ether for their own deplorable purposes to the extent some writers of detective fiction would have us believe—or, indeed, to any extent at all—is a question which the said writers of detective fiction would probably be sorry to have to answer; but the use of wireless by the police in the process of sleuthing is not by any means a novelty.

Ex-Chief Inspector Walter Dew, who was one of the most famous and successful of C.I.D. men at Scotland Yard, can speak with authority on this subject, for he it was who arrested Crippen for the murder of Mrs. Crippen (professionally known as Belle Elmore).

It was with the aid of wireless that Crippen was arrested in the summer of 1910—more than fourteen years ago!

Here are the views of:

**EX-CHIEF
INSPECTOR
WALTER DEW**

on wireless and crime:

There can be no doubt that wireless is one of the greatest inventions the world has ever known, and I should imagine that in the very near future it will play a tremendous part in the detection and cap-

ture of criminals. It is already being used to a considerable extent by the police, but the general public are inclined to forget the fact that its value, in the matter of crime, was established back in the summer of 1910.

As a matter of fact, wireless was first employed by the police in 1908, in connection with the Druce Portland case, which was also in my charge; but there was nothing so dramatic or effective about this first occasion as in the Crippen case.

After the opening of the Druce grave it was found that one of the notorious figures in the affair had left the country before a warrant was issued against him, and a wireless message was sent out—with the result

that the fugitive was located on board a big liner in mid-Atlantic.

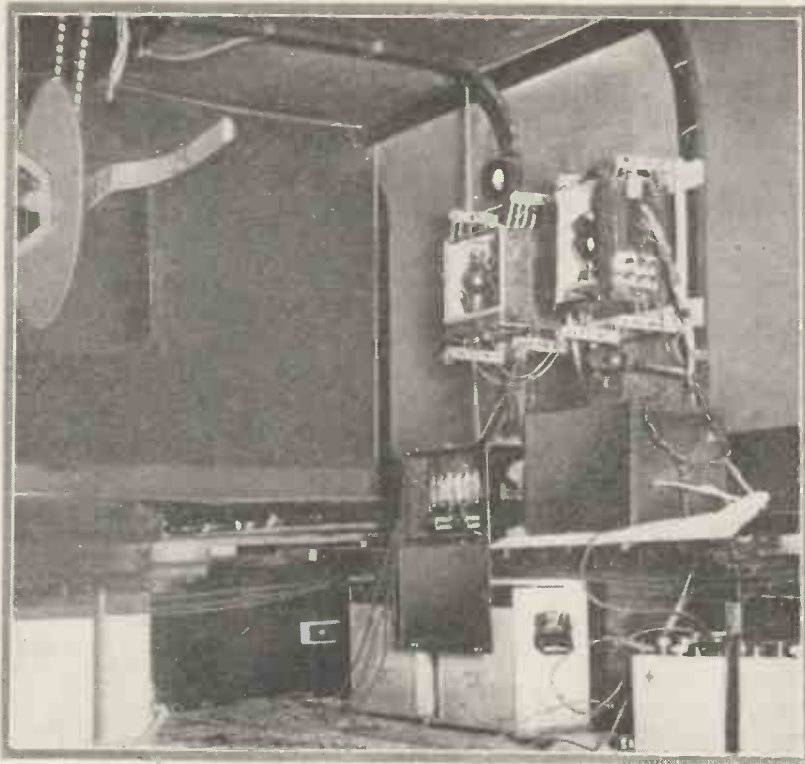
Steps were taken to have him arrested on his arrival in New York, but I regret to say we never got him back for trial in England.

I am not likely to forget the Crippen case, for I was concerned with it from the first to the last, and but for the wireless message which reached Scotland Yard one evening from Captain Kendall of the *Montrose*, Crippen might quite possibly have landed in Canada with his companion, made his way into the U.S., and rendered his arrest and extradition a lengthy business.

I had been in charge of the case for a considerable time before that fateful message arrived, but in this country a man is deemed innocent until he is proved guilty of a crime, and until I found the remains of Belle Elmore in the cellar of the house in Hilldrop Crescent, Holloway, no warrant was issued against the cold-

blooded but extraordinarily interesting murderer, with whom I had had a conversation and taken his statement, giving his version of his wife's disappearance, but whom I had no right to apprehend, since in the first instance it appeared that Belle Elmore had disappeared five months previously to any information being in my possession.

Consequently Crippen was able to go off with his companion to Belgium, and from Belgium—disguised—he took passage for Canada in the *Montrose*.



Interior of Scotland Yard Wireless-equipped Car.

After a warrant for his arrest had been issued a description and photographs of Crippen and his companion were circulated all over the world, and Captain Kendall, I think, came into possession of, or had seen these at Antwerp; and when about 300 miles away on the Atlantic, his suspicions were aroused concerning the identity of two of his passengers, and his wireless message reached the Yard one evening when I was there.

I immediately set off to see Sir Melville MacNaghten, who at the time was Chief of the Criminal Investigation Department, at his house, and he asked me for my opinion. I said I felt convinced that the man on board the *Montrose* was indeed Crippen, and he gave me permission to set off in pursuit.

As Crippen knew me, I boarded the *Montrose*, when it arrived at Father Point, disguised as a pilot. I went out in a boat and climbed up the ship as she went along—and well I knew it, for such cat-like tactics were not at all in my line.

However, I got aboard without the loss of much more than a little skin, and I arrested Crippen and brought him back to this country, where, as everyone knows, he was duly tried and found guilty.

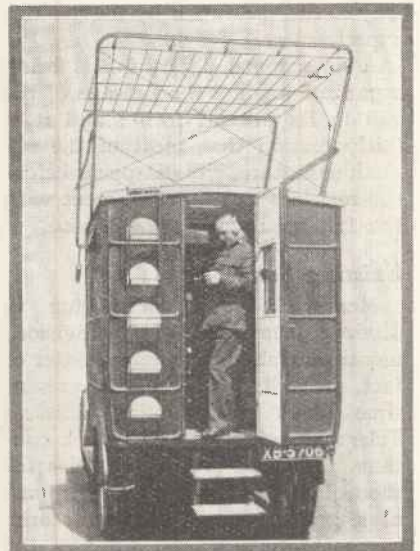
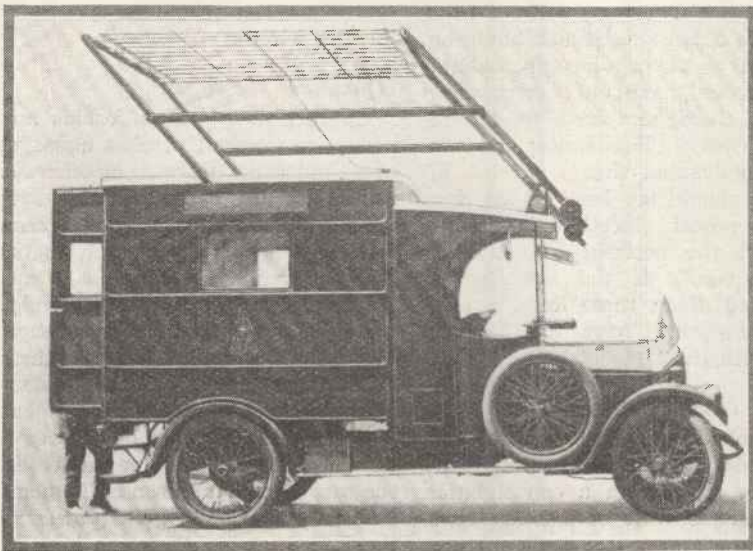
So much for the past; as to the future of wireless in relation to crime, it is almost impossible to predict the many ways in which it may be developed.

It proved of immense value in the Crippen case, and it would prove of equal value in any other case

It exists, I should say, only between the covers of novels. My experience of crooks is that they have their own methods of communicating with one another, and that wireless has nothing whatever to do with those methods.

The writers of detective stories are very clever people, and I have a particular admiration for Sir Arthur Conan Doyle's work; but when you invent a plot yourself it is easy enough to solve it, whereas I, in common with all the other men at the Yard or in private practice, have to go out and unravel plots which have been created by other people.

I can only say that I have not, as yet, encountered any real-life plots in which the criminals have made use of wireless.



Two Photographs of a Scotland Yard Wireless-equipped Car showing Aerial Used.

I caught next day the old *Laurentic*, which was turned into an armed cruiser during the war, and was eventually torpedoed off Ireland with five million of bullion on board. The *Laurentic* raced the *Montrose* to such good purpose that I landed at Father Point, a little pilot station up the St. Lawrence, some distance below Quebec, several days before the *Montrose* arrived.

On the way out I kept trying to get into touch with the *Montrose* by wireless, though without success; but at Father Point, where there is a big wireless station, the operators showed great courtesy and speedily got into touch with the vessel, and I was able to give the captain suggestions from time to time and to make my own arrangements with him.

which happened to possess similar features. Also, now that so many people possess receiving sets and listen-in quite regularly, it should be practically impossible for any criminal to remain in hiding in this country for very long after the police had broadcast a description of him.

Wireless news travels farther, as well as quicker, than printed news: it reaches obscure spots in which newspapers are almost a rarity, and makes it possible for the police to put a million amateur sleuths on the trail while the trail is still hot—though naturally it is not by any means *always* desirable to put amateur sleuths on the trail at all.

As to the use of wireless by crooks as a means of communicating with one another—well, frankly I don't believe in it.

Having obtained these interesting remarks from ex-Chief Inspector Walter Dew, it occurred to me that it would be well to add to them the opinions of several other famous London crime investigators who were originally associated with Scotland Yard.

Here are the views of:
**EX-DETECTIVE INSPECTOR
 THOMAS FREDERICK COX,**
who was in the Special Branch of the C.I.D., and who was decorated by the King of Greece for services rendered during the war.

As an ex-detective inspector it seems obvious to me that wireless must prove of very great benefit to the police in tracking and effecting the arrest of criminals.

(Continued on page 330)

THE Wireless Bill recently presented to Parliament by Sir W. Mitchell-Thomson (the Postmaster-General), has provoked a storm of criticism from

all quarters. The points in the Bill that have excited most indignation are (a) the penalties incurred by using wireless apparatus (either for transmission or reception) without a licence, which, it is rightly complained, are out of all proportion to the gravity of the "crime"; (b) the inquisitorial powers given to search private houses for unlicensed sets, and (c) the serious and unnecessary obstacles placed in the way of research work by the genuine experimenter.

A determined opposition is being organized against the passage of the Bill in its present form; and it is fairly certain that most of the obnoxious features will disappear before the measure can hope to meet with the full approval of the House.

Existing Laws

Meanwhile it is interesting to observe that all the provisions mentioned above are, as a matter of fact, in full force at the present time under the existing Wireless Telegraphy Act of 1904, which contains the same severe penalties for the unlicensed use of wireless apparatus, gives the same right to search suspected houses, and imposes the same handicap upon the private experimenter.

The 1904 Act was, however, framed long before the days of broadcasting. It was passed in order to secure to the Postmaster-General the same wide powers over wireless communication that he already enjoyed in the case of ordinary line telegraphy and telephony, these being part of his general monopoly over all postal communications.

The severe penalties set out in the 1904 Act were, it must be remembered, framed at a time when wireless was an obscure art and the country was nervous of its sinister possibilities in the hands of unauthorised persons.

Nowadays the situation is entirely changed. Wireless affords the means of innocent recreation and enjoyment to millions of the general public, who have a clear right to avail them-

The Public & the P.M.G.

A Discussion of the New Wireless Bill.

selves of these advantages without being subjected to the possibilities of vindictive punishment or undue interference at the hands of Post Office officials.

At the same time it is quite clear that some adequate penalties must be provided in order to eliminate the "pirate," and to ensure that the ether is properly controlled. Such penalties must, however, be of a reasonable nature, sufficiently severe to act as a deterrent, without being capable of being used as a bludgeon.

So far as the genuine experimenter is concerned, he should be encouraged rather than hampered in his research work. It is quite unreasonable to demand that a wireless inventor should lay bare all his ideas to a postal official before being allowed the necessary facilities to "carry on." If the new Act is amended along these lines, reasonable people will have little fault to find with it.

Some New Features

Although, as already pointed out, the new measure is practically nothing more than a consolidation and re-enactment of existing laws, there are one or two fresh features which it may be interesting to consider in detail.

In the first place the Bill covers not only all apparatus for wireless signalling, but also all means for signalling by sound from the land to ships at sea (for example the sirens used for under-water communication with submarines, etc.), and all devices for signalling by optical means when employed for the same purpose, that is, communicating from the shore to vessels at sea. Finally, it applies to all apparatus intended for transmitting power by ether waves.

Owing to the ambiguous wording of one clause in the old 1904 Act, many people have persistently supported the view that the P.M.G. licence was legally necessary only for transmission and not for mere reception. This contention was never, in fact, well founded, but the

new Act contains the following clause which definitely places the matter beyond further dispute.

"It is hereby declared that any references to transmission shall

be deemed always to have included references to the reception of messages, provided that nothing in this paragraph shall render any person liable to any penalties in respect of any act or omission made prior to the 12th December, 1924."

Accordingly all receiving sets, crystal as well as valve, are now specifically brought within the scope of the P.M.G.'s monopoly, and must duly be covered by a licence or else incur the penalties laid down for the wireless "pirate."

Offensive Messages

Another new section forbids any person to (a) send wireless messages of an indecent, obscene, or offensive nature, or any communication subversive of public order, or (b) send false signals of distress such as the SOS, or reply falsely to a vessel in distress, or (c) improperly divulge the purport of any wireless message. The penalties laid down for these acts vary from a fine of £10 on summary conviction to imprisonment with or without hard labour for a term not exceeding twelve months in the case of conviction on indictment.

Finally Section 5 gives power to the P.M.G. at his discretion to mitigate any penalty incurred under the Act by any person, without taking legal proceedings. Or he may stay or compound any proceedings taken under the Act and restore any seized or forfeited apparatus. In this connection it may be added that the penalties proposed by the new Act for the use of unlicensed apparatus, or for breaking any of the conditions imposed by a licence, range from a fine of £50, or in certain cases £100, to terms of imprisonment of from three to twelve months with or without hard labour.

The severity of these proposed penalties has, as already stated, caused widespread protest, and in all likelihood they will be replaced by others framed on a less vindictive scale, and more appropriate to the special circumstances created by the introduction of the broadcast system.

BARRISTER-AT-LAW.

Short-wave Practicalities

WHEN receivers have been constructed comprising one or more stages of H.F., the experimenter can then commence more serious work. It is to be assumed that he has by

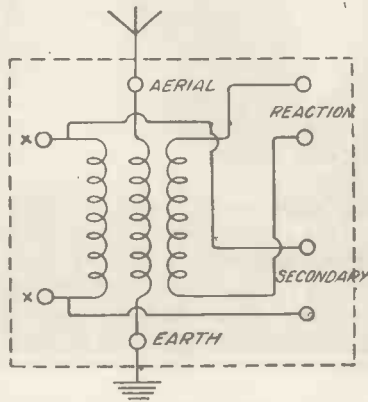


Fig. 4A.—Tuner Unit.

now found the extreme simplicity of "getting down to 100 metres," and mastered the difficult art of soldering and planning. My last circuit, Figs. 4A, 4B and 4C shows a tuner which gives a choice of single or double tuning; a high-frequency amplifier, separate as a unit, comprising four stages, and a detector unit.

With the addition of a standard two-stage note magnifier many extremely interesting experiments may be carried out with these instruments.

First of all the amplifier may be connected after the tuner and before the detector. By this means reaction is carried to the aerial and the whole system of the H.F. amplifier is regenerated; two distinct currents passing through the amplifier.

Then the amplifier can be placed direct to the aerial, followed by the tuner and detector, reaction thus being confined to the detector, only one current passing through the amplifier. By the use of an additional oscillator placed close to the aerial system the whole set may be subjected to outside heterodyne, and, in fact, the supersonic method may be tried by the simple method of

fixing a value for the H.F. amplifier of, say, three thousand metres, and placing an additional detector valve in front of the set.

These experiments will, I think, very speedily convince sceptics that the field of short-wave work is by no means as difficult of exploration as is generally supposed, and that anyone who can build a receiver comprising several stages of H.F. for the general wave band can also do so for the extremely low band. So long as reasonable care is taken there should be absolutely no difficulty in building short-wave receivers comprising two and three stages of H.F. with regeneration.

I have purposely confined myself to generalities in these articles in order to give the greater stimulus to invention, but it is possible to give several circuits for actual receivers, and I have, in fact, four receivers in general use on K D K A's wavelength which comprise stages of H.F., from two to five.

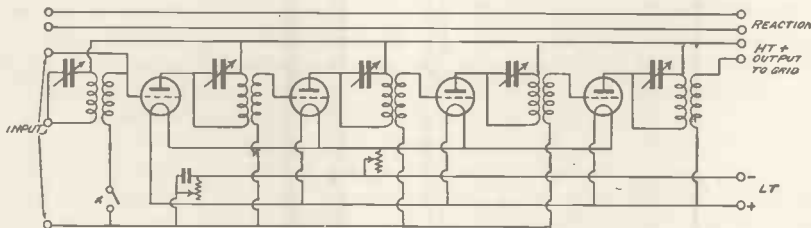


Fig. 4B.—Amplifier Circuit.

American Reception

It must not be expected at the moment that signals from K D K A will be received with great clarity, for though the transmissions have improved since their recent bad spell—when they could be scarcely heard at all—there is a considerable amount of distortion in the transmission itself. On nights that are favourable station W B Z (pronounced WBZEE), working on three hundred and thirty odd metres, will be found the purest and most enjoyable of the American stations.

With any of the receivers out-

lined here, with the possible exception of the two H.F. receiver, W B Z, K D K A, and W G Y should be received strong enough to switch through to a loud-speaker four nights out of five.

By the way, as there is at least one station working as low as fifteen metres, I am using a circuit which may provide inspiration for some work on receivers capable of tuning as low as one or two metres.

The condensers are made of ordinary test tubes such as may be obtained from any purveyor of scientific accessories, and the whole thing is so extremely simple as to merit a little work by those interested.

Dummy Transmitter

Experiments may be carried out by using a dummy transmitter built on the same principles in one room, and receiving in another.

But this work is still in its extreme infancy, though in a very few years

I am convinced that we shall see stations working regularly on wavelengths quite as low as one metre.

In conclusion, may I say that I should be extremely gratified if experiments on the lines outlined here

should in the hands of an amateur produce results—which I am quite convinced they are potentially cap-

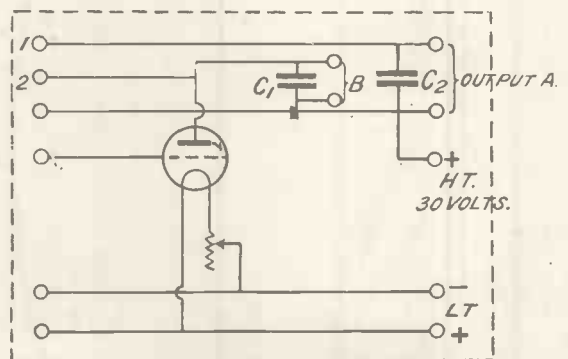
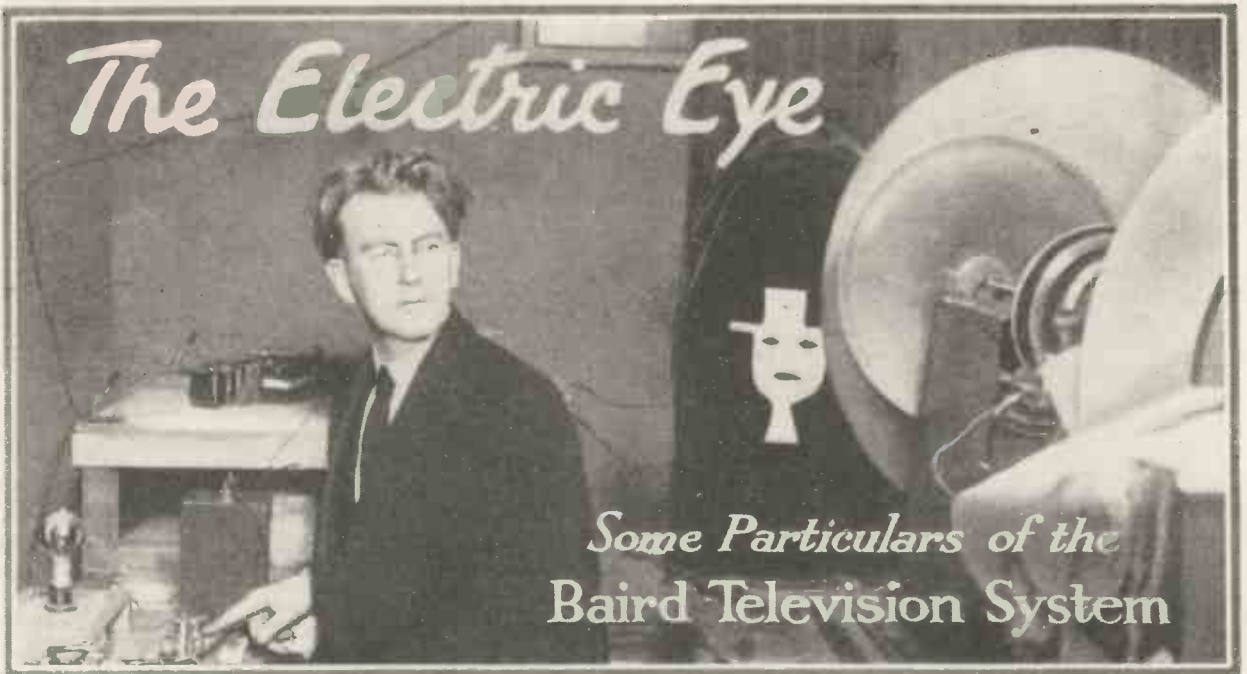


Fig. 4C.—Detector Unit.

able of—leading to advancement in the technique of wireless reception under all conditions. E. C. D.



TELEVISION has been the dream of inventors ever since wireless telegraphy became an accomplished fact. By television is meant the transmission of the forms of objects, or even scenes, to a distance by reflected light. This can be carried out by transforming light into electrical impulses, passing these to a distance through an electric circuit, wireless or wired, and re-converting the electric impulses into a form visible to the human eye.

Just as telephony has already given us an electric ear, so in the near

future television will also give us an electric eye.

This electric eye is made possible by the unique property of the element selenium in changing its electrical resistance in response to exposure to light.

Living and Moving Pictures

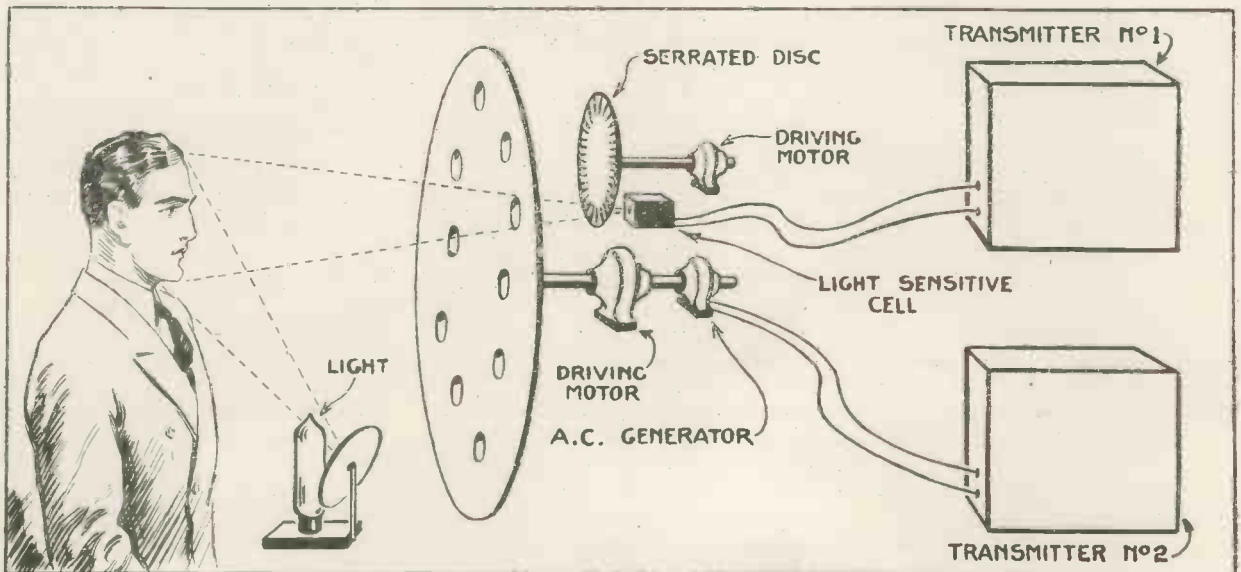
Television proper makes it possible to transmit living and moving images to a distance and then receive and reproduce them with the speed of light, reception being simultaneous with transmission:

We thus have "line" reproduction

as compared with telephotographic transmission which copies a picture gradually and, as it were, redraws the copy at a distance, taking some minutes to accomplish the task.

The system of television which is now being developed by Mr. J. L. Baird in his laboratory in Soho is representative of what has so far been accomplished by way of transmitting pictures—not shadows—by wireless.

While the apparatus is at present of experimental structure, actual images are being transmitted from one room to another and received by



Diagrammatic Representation of Transmitting Apparatus.

TRANSMITTING PICTURES BY WIRELESS

wireless, the receiving and transmitting stations being entirely separate, so that, although they are at present in adjoining rooms, their distance apart is limited only by the power of the transmitter used.

Progress Achieved

The progress recently achieved may be noted by the fact that early last year shadows of objects only could be transmitted. This year images have been transmitted by reflected light, thus opening up the possibility of reproducing solid figures and even scenes as viewed in their original form.

In practice the image, which is illuminated by a powerful electric light, is placed in front of what might be termed the analysing disc. This has sixteen lenses arranged in special form enabling the optical units to successively traverse the image and feed it into the light-sensitive cell in portions.

Interrupter

Between the lens and the light-sensitive cell is a serrated disc which, revolving at a high speed, causes equal periods of light and darkness, and thus sets up "beats" of light which pass through to the cell.

The fluctuations of light cause a varying resistance in a local circuit in which the sensitive cell is connected and the feeble current thus

produced is passed (by wire or wireless) through six stages of ordinary low-frequency power amplification.

The now greatly-amplified current is used to light a neon lamp, the rays from which pulsate and vary in intensity in sympathy with the

these being "staggered" so as to synchronise with the lens system.

A light-tight hood is arranged to enable an observer to see the image which forms on the disc as the slots pass rapidly before the neon lamp.

Synchronising

For transmitting to a distance an alternating-current generator is used in order to pull the receiving motor into phase and thus synchronise the receiving disc.

A low note is sent out by this small A.C. generator at the transmitting end and, after amplification, is applied to a synchronous motor at the receiving end. The image is, at the present state of progress, seen through a slotted disc, the size being about two inches square.

Wireless Transmission

The method used for wireless transmission involves the transmitting of a synchronising wave, upon which is superimposed the actual "light" wave.

In working out the principle thus briefly outlined it was found that if a telephone was placed in circuit the "picture" impulses resolved themselves into audible signals.

The system faithfully responds to the light and shade of the reflected image.

In earlier experiments the neon lamps themselves were placed at

Many schemes for bringing in being television have been planned on paper, but Mr. Baird is, we believe, the first inventor to actually demonstrate a workable system.

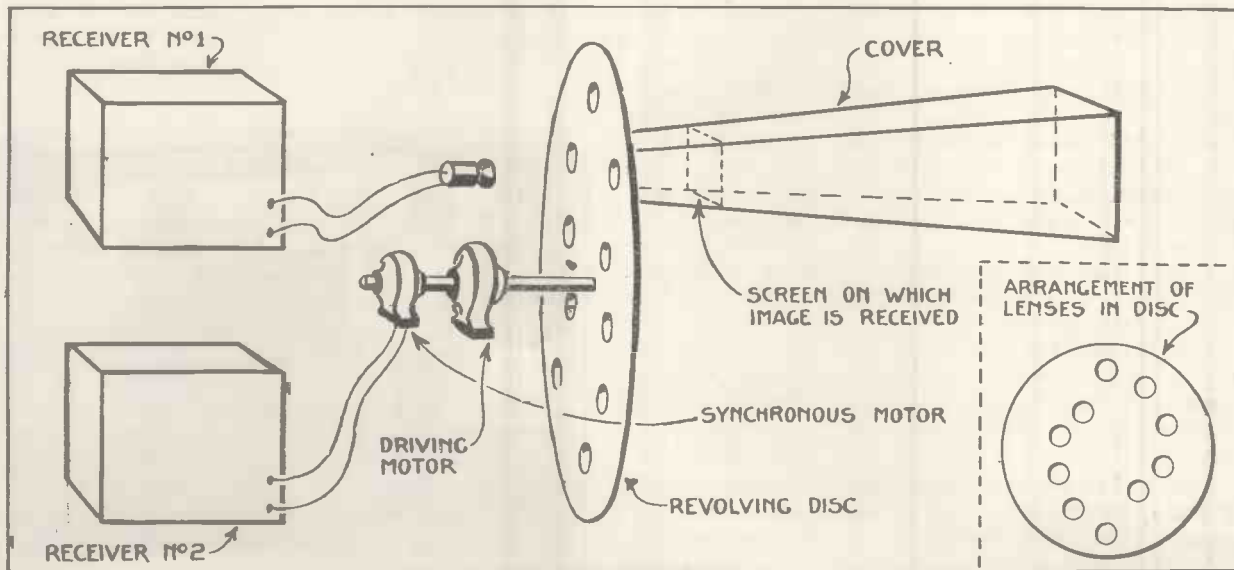
Although the apparatus used is at present in the experimental stages, the results attained with it convey great promises.

To see a face by wireless, even if it appears only as a flickering white oval with dark smudges for eyes and mouth, marks a very distinct and definite step in the art of television.

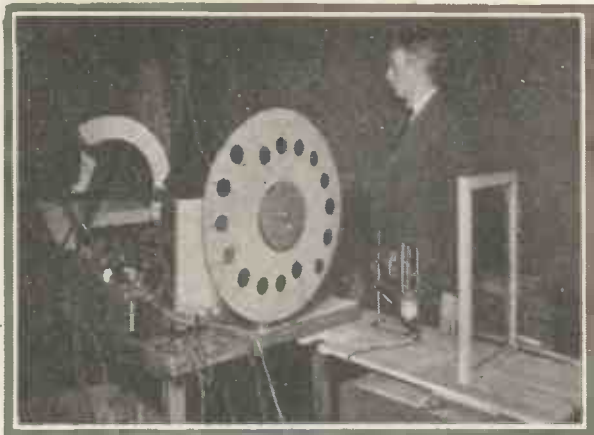
In this article we give an explanation of the system used by Mr. Baird.

"beats" received from the lens disc and interrupter.

On the same shaft as the lens disc is fixed another disc with suitably arranged slots (which may be replaced by lenses) at the outer diameter,



Arrangement of Apparatus at Receiving End.



The Inventor with his Transmitting Apparatus.

the periphery of the revolving disc, and upon the shadow of the object being cast on the transmitter the lamps lit up in corresponding sequence, thus giving a reproduction of the original image in silhouette.

At that stage it was obvious that anything in the nature of the reception of objects in relief or even in plane form by reflected light was out of the question.

These experiments, however, proved the success of the single light-sensitive cell system, and thus ruled out the rather imposing task of handling some thousands of cells in screen form—an alternative that has been suggested by others also interested in television.

The system appears to be perfectly feasible for land-line working, although capacity effects in long cables may prove fatal to good results.

Improved means of illuminating the received image will enable it to be projected upon a screen much in the same manner as is practised in the cinema.

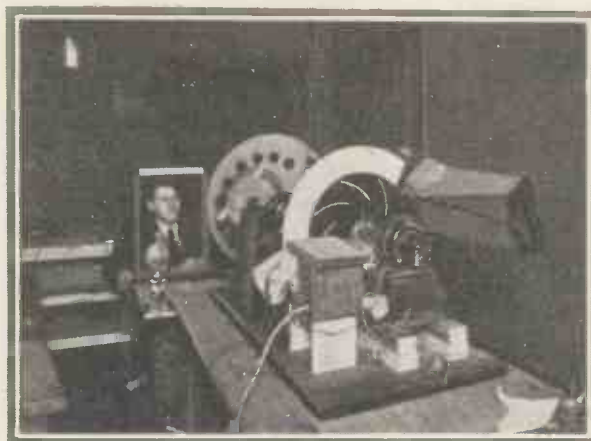
In comparing light and sound it is of interest to review the experiences and efforts of the past:

Firstly we had the one-time wonder of photography in which a permanent record of the view was obtained by the chemical action of light.

Then we had the recording of sound and the reproduction of the human voice by mechanical means.

Later on we had the photographic image adapted to produce the optical

are one and the same thing, and travel at precisely the same speed; secondly, the adaptability of electrical principles which enable such phenomena as light and sound to



The Picture to be Transmitted is Placed in the Frame.

be changed into electrical energy and as readily reconverted into the forms of energy that can be appreciated by the physical faculties of sight and hearing.

Great possibilities lie in the further developments of an undoubtedly promising invention. At the same time we feel that no service will be rendered to science, or the inventor himself, at this stage, by overstating the case or anticipating the future.

Television will come, and come

illusion of living pictures.

Still later we had the voice not merely stored up and then reproduced as a "back number," but transmitted and reproduced in the living form.

Two great aids exist to help forward the very weighty problem of television.

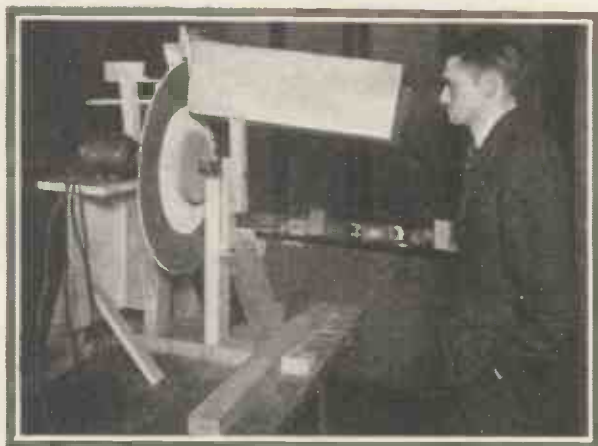
Firstly, the fact that light and free electric waves

to say, but there is a lot of work to be done before it becomes a commercial proposition, let alone a feature of every home's receiver.

RECTIFYING VALVES

AS a good working rule it may be laid down that cheap valves by unknown makers are a thoroughly bad investment. These things as a rule are "slung together" in the most rough and ready way. No two are alike, and even if you get one that does well when new the chances are that the character of its performance will have changed entirely by the time it has been a few weeks in use. There is one exception, and only one, to this rule. For some reason no British maker, so far as I am aware, has seen fit to turn out a special rectifier. Some of our home products are designed to amplify at high frequency or to detect; others are intended to act as note magnifiers or as rectifiers. The ideal rectifier is the slightly *soft* valve, particularly if it has no high-frequency stages in front of it. As rectifier the Dutch valve, tubular in shape and with a vertical filament, is unexcelled. They are not very well made; the "cleaning up" process is not over thorough, and they do not as a rule last long in the set—but they do give results.

When one of our more enterprising makers sees fit to put a special rectifier on the market, it will sell like the proverbial hot cakes.
J. H. R.



The Receiving Apparatus in Another Room.

The Enormous Success of THE WIRELESS MAGAZINE

I AM now able to speak with confidence of the extraordinary reception that has been given to THE WIRELESS MAGAZINE by the public, the advertisers, the Press, and critics everywhere. Never in a long experience have I had the pleasure of reading such sincerely expressed and yet such enthusiastic letters of congratulation and praise. Up to the moment of writing I have received almost 2,000 letters, and a large proportion of these contain messages of praise and good will.

I have been deluged with queries, and for a day or two it looked as though my "reply bureau" machine would break down, but, with extra help, my staff were able to do wonders, and now, as I write, they are level with the incoming post—that is, they are again answering queries so promptly that readers are able to obtain replies in from 24 to 48 hours. So I can handle yours, if you are in any difficulty.

On the day of publication No. 1 of THE WIRELESS MAGAZINE was sold out to the trade, and the publisher could not supply a single copy. I am writing immediately after the publication of No. 2. There is a big demand for it. A great many people insist on telling me that not only does No. 2 maintain the standard set in No. 1, but that it goes one better.

A reader at Goodmayes, Essex, for example, writes this morning: "I never like giving praise for a first number, and it is solely on this account that I awaited the advent of your second number before writing and congratulating

you on the production of such an admirable monthly as "The W.M." I consider both numbers teem with interest. I made up the 4-valver, details of which were set out in No. 1. For selectivity and purity of reproduction it would be hard to beat."

Of course, I have had criticisms. I invited them in No. 1, and was glad to receive them. Many of them were informing, and I shall profit by them in due course—for example, in this issue I am reducing to a minimum the number of continuations of early articles to back pages. Here is my opportunity of saying quite frankly that while congratulations make me happy, straightforward and well-informed criticism is very excellent food for me as an editor, and I welcome it at all times.

I am writing the day after the publication of No. 2, and am delighted at the reception accorded it. I have a feeling that THE WIRELESS MAGAZINE will depend for a growing circulation almost entirely upon the good will of its readers. I have striven as I have never striven before to produce a magazine acceptable to every section of the great wireless public, and if the reader agrees with me that my efforts have been met with any sort of success, will he do me the favour of speaking a good word for THE WIRELESS MAGAZINE among his wireless friends?

I am printing below the merest handful—taken almost at random—of the enormous number of congratulatory messages that have reached me. To all my correspondents I offer my warm and appreciative thanks.—B. E. J.

Just a Handful Out of Hundreds of Congratulations!

A CHANGE.—"After reading THE WIRELESS MAGAZINE, I should like to congratulate you upon having just hit on what the majority of wireless people require in the way of a change from ordinary publications. THE WIRELESS MAGAZINE gives a little bit of everything. Wishing your paper the best of luck, and waiting eagerly for the next number."—"Satisfied," Houghton-le-Spring.

THE BEST YET.—"I must congratulate you on your magazine, which is the best I have seen yet, as also are the photos."—R. W. D'Vine, Rathfarnham.

WIDE INTEREST.—"Congratulations on your splendid magazine. It has an interest for the beginner, the non-technical, the advanced, and also for the womenfolk."—H. Gordon, Southfields.

ADVICE.—"Am delighted with it. My hope is that you will keep all the following publications as good as the first. The finest advertisement is the reader you have pleased, so keep the quality up to the first issue."—Edward Hudson, Liverpool.

VALUE.—"I would like to congratulate you, as a reader of THE WIRELESS MAGAZINE, No. 1, on the very excellent value you have given

the public for one shilling."—Tom Haslam, Alfreton.

A NEW NOTE.—"THE WIRELESS MAGAZINE certainly strikes a new note among the wireless papers. May it meet with all the success it deserves."—Lawrence Anderson, Camberwell.

MOST INSTRUCTIVE.—"As a reader of 'A.W.' for the past year, I must tell you how pleased I am with your new wireless mag. I think No. 1 is just the most instructive paper of its sort that I have read."—S. L. Hogben, Windlesham.

BEST OF THE BUNCH.—"I have been reading all wireless journals during the past twelve months, but yours is the most instructive of the whole bunch."—A. H. Hillman, Liverpool.

A PLEASANT SURPRISE.—"Congratulations to you for your first edition of THE WIRELESS MAGAZINE. To the non-technical reader it comes as a pleasant surprise to be able to understand the functioning of wireless so easily. I have digested so much of Vol. 1, No. 1, that I propose making the 4-valve set. As good a set as money can buy."

FROM A NOVICE.—"The finest shillings-worth of information and

plain, straightforward information and instructions that it has ever been my lot to get hold of. I am an absolute novice, but your drawings and instructions are so clear that it is as easy to follow as falling off a log."—J. C. Tetley, Brighton.

ENJOYMENT.—"Congratulate you on the very fine publication you have given us. The articles are full of absorbing interest, the stories are quite original, and the periodical itself is one which the novice can pick up and read with enjoyment."—T. F., Blackpool.

SOMETHING DIFFERENT.—"THE WIRELESS MAGAZINE is very different from all others on the market. I take in many of the radio periodicals at present on sale, but their very sameness is a little boring. The matter in this first number of THE WIRELESS MAGAZINE is so well balanced and varied that interest is maintained all the way through."—M. J. Morris, St. John's Wood.

ABOVE THE AVERAGE.—"May I convey to you my congratulations on the production of the first number of THE WIRELESS MAGAZINE? The general tone of the magazine lifts it above the average, and it is no doubt a book to be kept about the home."—C. Peverall, Stoke-on-Trent.

Famous Folk WHO HAVE FACED THE MICROPHONE

IT is just three years ago since the old days of Writtle and 2 MT, those early days of broadcast music consisting chiefly of gramophone records. In view of the huge organisation which has now come into being with the various B.B.C. stations, it is safe to say that on no other platform has so vast and varied a number of the famous folk of the world met, and received from their audience exactly the same reception, namely—silence.

To those accustomed to the tumultuous applause of enormous audiences, the effect is almost terrifying. The immobility of that round "eye" before which they have sung, played, acted and talked—the dead silence when finished and the lack of all knowledge as to whether they have had their usual effect on their hearers is not a pleasant ordeal to the greatest of artists, and it is almost surprising, therefore, that so many have succumbed to its lure.

Stage, music, society, politics, literature, filmdom, and even the Church, have sent their highest and best to essay the terrors of the microphone, which treats one and all with lordly contempt.

Lily Payling

One of the earliest artists was Mme. Lily Payling, the great New Zealand prima donna, by whom an interesting experiment was made. After singing to a packed audience at Albert Hall, Mme. Payling also sang to the microphone, thus enabling two audiences to hear her under similar conditions. Mme. Tetracini also sang in the early days, and on Christmas Day, whilst in Italy, her good wishes were transmitted here.

Sport was admirably represented when Mlle. Suzanne Lenglen, the tennis queen, spoke after her tournament at Wimbledon last year, and again in July last. She admits



Miss Betty Balfour.

that she regards broadcasting as an ordeal.

"I simply hate it," she said in an interview preceding her second attempt. "You see, I am accustomed to speak, or perform, before crowds, and not before a blank wall, or that horrid little thing!" The "horrid little thing" was, of course, the microphone. Mlle. Lenglen, however, expressed her admiration of broadcasting notwithstanding, and also her preference for speaking in English, rather than in French, for she regards our tongue as "fascinating." She is, too, an ardent listener-in, and has had experiences of this in all parts of the world.

Ellen Terry

We all remember the thrill with which we listened to our own Ellen Terry, just recently honoured, and when she read us the famous Hubert and Arthur scene from *King John* we realised once again the magic of her art. Accustomed as she is to huge audiences, she could scarcely imagine the extent of this one, the largest, though invisible. Possibly the very fact

that the great actress has set the seal of her approval on broadcasting encouraged many of her compeers in art.

We have since heard the best representatives of the English stage, amongst them, Mrs. Kendal, Sir Forbes Robertson, Lady Tree, and Marie Tempest, to quote but a few.

Variety is still hampered by the prejudice of its agents and managers, and but few real "stars" have broken away. Sir Harry Lauder gave us some "real Scotch," and Whimsical Walker, the famous clown beloved of all the world of children, has also visited 2 L O. He was then appearing at Olympia, and he broadcast in his stage make-up just the same as if his hearers were present.

Mary Pickford

Filmdom on both sides of the world has sent its best to 2 L O. "The World's Sweetheart," Mary Pickford, herself drove to the local station almost immediately on her arrival in London last year to give her message to the English people.

English films may be said to have been equally well represented by charming Betty Balfour, who shared honours with Alma Taylor, the Hepworth star. Both are at the head of the English screen.

Countess Westmorland

Society, too, has done its share, one of the earliest to speak being H.R.H. Princess Alice, the Countess of Athlone, then the Duchess of Atholl, being followed by the Countess of Westmorland, who sang at Manchester prior to her taking up a professional career on the London concert platform. The Countess is seen opposite with her accompanist, Mme. Holman.

Then we have had Earl Haig, Lord Riddell, Lord Curzon, the Rt. Hon. J. C. Smuts, Viscount Burnham; while even Royalty itself has broadcast—the King and the Prince of Wales at Wembley.

Politics, apart from the great



Countess Westmorland (right) and Mme. Holman.



Dame Ellen Terry.

political election speeches broadcast, was well represented when Mrs. Wintringham, then M.P., spoke on the work of women, and it was soon evident that for her the microphone held no terrors.

In music, it may be said that the greatest musicians of the world have contributed either directly or indirectly, for even if they have not come down to the actual studio, their work has been broadcast from the stage.

In this way have been heard the voice of Melba, the music of Pavlova's dances, the conducting of Weingartner and Sir Landon Ronald, and the speeches on every musical subject by musical experts.

Clara Butt

One of the most popular as well as famous of English singers is Dame Clara Butt, who broadcast from 2 L O last year. "I confess," she said,

"that I still regard wireless not only as the modern miracle of the age, but one almost uncanny by reason of its very immensity.

"The thought and subsequent knowledge that my voice reached thousands and thousands, in dull towns, isolated farmhouses, and in hospital wards, thrilled me beyond conception."

Dame Butt also regards broadcasting as a help to the youthful aspirant, for broadcasting gives thousands of singers an opportunity where the concert platform is restricted to but a few.

Literary Art

Literary art has also had its share of honours, amongst the authors who have been "put over" being Mr. H. G. Wells, William Le Queux, John Drinkwater, Noyes, and even Bernard Shaw, while the Church has taken liberal advantage of this

opportunity to reach thousands of ears who would otherwise probably refuse to seek it. Amongst its preachers who have broadcast are the Archbishop of Canterbury, the Bishops of London and of Woolwich, the Dean of Canterbury, and the Bishop of Kensington, while other denominations have included the perorations of Gipsy Smith. Surely the microphone is the lowest common denominator of society and civilisation.

Sir Hall Caine has twice broadcast from 2 L O, the first time on Armistice night, 1923, and the second on Christmas Day, 1924, on which second occasion he broadcast to all stations on the subject, "The Dream of Christmas Day—B.C. 4 to A.D. 1924," a theme which, I feel sure, grew out of his researches into the life of Christ.

Said he to a friend when the B.B.C.'s second invitation reached



Dame Clara Butt.



Mlle. Suzanne Lenglen.



Archbishop of Canterbury.



Mme. Lily Payling.



Miss Lilian Baylis.



Mrs. Wintringham.



Miss Mary Pickford.

him: "To speak to four or five million people at one time . . . on the greatest of all themes on the greatest of all days, is a great opportunity. Indeed, it is almost frightening. It would be so easy to fall short or even fail altogether."

Popularising Opera

When, with the aid of the artists of the British National Opera Company, the first opera, *The Marriage of Figaro*, was broadcast, being followed by *Hansel and Gretel*, public taste began to improve. Then came the fine work, pioneer once again, of the Old Vic company, headed by Miss

Lilian Baylis, who has been intimately associated with the fortunes of the theatre since a girl, when she came to help Miss Emma Cons, her aunt, a philanthropist and social worker, and she has shouldered its responsibilities ever since.

Since 1914 the Old Vic has presented all the plays contained in Shakespeare's First Folio as well as *Pericles*, and also other old comedies, moralities, etc. Miss Baylis was made last year an Honorary M.A. of Oxford, being the only woman other than Queen Mary to receive such a degree from the older University—a great honour.

The B.N.O.C.

Of the work of the B.N.O.C. itself there is little need to write. Both on the stage and in the studios all along the line, the artists have faced the microphone, and amongst them will ever be remembered Meses. Doris Lemon, May Blythe, Florence Austral, Beatrice Miranda, Miriam Licette, and Messrs. Walter Hyde, prince of singers, Norman Allin, Robert Parker, William Michael, Walter Widdup, William Anderson, Andrew Shanks, as well as John Perry of the Carl Rosa.

L. BAMBURG.

DON'T USE "DUD" PARTS!

THE old proverb of "spoiling the ship for a ha'porth of tar" is especially true in the case of home-assembled wireless sets. Two sets of exactly similar design, one built from guaranteed components of highest quality and the other assembled from cheap parts bearing no name or guarantee, will give vastly different results, even though the external appearance of the cheap parts may be almost identical with the other more expensive components.

Don't Stint Yourself

Quite a number of experimenters get disappointing results because they stint the few extra shillings that mean the difference between good class components and rubbish.

Take L.F. transformers, for example. A cheap transformer of unknown make costs 10s. and will probably break down in a very short time. A similar transformer, built

by a reputable maker, can be obtained for 16s. 6d. or 25s., and besides being considerably less noisy, will be better made and last indefinitely. Then again, take fixed condensers. A cheap type, of doubtful capacity, costs 10d. or 1s. One built by a reliable firm will cost 2s. 6d. and give infinitely better results.

A badly made variable condenser sells at 7s. to 8s. 6d.; a perfect model, guaranteed accurate, will only cost a matter of four or five shillings more. Accumulators, also, may be purchased at the present moment at extremely low prices, a 4-volt 20 amp. hour (actual) capacity battery being offered for 16s. 6d. These accumulators have very soft plates, however, and will not last half the time that a hard plate accumulator costing 25s. will.

It will thus be obvious that buying cheap parts because they are apparently bargains does not pay

in the long run. Supposing that it is proposed to build a four-valve set. The cost for component parts in the case of the constructor who is out for cheapness will amount to, say, £5 10s., including a second-rate accumulator and H.T. battery, but exclusive of valves. A similar four-valve set, but assembled from parts of highest quality and workmanship, will only cost approximately £7 10s., and the superior results obtained will amply repay the additional expenditure.

Deal with Advertisers

In fact, there is everything to be said in favour of purchasing components from advertisers in THE WIRELESS MAGAZINE who, by means of persistent advertising in the technical press, have built up a name for themselves which they cannot afford to lose by offering articles of inferior design and workmanship.

A. W. H.

THE average amount of time devoted to sport in the weekly programmes broadcast from the various stations in this country is about half an hour; that is, from one to three "talks" of 10 to 15 minutes each. Items of sporting interest are also given in the daily news bulletins received from the four great news agencies.

At first this seems to be a very small proportion, considering the interest in sport taken by both sexes and all classes in this country, but it is not merely a question of supply and demand, although the B.B.C. are keenly alive to the needs of listeners.

In Touch with Listeners

Their post-bag keeps them in touch with all the listeners who count—that is, all those who are sufficiently interested in wireless to put their comments, criticisms and suggestions in writing—but the B.B.C. are not entirely free agents.

When broadcasting first began it was such an entirely new thing, so completely outside all precedent, that the Government was obliged to go very carefully and to provide ample safeguards for all the other interests concerned. In all matters connected with sport it is obvious that the greatest of these is the Press, the recognized medium for communicating this and other news to the public.

Without such safeguards it is possible to imagine broadcasting as a serious rival to the newspapers, though there are many who deny this possibility.

General in Character

It is for this reason that the talks on sport are general in character, and, although they deal very often with topical matters, do not refer to events *in being*.

Thus, while you may hear the prospects of, say, the Derby discussed in a talk before the race is run, or described some time after it has been run, you will not hear an account of the race as it is taking place or immediately afterwards.

Broadcasting in other countries is on a different footing; there are



not the same restrictions and, perhaps, not the same advantages as in Great Britain. Sport occupies a larger place in American programmes, and the subject is dealt with in a more topical way. The same thing may be said of other countries in Europe.

For instance, one at least of the international Rugby matches played in France was described *as it took place* by an expert watching it and speaking directly into a microphone.

In this connection two questions may be asked. Did the knowledge that this account was to be broadcast keep anyone away from the match who would otherwise have gone to see it? Did the account broadcast take the place of a written report and prevent anyone from buying a paper which he would otherwise have done?

Seeing for Oneself

The answer to the first question is "No," for I do not believe any account, written or spoken, ever kept anyone away, or could keep anyone away in the future. To see a thing for oneself must always be better than seeing it through another person's eyes, though the description of such an event might make one who had never seen a match want to do so.

As to the other question, it is conceivable that the spoken account might take the place of the written report, but I doubt if it would have an appreciable effect on the sale of papers.

On the other hand, there must be a very large number of people who cannot, in any circumstances, be present at football matches, boxing contests and race meetings, but who would enjoy much of the thrill of such happenings by hearing them related graphically by an expert who is on

the spot. This is a difficult and delicate matter which can only be adjusted as a result of further experience.

What of the future? Will sport play a more important part in the programmes of ten years hence? I believe it will. Year by year an increasing number of men and women take an active interest in one

or other form of sport; with this increase will grow a more insistent demand for information on the subject.

Apart from the *reporting* of sport by wireless, there will probably be an increased need for technical talks by experts on how to play, hints for players (both novices and old hands), critical comments on the doings of famous teams and, above all, for the *personal touch*.

How Others Live

The average man and woman in the street is intensely curious about the personalities and lives of those who are prominent in any walk of life, sport included.

I believe the spoken interview has a great future before it. How much more interesting it would be to hear Bombardier Wells describe his sensations when being knocked through the ropes than to read it, however well the interview was written!

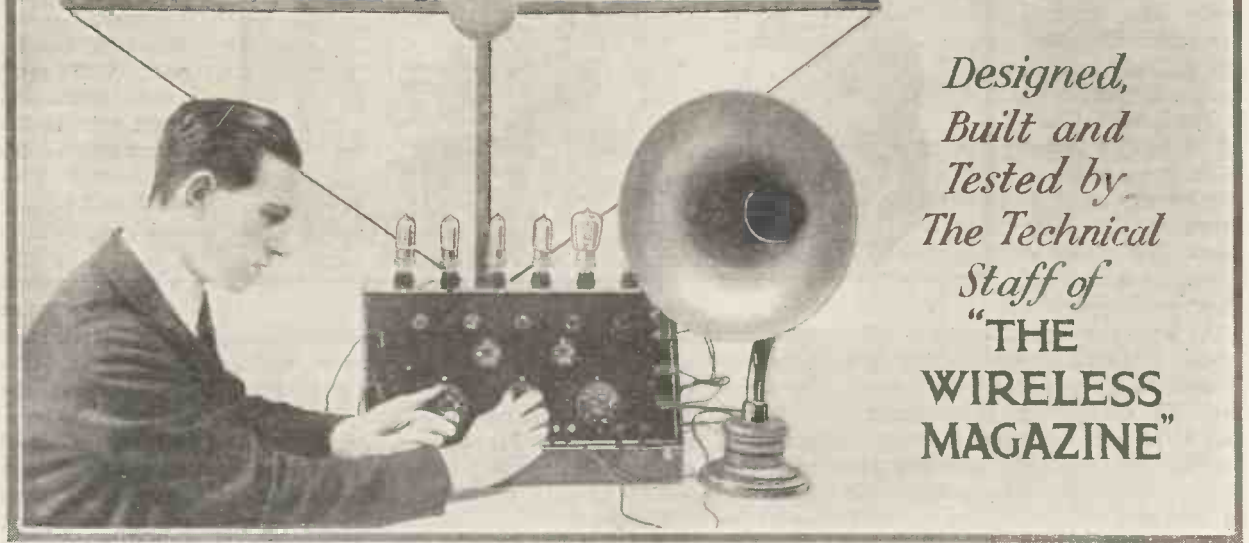
There is one other thing—atmosphere. I have attempted once or twice, with the help of the B.B.C., to introduce an appropriate setting for my talks. When describing a boxing match, such sounds as the scuffling of feet, the thud of blows, the striking of the gong, all add very much to the reality of the scene described. This may be developed in the future.

Sport Records

Who could help being thrilled at hearing the crowd cheering the winning goal in a Cup-tie, or the mingled cries of the spectators at the Derby? Why not have records taken of such sounds and use them as an accompaniment to appropriate talks?

(The photograph shows an observer broadcasting a report of a Scotland v. France Rugby match as it took place.)

A Six-Valve Supersonic Heterodyne Receiver



*Designed,
Built and
Tested by
The Technical
Staff of
"THE
WIRELESS
MAGAZINE"*

A SUPER - HETERODYNE set employing the usual eight or nine valves would be a little beyond the beginner, consequently it is believed that the description and practical details of a "super-het" using only six valves will be welcomed by many amateurs.

Theoretical Circuit

Referring to the circuit diagram, Fig. 1, it will be seen that the first valve acts as a detector, the grid circuit being coupled to the oscillator valve by means of the three fixed coils L_1 , L_2 and L_3 .

The inductances L_2 and L_3 are the grid and plate coils respectively of the oscillator valve.

Across the grid coil is shunted a

variable condenser C_2 ; by suitably adjusting this condenser the oscillator valve induces currents into the grid circuit of the detector valve, producing supersonic beats. These beats are rectified by the first detector valve in the plate circuit, of which currents are produced corresponding to a long wavelength. These are transferred to the next valve through a 2,500 to 7,000 metre high-frequency transformer.

The plate circuit of the second valve contains an exactly similar transformer, the secondary of which is shunted with a fixed condenser of .0005 microfarad capacity.

The secondary of the first H.F. transformer is shunted with a .001 microfarad variable condenser. In

this manner the output side of the two transformers may be tuned to exactly the same wavelength with only one control.

After this control (the .001 microfarad variable condenser) has been properly adjusted there is no need to alter it again. The fourth valve is another detector, and the remaining two valves are low-frequency power amplifiers.

Oscillator Unit

The oscillator unit consists of a No. 50 Igranic coil (L_2) which is carefully unmounted from its holder and 20 turns of No. 26 d.c.c. copper wire wound over it.

The 20 turns are wound in the ordinary solenoid fashion, the "honeycomb" method being unnecessary. This forms the plate coil, L_3 .

The coupling coil, L_1 , consists of four turns of the same gauge and type of wire wrapped round the honeycomb coil and the extra winding.

From the number of queries we receive on this subject it is obvious that many amateurs like to know the actual make of the components used in the original sets made by us in THE WIRELESS MAGAZINE Workshop.

For this reason the manufacturers' names are given. It should be clearly understood, however, that any other reliable makes may be substituted provided that the elec-

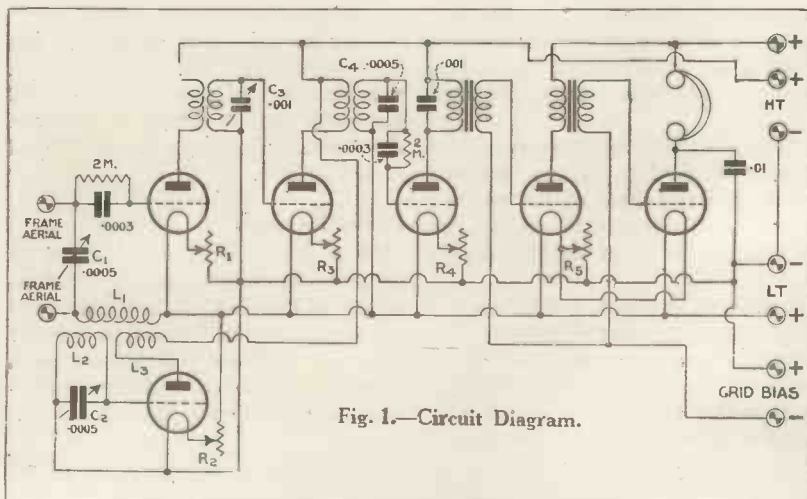


Fig. 1.—Circuit Diagram.

trical values are identical with those given in the following list.

Components Required

Two Radion mahoganite panels, one 19 in. by 4 3/4 in., and the other 18 in. by 9 in. (American Hard Rubber Co.).

2 .0005 microfarad variable condensers (Polar).

1 .001 microfarad variable condenser (Polar).

5 filament rheostats (Lissenstat Major).

6 valve holders.

2 valve holders below panel mounting type.

2 low-frequency transformers (Lissen type T1 and Listoleon).

2 .0003 microfarad condensers fitted with grid-leak clips and grid leaks of 2 megohms each (Dubilier).

2 H.F. transformers, 2,500 to 7,000-metre range (L. McMichael).

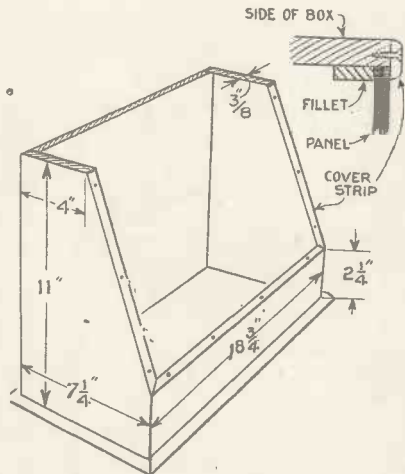


Fig. 2.—Details of Cabinet.

1 .0005 microfarad fixed condenser (Lissen).

1 .01 microfarad fixed condenser (Ediswan).

1 No. 50 Igranic coil.

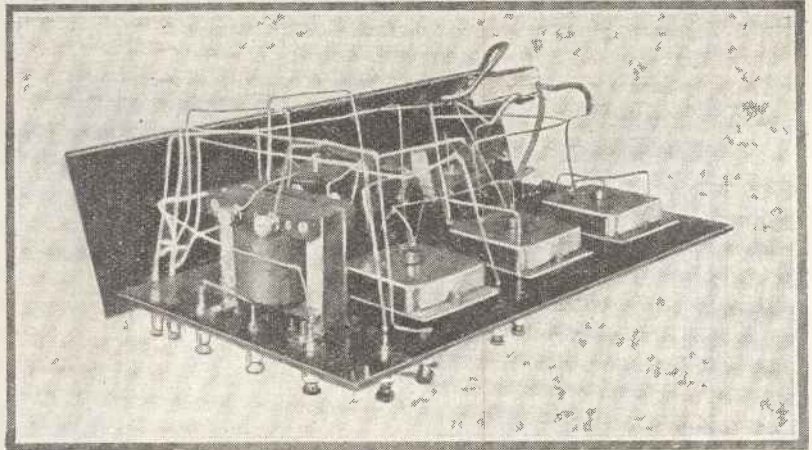
Complete set of terminals.

1 sloping oak cabinet having an opening for an 18 in. by 9 in. panel.

Cabinet

In Fig. 2 is given a dimensioned sketch of the cabinet. The cabinet used in actual receiver was made by Ashton and Mander, who stock it as one of their standard sizes. The top of the cabinet was removed and the dovetails sawn off flush.

The 19 in. by 4 3/4 in. panel lies flat on top of the cabinet while the 18 in. by 9 in. panel fits in the front. The two panels are attached to each other by means of wooden cleats (see photographs).



View of Panel showing Wiring.

Before fixing the panels together, each should be drilled according to the drilling diagram, and the various components mounted on them.

Blueprint

A full-size blueprint showing the layout of the panel and giving the sizes and positions of holes to be drilled may be obtained from the editorial offices of this magazine, price 1s. 8d., post free.

A small reproduction of this blueprint, which to some constructors will prove sufficient, is given on page 277.

Assembling and Wiring

Having drilled the two panels, the next step is to assemble the instruments thereon. The valve holders and the oscillator coils are mounted on the top panel.

In the coloured wiring diagram two fixed condensers and a grid leak are shown on the top panel for the sake of simplicity in wiring. Actually, these components are placed in

the nearest positions possible to the instruments to which they are connected.

Start wiring up all the small instruments first, otherwise difficulty will be experienced later on in getting at them.

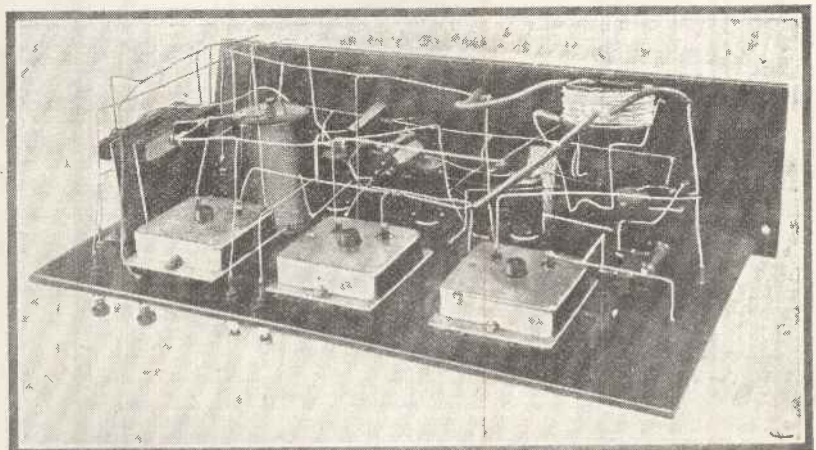
Free Coloured Plate

Referring to the coloured plate, the filament lighting circuit is shown in red, the aerial circuit in blue and white, and the remainder of the circuit in full blue lines.

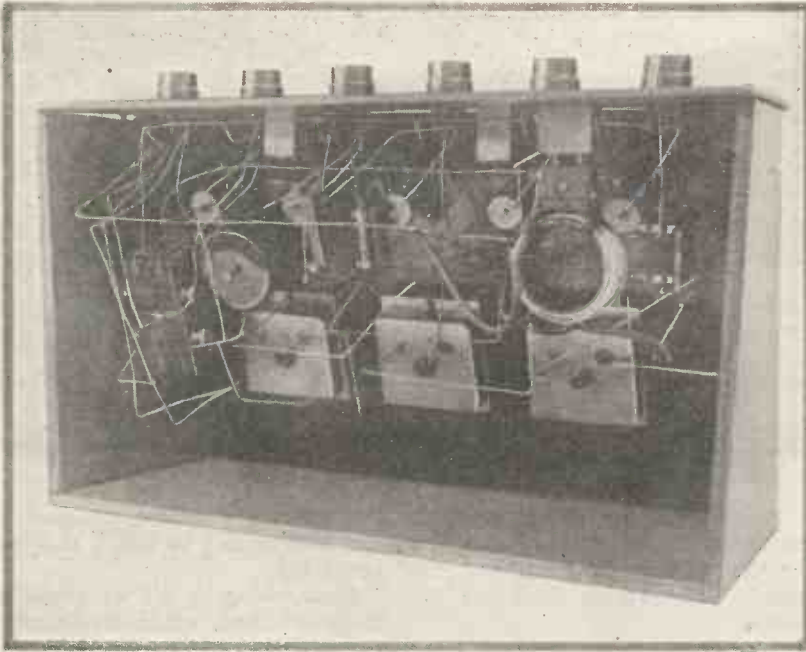
It is advisable to wire up a complicated set such as this in a systematic manner, making sure that one circuit is completed before starting on the next.

In this manner the chance of missing out a connection is minimised.

When connecting up the oscillator unit do not permanently solder the leads from the plate coil until the set is tested to ascertain whether these leads should be reversed or not. It is sufficient for the test to merely twist them round their connections.



Another View of Panel showing Wiring.



Back of the Set, showing Disposition of Components.

It would indeed be a tragedy if the constructor were to burn out six valves owing to some mistake in the wiring. To avoid this the

H.T. and L.T. batteries should be connected up to their proper terminals, and a voltmeter placed across the filament legs of each of the valve

holders in turn, the filament rheostats being turned on to their "maximum" position. The voltmeter should register about 4 or 6 volts, according to whether the L.T. battery used is a 4 or 6-volt accumulator.

If, by any error in wiring, the H.T. battery has its voltage applied to the filament legs, the voltmeter will indicate the fact.

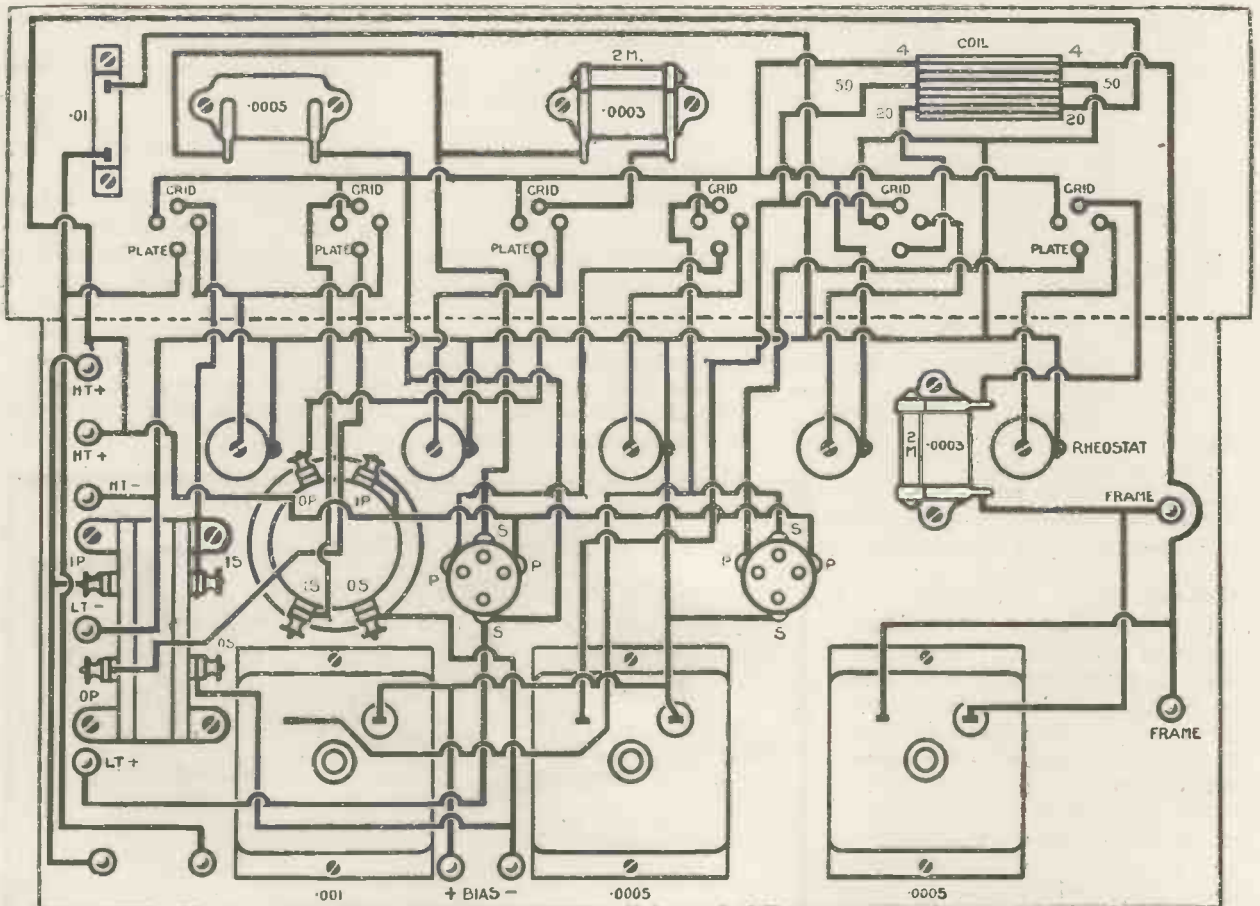
Frame Aerial

Eight turns of No. 22 gauge enamelled copper wire wound on a 2-ft. frame, the turns being spaced $\frac{5}{32}$ in. apart, will form a suitable frame aerial for use in conjunction with the set.

Operating the Receiver

Connect up the frame aerial to the terminals marked "frame," and the L.T. and grid bias batteries to their proper terminals. Bright-emitter valves are recommended, although, of course, dull-emitters may be used.

The last two should be power valves for which an extra H.T. terminal has been provided. Altogether two



Above is reproduced the Coloured Wiring Diagram given Free with this issue of THE WIRELESS MAGAZINE. The layout of the panel is shown on the opposite page.

H.F. valves, two detector and two power valves are required.

Testing

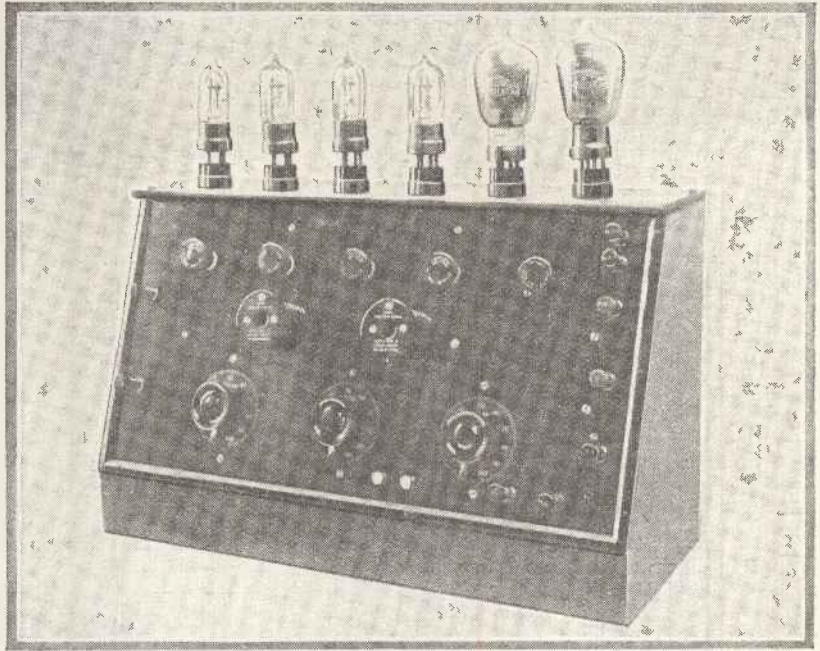
The first test is to make sure that the polarity of the leads from the plate coil in the oscillator unit is correct. To do this, tune back and forth with the aerial tuning and oscillator condensers until signals are heard, when a slight whistle will be noticed.

If the set does not seem to be working properly, reverse the two plate-coil leads of the oscillator.

Indoor Aerial

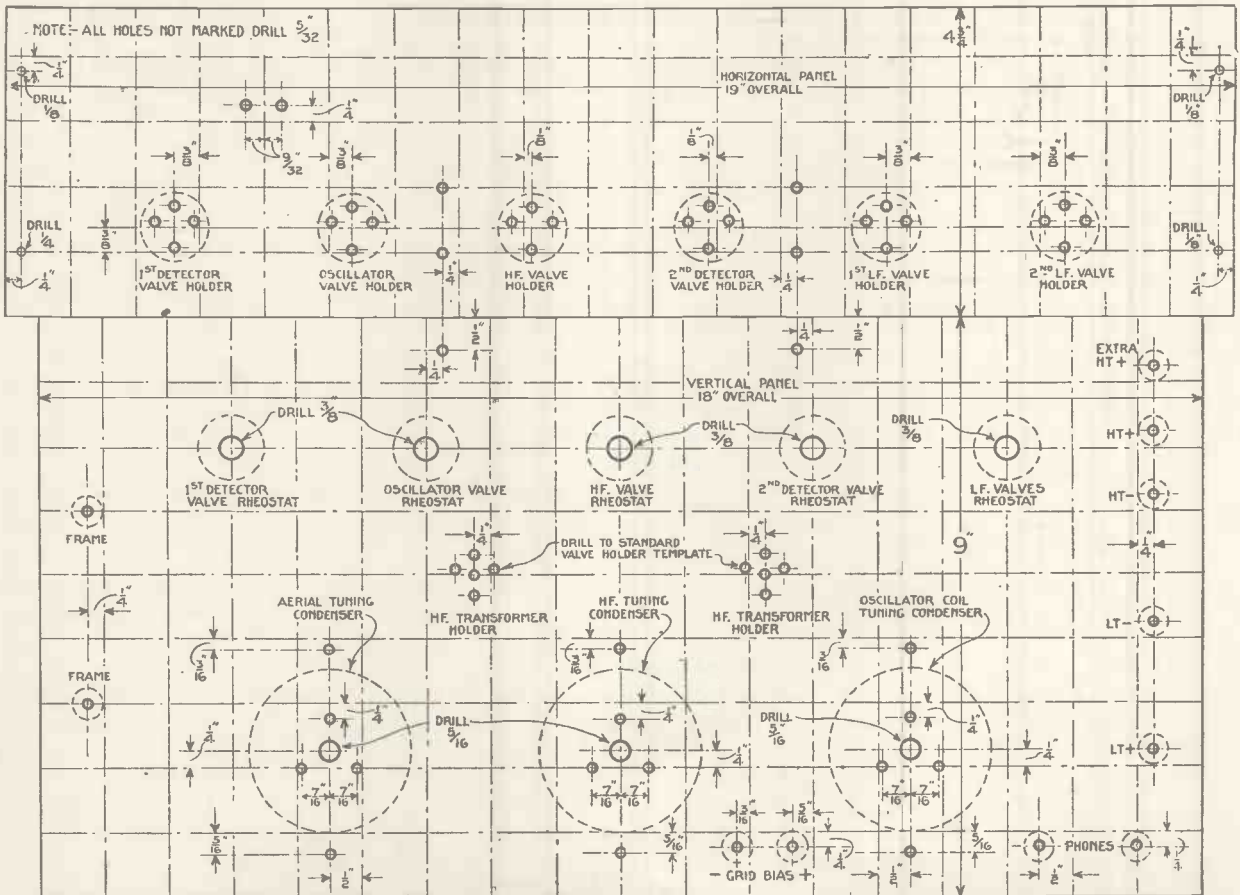
Instead of using a frame aerial the set may be operated on a small indoor aerial, in which case a coil of 40 turns of No. 24-gauge d.c.c. copper wire wound on a 3½-in. diameter former should be connected in place of the frame and an aperiodic aerial coil of six turns of the same gauge wire wound over the 40-turn coil.

The aerial and earth would be connected to the two ends of the six-turn coil.



Front of the Six-valve Supersonic Heterodyne Receiver.

A final word of advice. Do not expect results on a super-heterodyne equal to or better than those given by a multi-valve set connected to an outside aerial and earth system. The super-heterodyne is intended primarily for use where an outdoor aerial cannot be erected.



This is a reproduction of the Blueprint Panel Drilling Template that can be obtained from THE WIRELESS MAGAZINE Offices for 1s. 8d., post free.

A CHEAP and easy method of deriving electricity without the aid of any of the methods which are at present used—and which, without exception, are costly—is surely something of considerable importance, and it will be surprising if more is not heard in the near future of the discovery made by Mr. J. B. Kramer, president of the Birmingham and Midland Scientific Society.

For nearly six years Mr. Kramer has been engaged on experiments and research with the object of harnessing electronic energy, and the results which have attended his early experiments seem to indicate that Mr. Kramer has found a way.

Monazite Sand

Mr. Kramer has been testing the radio-activity of some monazite sand, which is one of the commonest radio-active substances known. It abounds on the shores of India, South America, and elsewhere. In the course of the experiments he found that by placing the sand between two plates of different material, one carbon and the other zinc, each became charged with electricity, the carbon receiving a positive charge and the zinc a negative one. The plates had, in fact, separated and stored up the positive and negative electrons which are radiated in a ceaseless stream from the atoms in the monazite sand; and thus a cell had been formed from which a current could easily be drawn.

With a few handfuls of monazite sand and several pairs of metal plates Mr. Kramer produced at a

Batteries that never Run Down

A New use for Sand?

recent demonstration a current, at a pressure of twelve volts, sufficient to light a good-sized lamp.

Power from Sand!

But the Birmingham scientist has gone farther than this; he has actually driven a small beam-engine from such a cell, and he hopes shortly to demonstrate this to the public.

Much more remarkable than the simplicity of the discovery is the fact that radio-active substances retain their activity for thousands of years. In the case of the monazite sand the minimum period of activity is two thousand years.

Obviously the strength of the current is determined only by the area of the plates and the quantity of the sand used, and Mr. Kramer has suggested that there seems no reason why cells should not be built up in the way described so as to make high-tension batteries for wireless purposes. The life of such a battery would be restricted by the life of the metal, which, however, could be easily replaced when it began to decay. There would, it is true, be a progressive diminution in the radio-activity of the sand, but spread over so great a period of time this would be negligible for all practical purposes if, in the first place, sand with its radio-activity at the maximum were obtained.

It remains to be seen, of course, whether monazite sand can be used on a wide scale for the manufacture of batteries on Mr. Kramer's method. There seems no reason why it should

not. What a boon if it can be used!

The sand already has a commercial value, for it has been used extensively in Germany in the manufacture of gas mantles, and apparently all that is needed is for some enterprising firm to come along and try the market with these new batteries. They would probably confer an inestimable boon upon the wireless public, for the existing types of battery remain one of the biggest sources of trouble.

Absorption

But whether the commercial prospects will mature or not, Mr. Kramer's discovery opens up a new line for research, or so it seems, at least to the writer, in connection with some of the problems met with in the propagation of wireless waves.

Absorption, deflection, and blind spots, for instance, have lacked a really convincing explanation up to the present. May it not be that the radio-activity of substances in the earth, this "nature's own wireless," has something to do with these phenomena? L. B. P.

[Amateurs who feel disposed to carry out experiments with monazite sand should note that this commodity cannot be obtained from the offices of THE WIRELESS MAGAZINE!]

RIPPLES

EARL RUSSELL thinks that Parliamentary debates ought to be broadcast. It certainly is a "sound" suggestion in one respect. A RECENTLY issued catalogue of ex-army wireless parts contains no mention of loud-speakers. Evidently there are no sergeant-majors to spare.

WRITING of wireless, a business man says that no invention will count more in the development of commerce. What about the adding machine?

LISTENERS in America recently heard the comments of a diver on the sea bottom. We should hardly like them to hear our comments under such circumstances.

WE understand that those Thames-side dwellers whose aerials were submerged during the recent floods have expressed the opinion that the river ought to be dammed.

NEWCASTLE has broadcast talks to farmers on the "Management of Meadowland." This is about the only sphere of activity where you can let the grass grow under your feet and yet make money.

DOCTORS say that wireless has an extraordinary curative effect upon children. It certainly cures them of chattering when father wants to read the paper.

Now that a schoolmaster has publicly declared that wireless interferes with home lessons, there should be an enormous increase in the number of juvenile listeners.

THE Japanese are perfecting a wireless instrument that will enable them to foretell earthquakes. If it will do that, it ought almost to be capable of forecasting a fine day occasionally for us.

THE CRYSTAL GAZER — *New Style*



AM. ROBBIE.



How MILL HILL SCHOOL Talked with NEW ZEALAND

A SPECIAL ARTICLE by the SUCCESSFUL AMATEUR, C. W. GOYDER

It is interesting to notice how quickly the English amateur has developed long-distance communication on low power, in spite of the handicap of Post Office restrictions. Three years ago, when the station 2 SZ at Mill Hill School commenced transmitting—the amateurs were using a wavelength of 1,000 metres—communication over a distance of 100 miles was considered exceptional, and being received in Scotland was the height of ambition.

Lower Wavelengths

The amateurs then dropped to 440 metres by Post Office regulation, and later to 200. Several European stations were then heard here, Mr. Deloy, F 8 A B, of Marseilles, being the first. Then followed the reception of American amateur signals, and an increase in the number of transmitting stations, both here and in Europe.

Owing to the difficulty of obtaining the necessary permission and apparatus for the higher power required for communication with America, only one or two such stations entered for the tests in the winter of 1922-23. In the winter of 1923-24 tests were again arranged, when 30 to 40 stations in England and Europe were heard in America.

American Tests

During these tests the 100-metre region was opened, and immediately two-way communication with America was found possible every morning.

It was in April, 1923, that the first experiments using higher power (250 watts) were made at Mill Hill School. A special set had been constructed for working on 200 and 100 metres, and our call signals were received and confirmed from America during these

tests, upon 19 out of the 20 nights. More than 40 American stations were worked that winter, and reports were actually received from 130. Further, our signals were heard in California, Colorado, and near the North Pole by the McMillan Arctic Expedition.

From the end of May last year no more night transmitting was attempted until October 8, when I changed from the direct-coupled Hartley to the present loose-coupled circuit. After a few hours of clip juggling (in all there are seven clips to be adjusted) the set was working fairly well, and during the

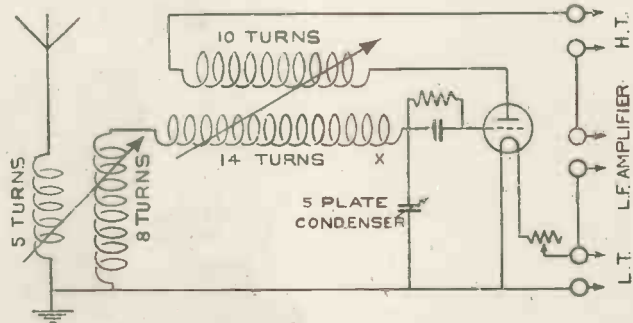


Fig. 1.—Loose-coupled Receiving Circuit

half-hour before dawn on October 8 I communicated with two American amateurs. Being at work all day there are limits to getting up before 5 in the morning, so not until October 18 was I ready to resume the experiments.

Early that morning, after manipulating clips for a couple of hours, the radiation and efficiency were a little higher. At 5.30 I listened for American stations, and at 6.15, while 2 O D (Mr. Simmonds) was trying to get me into touch with one of them, I heard a station with a D.C. note calling continuously for ten minutes. He then signed Z 4 A A.

I was of opinion that somebody was having a joke with me, but I replied on chance. Not until three hours later was I really convinced. A cable arrived reading:

“Congratulations on first trans-world message.—BELL.”

World's Record

Thus was established the world's record in amateur transmitting, and as the Antipodes is the goal, it is hard to imagine how it is to be beaten. Our American friends, with their usual generosity, sent the following message:—

“Dear Mr. GOYDER,

“I am obliged to you for your kind cablegram of October 19, reporting your most amazing work on that date with New Zealand 4 A A. This is stupendous, and staggers the imagination. Amateur distances have been increasing

constantly, but I don't think there was anyone amongst us who would have been willing to say he believed that we would so suddenly achieve communication with the Antipodes over a distance of 12,000 miles. You are very much to be congratulated, and we hand you our sincere compliments.

“It would certainly be interesting to see if this contact could be duplicated with any regularity.”

(Signed) K. B. WARNER,
American Radio Relay League.

Next morning and for ten consecutive nights I established communi-

cation with New Zealand, including two others there, Z4AG and Z4AK, and I have since worked with Z2AP. Working now only at the week-ends, I regularly connect with New Zealand. Four other English and one, French amateur have also connected. Communication has also been established with Australian 3BQ.

The conditions for good reception of New Zealand signals are interesting. Invariably, a cold, clear night favourable for America is no use for New Zealand, for which a rainy, misty, cloudy night is the suitable condition. What is the explanation?

The set used is as follows: For receiving, the standard loose-coupled circuit (Fig. 1) with untuned aerial coupling is used. The secondary is split, as shown. The aerial coil is coupled to one part and the reaction coil to the other. This obviates, to a large extent, the shift of wavelength when the coupling is varied, which is usually very troublesome on waves as short as 90 m.

Low-loss Coils

The coils are the "low loss" cylindrical basket-coil type made by interweaving No. 20 d.c.c. wire around 11 pins arranged on a flat board in circular fashion, 3 3/4 in. diameter for the grid coils, and 3 in. for the other two coils. These are kept together with cotton, no shellac being used. This gives a very low self-capacity coil, which will cover a large range with a small condenser.

With 5 turns in the aerial coil, 10 turns reaction, and 8 turns and 14 turns in the coils coupled to the aerial and reaction respectively, the set will tune down to approximately 75 metres. The 5-plate condenser has a low minimum capacity, obtained in this case by cutting the plates away to some extent. The grid condenser and leak have the standard values. The low-frequency amplifier is of the standard type.

Best for C.W.

This type of set is excellent for C.W. work, and in my opinion better than more complicated types, although for telephony a super-heter-

odyne is undoubtedly superior. For 200-metre work the secondary may be loaded up by inserting a 25-turn coil at x (Fig. 1).

The aerial is a 5-wire flat-top, 50 ft. long on 12 ft. spreaders. A cage lead-in, 45 ft. long, goes to the wireless room. Under the aerial, which is 25 ft. high, is an 8-wire counterpoise, also with a cage lead-in.

Transmitter Details

The transmitter uses the loose-coupled Hartley circuit as shown in

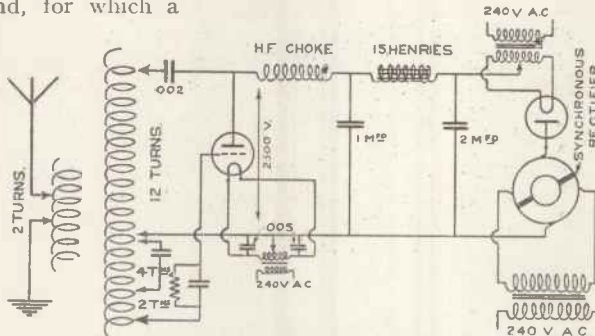


Fig. 2.—Loose-coupled Transmitting Circuit.

Fig. 2. The inductance is wound with 1/4-in. copper tubing. The valve is a Mullard 0/250 C. A great difficulty is the high-tension problem. Originally a synchronous rectifier was used, but as it is not possible to smooth this type of rectifier as it stands, owing to the necessity of keeping the volts and amperes in phase so that a sparkless make-and-break may be assured, a 2-electrode valve is placed in the positive

H.T. lead, and after the current has passed this valve it may be smoothed with chokes and condensers as shown. This method gives a good D.C. note. The synchronous rectifier disc is 8 in. diameter, and has two brass segments separated by a half-inch ebonite washer. This is driven by a small synchronous motor.

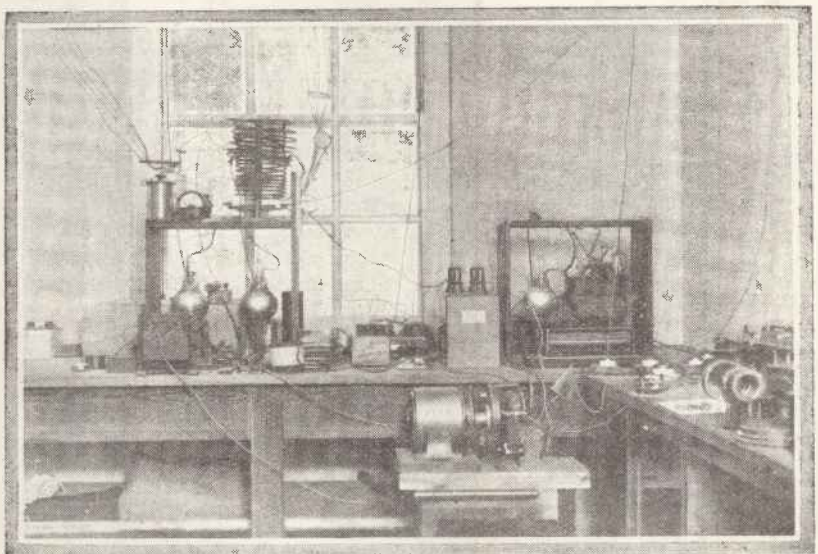
The filaments of the valves take about 12 volts, 5 amperes, and are run from step-down transformers as shown.

A widow recently asked the B.B.C. to broadcast her appeal for a husband. Not wishing to spoil the enjoyment of their listeners, they wisely declined.

A CORRESPONDENT asks if there is a broadcast station with the call sign OBE. We are afraid he is mixing up call signs with infectious diseases.

WIRELESS sets can now be insured against all risks, says an insurance company. We should like to see their policy for insuring against atmospherics before believing them. In the introduction to a lecture from Nottingham, a professor invited his hearers to heckle him. Some lecturers seem to do the same thing unconsciously.

TELEPHONE broadcasting to ships in mid-ocean is estimated to cost £1 a minute. The people who arranged this rate must have been professional boxers.



Transmitter at 2SZ (Mill Hill School).

On the right are the rectifying valve and H.T. transformer, and between the two frames is the smoothing system. The synchronous rectifier is on the stool. In the left-hand frame are the power valves, with copper tubing inductance, tuning condensers and meters on top. The cage-type leads are for the aerial and counterpoise.

AT 2 SAVOY HILL, W.C.2.

THE subject of outstanding importance this month is the new Wireless Telegraphy Bill. We (the B.B.C.) have been overwhelmed with inquiries as to our attitude on this measure ever since the Bill was printed.

We have had nothing whatever to do with the Bill in its present form. We were not consulted in drafting its terms, and had no idea whatever as to what its terms would be. All that we have ever done has been to point out repeatedly to the Post Office that there is a very large amount of evasion of licences going on, and certain people are openly defying the Post Office to prosecute them for not having licences.

Evading Payment

It is impossible to state the number of people who are evading payment of licences, but when it can be proved that in some towns the number of aerials is much greater than the number of licences, obviously something is "rotten in the State of Denmark." There has also to be added to these the very large number of indoor aerials.

The figures as to the number of evasions vary considerably, but a modest estimate would be that half-a-million people have unlicensed sets.

Of course, there are many people who say: "What does it matter? The B.B.C. is rolling in money and has more than it knows what to do with." This is very pleasant fiction, but it is far from being the truth. We cannot heap up a surplus. If, after meeting current expenditure on engineering, programmes and administration, there is any surplus, it must be returned to the Postmaster-General.

Reduced Licence Fee

Already as the result of improved income, the licence fee has been reduced to ten shillings for everybody. With improved income, also, we dropped all revenue from tariffs, and we have now no income whatever save from our share of the licence money.

It cannot be too often reiterated that we are limited to a dividend of $7\frac{1}{2}$ per cent. on our capital. The amount subscribed is about £60,000, and the capital is £100,000. No

A Page Specially Contributed by the B.B.C.

matter how prosperous we may be, not more than £7,500 can ever be paid to the shareholders in any one year, and, as a matter of fact, the sum paid last year was about £4,000.

The real fact is that so far from rolling in money we are at present sailing very near the limit of our expenditure. Every month we get a return from the Post Office as to the amount of revenue accrued from licences, and the amount expended on programmes is determined accordingly.

The money that we get is spent on improved service. There are a great many things that we should like to do if only we had the money. We are only at the beginning of possibilities with regard to the high-power station, for instance, and if we are to exploit that station to its utmost on behalf of the listening public, we should need a much greater income than we at present possess.

Footing the Bill

All that we are asking of the Post Office and the public is that some means should be taken whereby those who have partaken of the fare will foot the bill.

We have had hundreds of letters to the effect that many people refuse to take out licences simply because they know others who do not take them out, and they don't see why they should pay for themselves and for other people as well.

The public have the matter in their own hands. If they want the broadcasting service to prosper and grow in influence and enjoyment, then they will continue in ever greater numbers to pay the very modest sum asked. If they do not do so, then the programmes will suffer, and the whole proud position which British broadcasting has won as incomparably the best in the world will speedily be undermined.

One of the early projects which we have in mind is to run programmes continuously from 3 o'clock in the afternoon to 11 or 11.30 every night. That costs money. We should also

like to be in a position to be able to engage the greatest artists in the world, no matter how high their terms might be.

Installing Relay Stations

We are being continually invited by various districts which are not at present served by broadcasting stations to install relay stations, but we have come to the end of our relay-station policy in the meantime. Nothing further can be done in this direction until Daventry has been tried out. It is admitted that Chelmsford does not serve the whole country adequately on crystal sets because of its position, but after the station has been removed to Daventry, several areas which at present are blind spots, so far as crystal reception is concerned, will come well within the radius of the new station.

BRANDED EBONITE

MANY unreliable firms are offering sheet ebonite at extremely low prices, in some cases just a little over half the price charged by the leading makers. This cheap ebonite is in most cases remade from "scrap" ebonite obtained from old electrical apparatus, and contains a large percentage of odd pieces of metal, even brass screws and washers finding their way into the mixture.

Needless to say, the insulating properties of such ebonite are very poor indeed, and the reader who uses it for mounting his set on is running a great risk of reducing the efficiency of it by 50 per cent. or even more. In fact, with regard to all wireless parts one cannot do better than buy "branded goods." A. H.

A HAIRDRESSER from South London suggests that the new short-wave idea should be christened the shingle. Soon, therefore, we may have single-valve sets for shingle reception.

THE professors at Sheffield University are using wireless valves for melting metal. If this practice spreads we may soon find the plumber excusing himself for a few minutes while he goes back to fetch his wireless set.

THE SOUND MIRROR

*A Novel Solution of
the Loud-Speaker Problem*

by DR. ALFRED GRADENWITZ

A REMARKABLE type of loud-speaker, in the construction of which no metallic parts are used, has been developed by one of the leading German piano makers, Mr. Ibach, of Berlin, in co-operation with two engineers, Fritz Wilhelm and Carl Johannes Müller.

Melodious Rendering

This apparatus is made of wood throughout, it being thought that the same material to which the violin is indebted for its melodious sound would be likely also to render broadcasting in a more enjoyable manner than any apparatus comprising a metallic funnel and accordingly disturbing the original harmony by its own scratching sound.

Similar to Violin

The new sound mirror outwardly resembles a musical instrument of the violin type, an ingenious construction effecting a connection between the upper lid and the telephone membrane. This ensures a strong and strange resonance which, particularly in connection with any

musical performances, enables sounds to be rendered with remarkable faithfulness. Even the piano, which

with so far unheard-of purity and sonority.

Construction

[The construction of a loud-speaker similar to that described by Dr. Alfred Gradenwitz is not beyond the capabilities of the amateur. The back and front boards can be made of pine or sycamore $\frac{1}{8}$ in. thick, held together by about eight small wooden blocks placed round their peripheries. A strip of thin wood is glued round the blocks. A Brown A-type phone is let into the back board and con-



Listening to the Sound Mirror.

is known to be the least satisfactory instrument from the point of view of wireless broadcasting, comes out

nection made between the reed and a bar under the hole in the front board by a threaded pin.—ED.]

THE FLEWELLING—AND A GRID LEAK!

INTEREST has recently been revived in the original Flewelling circuit, a circuit which forms a splendid basis for a considerable amount of experimental work. I shall never forget my own first experience of this fascinating circuit, nor shall I forget the hunt I had through the wireless shops for the large-capacity fixed condensers which do the super-regenerative trick in the Flewelling receiver.

Without an Aerial

What astonished me most about the Flewelling receiver was the way I could get splendid signal strength

from the nearest broadcasting station with the "earth" attached to the aerial terminal, and nothing attached to the earth terminal.

When the Leak "Leaked"

The first variable grid leak I fitted to my Flewelling set had a screw terminal at the outer end. I had in those days, as at present, the greatest faith in a good soldered joint, and I thought it best to solder a wire to the screw terminal of the grid leak. When I applied the hot soldering iron to the screw, however, my new variable grid leak behaved in a remarkable manner. The end

screw flew off, and the little carbon compression pellets jumped out all over the bench, some even rolling on to the floor in their efforts to hide their little selves.

Caution!

From that day to this I have applied a hot soldering iron to a variable grid leak in a very gingerly manner. Having seen one grid leak do a Jack-in-the-box stunt, I have no wish to see another one do the same thing. Besides that, I hate to see a half-crown of mine go west in the twinkling of an eye, even in wireless.

AERIAL.

Ideas for ANTIQUE CABINETS



There are many possibilities in the way of beautiful cabinets. This article explores some of them.

occasionally come my way, and, fortunately, one broke in on me whilst I was in the shop.

"Can one have a wireless set without a cabinet?" I inquired tentatively.

The dealer did not appear to get my meaning.

"I mean to say, can one have the apparatus fitted into one's own idea of a cabinet?" I explained.

He was a gentle and patient salesman, and I finally gathered that I could have a set fitted into anything from a wardrobe to a salt-box. Here, then, I pass on some ideas for cabinets which are original and not inartistic.

The old Bible box on the stand is an ideal receptacle for a wireless set, for the front only need be taken off and refitted with hinges, which allow of its being pulled down and rested on two stays fitted at either side, like those in a bureau. The lid, of course, lifts up.

Such a cabinet would be fit for any room furnished with old things, and anyone having such a piece will find the experiment most successful.

The old dresser in the picture is about to be altered at my suggestion into another cabinet. Here the little door of the cupboard between the shelves has been taken off and another is being made to match. The sides of the cupboard will be moved farther apart to receive the set, and then both doors will be refitted to enclose it.

Another picture shows an old Spanish inlaid box originally used as an odds and ends box in an artist's studio. This is going to be converted simply by making the fronts of the drawers into a door.

The old oak clock case was picked up at a country sale for fifty shillings, without works. It belongs to a friend of mine, and I am always telling him clocks that do not go are but ghosts of themselves. He is always "going to pick up some good works," but never does.

"Why not wireless?" I suggested, just before Christmas, but he received the idea with scorn. To-day, however, I hear that soon I shall listen to that old clock booming out the time by the help of Big Ben.

I was invited by a north-country
(Continued on page 286)



The old oak box-like structure on the left would make a fine cabinet; it was originally a bread trough (right).



Beautiful and strong wireless cabinets could be made from the old oak medicine chest (top left), the farmhouse corner cupboard (top right), the dresser (bottom left), and the Bible box (bottom right) shown here.

farmer and his wife to go and stay the week-end with them to see some of their old furniture and to hear the new wireless.

The wireless fulfilled all expectations, but the food and the furniture exceeded them.

It seemed most entrancing to me to be sitting in their parlour full of fine old country furniture, which had been in their family for generations, and listening to the latest dance tunes of the Savoy band. Here indeed was the meeting place of the old and the new.

The brand-new, rather yellow oak, sharp-edged wireless cabinet was placed on a fine old Queen Anne table, a fact which did not appear to disturb them at all, but which made me feel restless.

"Don't you hate that new wood amongst all your beautiful old oak?" I questioned.

"Never thought of it," said the farmer.

"It'll take a lot of beeswax to get it right," said his wife. It will.

"Why didn't you get it fitted into one of your old pieces?" said I. They stared.

I could see at least three pieces of furniture in that room alone which could have been converted into cabinets with hardly any trouble at all.



Old Spanish Inlaid Box.

In the corner opposite me was an old oak cupboard full (I was informed) of home-made chutney, jam, and stiff damson cheese. It would have been perfect for their four-valve set, and I suggested they should have it transferred later on.

On another side of the room was the old oak medicine chest, and this again would have been a splendid little box for a set with the fronts of the drawers made into a door.

The old oak box-like structure on legs engaged my attention for some time, for though I was well aware it would be good for wireless, I had no idea of its former mission in life.

Its companion picture elucidates this and reminds one of the delicious home-made white, brown, and currant bread that is still made by the farmer's wife, though the old mixing trough has now become a species of sideboard. H. NELSON.

(To be continued).

THE Aberdeen wireless programme has been received in Burma. The Burmese need not get excited. That's about all they will receive from the Aberdonians.

"STATIONITIS"—DO YOU SUFFER FROM IT?

IT would appear that the English listener-in has at last contracted a wireless malady comparable with the "distance itch" of the American wireless "fan." This new English wireless ailment takes the form of a series of attempts to pick up a large number of broadcasting stations in as short an interval of time as possible. Some extraordinary claims have been made by listeners-in who have apparently got this disease, "stationitis," in its worst form.

Annoying Twiddling

Personally I have an utter lack of sympathy for this kind of thing. I do not see how it can do wireless anything but harm. There is nothing more annoying to the casual listener-in than to be present when somebody is twiddling knobs the whole time and changing so rapidly from one station to another that it is impossible

to enjoy one single item from the broadcasting programme.

The other evening I was testing a new receiver on the higher wavelengths, and I did want to change about a little, but a friend came in and heard part of the Chelmsford programme. He requested me to keep on with that programme for a quarter of an hour, after which he would leave me to my work. The quarter of an hour became half an hour, and still my friend remained. The half-hour became an hour, and in the end it was nearly two hours before my friend left me and Chelmsford.

Another Convert?

By the time he had gone there were very few minutes left for me to go on with my tests, but I did not mind in the least. I felt sure that my friend had enjoyed the re-

ception, and I am fairly certain that he will go in for a wireless set before long. I feel equally certain that he would not have stayed with me many minutes if I had tried to pick up seven stations in as many seconds.

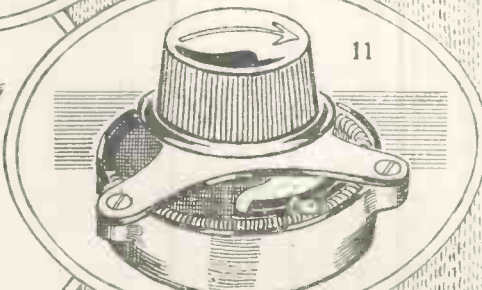
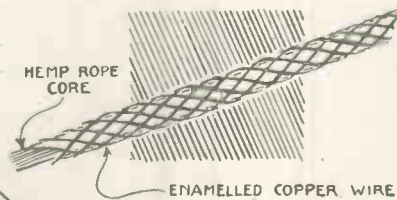
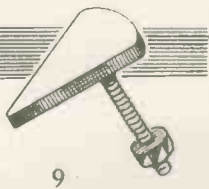
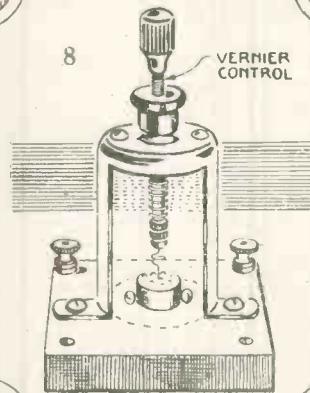
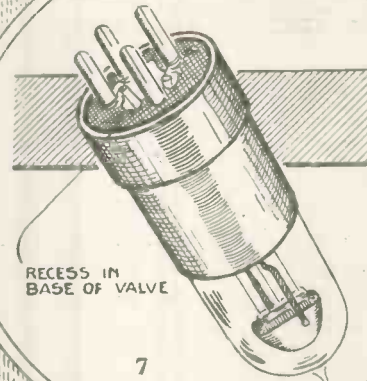
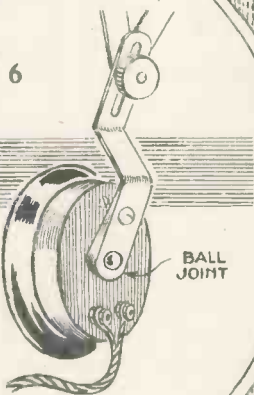
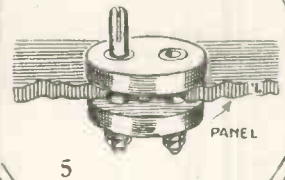
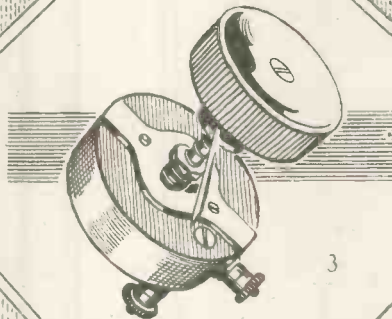
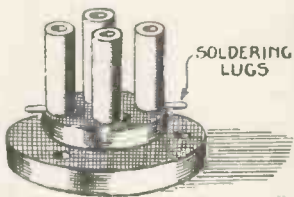
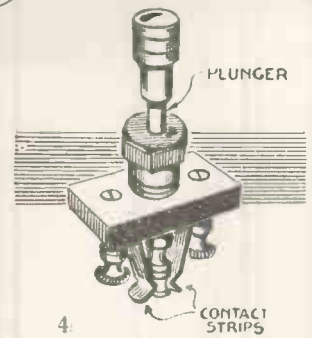
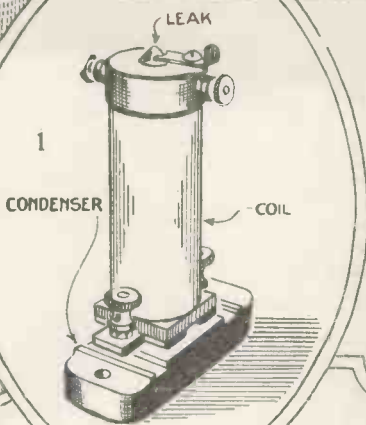
AERIAL.

A DEBATE has been broadcast on the proposition "That the Eastern woman is more successful in married life than her Western sister." Impossible, says Mr. Henpeck.

GRAMOPHONE manufacturers say that the wireless boom has created activity in their industry. But while the gramophone is making records wireless is breaking them.

THE German workers are enjoying wireless concerts during the dinner hour. The favourite song on the programme, we understand, is "We ain't gonna pay no more."

NOVELTIES AND NEW APPARATUS



1.—Radio Communication Co.'s resistance-capacity coupling unit. 2.—Board-mounting valve holder by Peto-Scott. 3.—Shipton grid leak. 4.—Plunger-type switch made by A. F. Bulgin. 5.—Panel-mounting coil socket. 6.—Ball and socket joint of Ediswan phones. 7.—Low-capacity base of Cossor valve. 8.—Hunt crystal detector. 9.—Dial indicator made by A. F. Bulgin. 10.—Sparta aerial wire (sixteen strands). 11.—Economic Electric filament resistance with fine adjustment.



With The Lights Down

A Story by FRANCIS ROBERTS

Illustrated by CHARLES CROMBIE

THE hardest man on the Stock Exchange," John Sholl was called for years and years, and people swore he hadn't a soft spot in him. Then suddenly he appeared at his office with a home-made crystal set, and was seen meekly accepting correction from a junior clerk. The hobby developed into a craze; he longed to associate his name with some great development, and paid large sums to any inventor who could interest him.

He would not acquire any commercial interest in wireless, though. It represented his one relaxation, the poetry of his existence, and he would not defile it with business.

One day he received a curious letter.

"I have made a discovery," it ran, "which will revolutionise wireless. It amplifies signals to an incredible extent. I cannot, however, develop it without money, and my capital is exhausted. Would you care to advance, say, ten thousand pounds? My laboratory is at 67, Southwark Mews, and I will arrange a demonstration at any time."

"Make an appointment with him

for to-night," Sholl told his secretary. "This sounds interesting."

"But, sir," the young man exclaimed, "you don't really believe him? The fellow is evidently the clumsiest of swindlers. Look at the sum of money he demands!"

"That may be," said John Sholl, "but his statement may be true, and anyway, don't grudge me my one pleasure! It keeps me human. Heaven knows I can afford to waste a few thousands!"

He took with him to Southwark only one personal friend. John Margetson, the writer of the letter, showed them his laboratory. In one corner stood a wireless cabinet surmounted by a loud-speaker with a curious bulb-like base, in which, he said, was his secret device.

"Can we inspect it?" asked Sholl.

"I should prefer to demonstrate its effects first," replied the inventor. "It is in a rough experimental state, and I don't want its appearance to prejudice you. Will you trust me, and wait till I have spent more time on it?—and money," he added significantly.

"Yes," agreed Sholl after a pause. "Show us what it can do, then. Get me 2 L O to start with."

Margetson laughed heartily.

"It would deafen you," he answered, "at my very lowest power. I will try Radio-Iberica, and even so I must cut down the magnification to its minimum. Listen!"

A voice began to speak in Spanish. Extraordinarily melodious and natural, it seemed to be in the very room.

"It is wonderful!" exclaimed Sholl. "Miraculous!" He shook the inventor warmly by the hand. "And now," he continued, "can we try some farther station?"

Margetson was flushed with evident pleasure.

"Yes," he answered; "by an extraordinary coincidence I think I can give you something very far indeed, something that will prove the value of my discovery beyond a doubt. Last evening I received a curious and very faint message, obviously given at a great distance by a very inferior transmitting station, which would be quite inaudible without my amplifier. I

jotted it down as I heard it, for it was remarkable. Here it is."

He handed Sholl a memorandum sheet, on which was written:

"I cannot return alive. My stores are almost gone. All dead but me. Poisoned arrows. I've no hope of being heard, but this keeps my mind occupied and saves me from madness. I want to die game. We found it—El Dorado."

"There was more of it," said Margetson, "but it was too incoherent to record. But I made out a statement that the transmission would be continued later."

"Who was it?" asked Sholl's companion.

"I feel sure," replied Margetson, "although of course I have no proof, that it was Hardy Lang, the explorer, who started for South America a year ago. His party was equipped with wireless apparatus, and I expect you have seen a statement in the press that the expedition has been lost sight of."

Sholl and his friend exchanged glances. "I say, old man," said the latter in his easy drawling voice, "perhaps he will tell us where El Dorado is—you could finance a party and get its treasures."

"No thanks," said John Sholl drily, "I'm sane enough except where wireless is concerned."

Margetson had been listening to them impatiently, and as soon as they had finished he returned to his apparatus and began to adjust it. Fragments of extraordinary sounds filled the ears of the listeners; half-sentences in unknown languages, songs in voices incredibly remote. There was a short silence, and then across it an unmistakable and

heartrending sound, a human groan.

"This is it!" said Margetson in a satisfied tone. "With your permission I will turn down the lights. It will seem nearer." So they sat there in eerie semi-darkness, and by and by a voice spoke to them. It was a voice unutterably tired, unutterably despairing; a voice on the borderland of death as well as that of savagery. They had an illusion of tropical trees and dark men, hidden among the exotic shrubs, who drew slowly nearer.

"The game is up," said the voice, "they're on me now. They shan't get me, though. I've seen too many bodies that they've finished with. Thank God I've got one bullet left. I'd like to have told the way to El Dorado, but I can't—no time. Good-bye, whoever's listening. I'm Hardy Lang. Rule Britannia and all that!" he laughed hysterically, and said again, "Good-bye!"

There was an instant's silence, then a deep sigh . . . and a shot.

The next moment Sholl put up the lights, and he and his friend burst into a simultaneous roar of laughter.

"An exquisite bit of acting!" said the millionaire. "Where is your friend? A street or two away,

or merely behind the partition? He's a fine actor—I must really find him a job in the West End!"

Margetson shrank back in dismay. "How did you guess?" he stammered . . . "how?"

"I don't know how you faked the rest of the transmission," Sholl continued, disregarding him, "but Jove, that fellow's a genius! He nearly made me weep."

Margetson had now collected himself. "It was a bold game," he admitted, "but I thought we'd win through. How did you know?"

"You sound almost as dolorous as the defunct explorer!" said Sholl's friend.

"Leave me to Mr. Sholl," said Margetson sullenly. "It's nothing to do with you . . . who are you, anyway?"

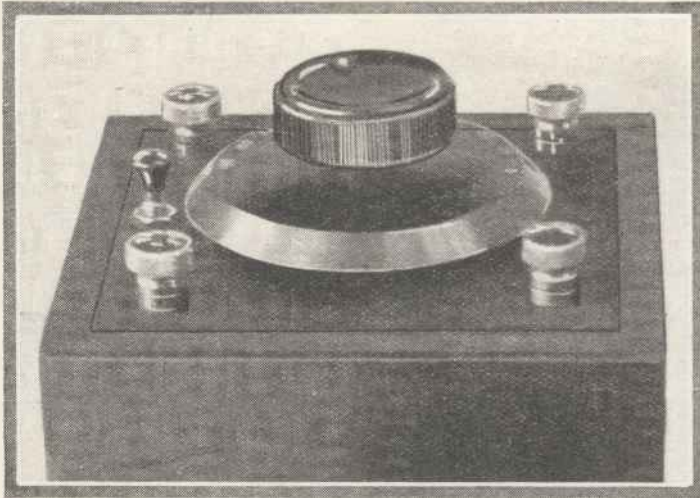
Before he heard it, he divined the answer with a lightning inspiration:

"Hardy Lang!"

Old John Sholl ejaculated between gasps, "You're just one day behind the news! He landed in England this morning!"



"It is wonderful!" exclaimed Sholl, "Miraculous!"



Top View of Panel.

A Crystal Set with Enclosed Detector A Special Design

NEAT in appearance, the crystal set described in this article will be found to give excellent results and may be used for receiving either the ordinary broadcast wavelengths or the high-power station's (5 X X) transmissions.

Under-panel Mounting

The enclosed detector—the new R.I.—is mounted beneath the panel so that only the control knob is seen when the set is in use. An advantage in mounting the detector below the panel is that it is entirely out of the way of dust, moisture, etc.

For making the set the following components are required:

Ebonite panel 4 in. by 4 in. by $\frac{3}{16}$ in. thick.

1 .0005 microfarad variable condenser, preferably with one-hole fixing.

4 terminals.

1 crystal detector.

1 basket coil.

In the original set Belling-lee indicating terminals were used, and these gave the set a neat appearance. The panel is drilled as shown in Fig. 1. Fitting the detector is a simple operation, one hole $\frac{3}{16}$ in. diameter, being all that is needed.

After the trigger knob of the detector

and the terminal head at the trigger end have been removed, the instrument is inserted into the hole and secured, not by the original terminal head, but by a 2 B.A. locknut.

The nuts are changed so that the terminal head will not allow any free movement of the trigger when the $\frac{3}{16}$ in. panel is interposed.

Basket Coil

A basket coil $5\frac{1}{2}$ in. in diameter and wound with 50 turns of No. 26 D.C.C. copper wire comprises the inductance. The coil is held in

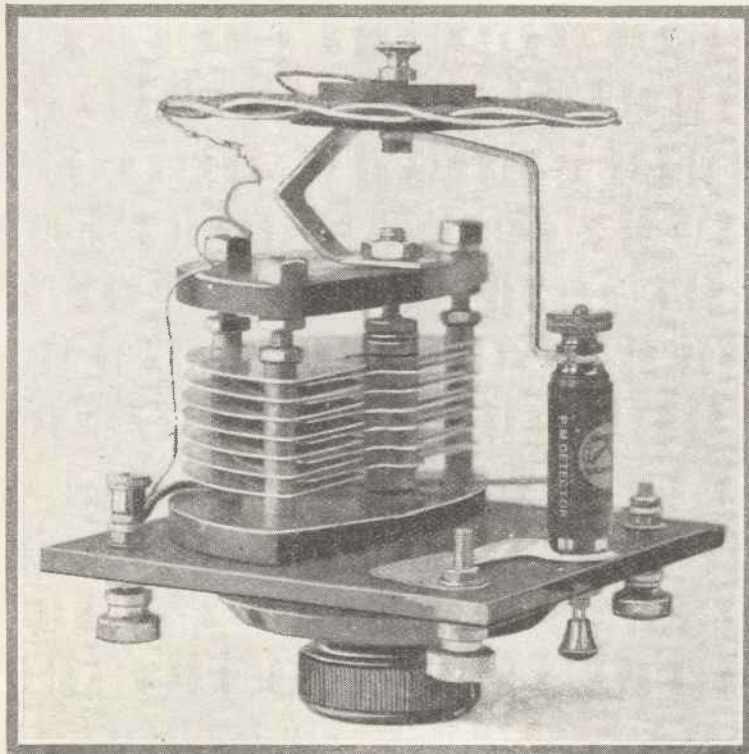
position by means of a 4 B.A. screw fixed in a brass angle bracket which is itself mounted on the lower end plate of the variable condenser as shown in Fig. 2.

For the reception of the high-wavelength station on 1,600 metres three 50-turn coils should be mounted together with a disc of thin shellacked cardboard between them. Care must be taken to connect the coils so that the windings are all in the same direction.

Fig. 3 shows the wiring up of the set which is carried out with No.

18 or No. 20 tinned copper wire. If the set is required for receiving stations of higher wavelength than Chelmsford, the condenser should be wired up in the position shown by the dotted lines. In this case the tuning inductance will be three 50-turn basket coils as mentioned.

Owing to the small size of the panel and the mounting fillets of the containing box, the outside diameter of the coil or coils must not exceed $3\frac{1}{2}$ in., or difficulty will be experienced in getting the components into the box (Fig. 4). The inside depth should be sufficient to accommodate the parts without fouling the bottom. R. N. W



View showing Positions of Components.

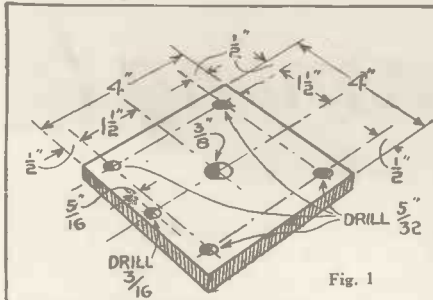


Fig. 1.—Layout of Panel.

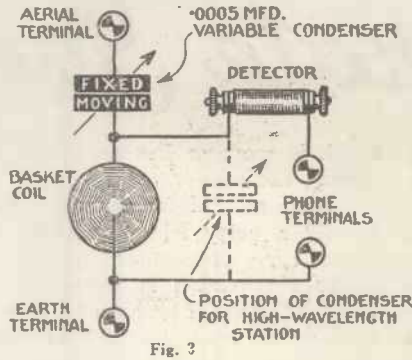


Fig. 3.—Wiring Diagram.

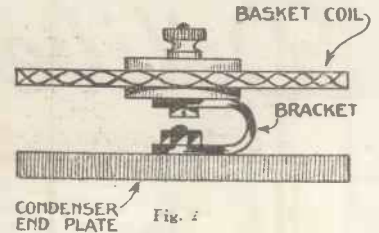


Fig. 2.—Details of Coil Mounting.

Fig. 4.—Cabinet.

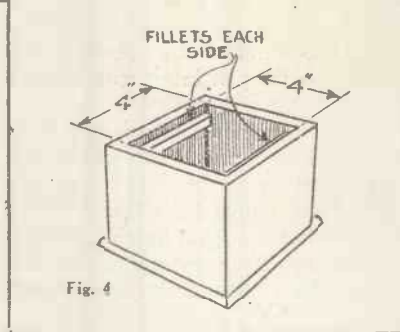


Fig. 4

If a little extra trouble is not objected to signal strength may be appreciably increased by fitting a special low-loss coil instead of the commercial type of basket coil wound with No. 26 or 28 d.c.c. wire.

Some No. 20 d.c.c. copper wire should be obtained—a ¼-lb. reel will be sufficient for tuning to the ordinary broadcast wavelengths — together with two cardboard or fibre basket-coil formers of the type containing 11 slots. These formers must, of course, be of a diameter which will not be too large to go into the containing box of the set, while their thickness must be sufficient to stand the winding strain.

With the .0005 microfarad tuning condenser in series with the aerial as shown in the thick lines in the circuit diagram Fig. 3, a total of approximately 60 turns will be required; using the No. 20-gauge wire, however, it will be found impossible to get the requisite number of turns if the ordinary slot-to-slot method of winding is employed.

If what is known as the duplex method is used—that is, winding through every second slot—it will be found possible to get 30 turns on each former.

No shellac or other binding medium should be applied, and after completing the two baskets they should be connected together so that the windings are in the same direction.

This is a most important point as, if the coils are connected so that the windings oppose each other, the inductance of the combined coils will be too small to tune to the required wavelength.

When mounting the tuning inductances in position on the set an ebonite washer should preferably be placed in between the two coil formers in order that the windings will not rest directly upon each other—a washer about ½ in. deep will be found very suitable and may con-

veniently be cut from a piece of ½-in. bore ebonite tubing. R.N.W.

R.I. ENCLOSED DETECTOR

TO those who intend to build the crystal set described on these pages some further particulars of the new R.I. enclosed detector may be of interest.

The external appearance of the detector denotes an excellent finish, quite in keeping with the usual R.I. standard. All brass parts are lacquered.

The overall length is 2½ in., and its diameter is just ½ in. This is a great convenience where there is little room on the panel (especially in the case of reflex sets with crystal detectors). This detector takes up no more room than an ordinary terminal.

The rectifying mineral is enclosed in a small ebonite tube and a small knob at the top provides the adjustment; in fact, the whole thing could be easily mistaken for a variable grid leak.

On test, results were quite up to our standard crystal detector (cat-whisker type), and it could be tapped hard with a screwdriver without affecting the adjustment.

“RIPPLES”

WE are in danger of becoming a nation of mere listeners, says a well-known thinker. This total disregard of the part played by our women in the life of the nation is a gross slander.

A WINK has been transmitted on the wireless. If the B.B.C. intend to make this a permanent feature of their programmes we can now understand why they have moved their transmitting station farther up the West End.

Moscow broadcasts a speech once a month. This is one thing that our politicians can learn from Russia. ECONOMISTS say that we are importing more manufactures from America than we used to. And more atmospherics!

GLASS is an excellent insulator, says a wireless writer. This encourages us to believe that Scotsmen must go through life in constant fear of electrocution.

YESTERDAY I picked up Havana, writes a boastful correspondent to the press. Out of the gutter?

A PRINTER'S error makes a northern newspaper speak of the “pints” on a crystal. The artful compositor must have known that crystal is closely allied with quartz.

WIRELESS has led to a reduction of drinking in France. This means that the French will be able to spare some of their hops to send over here, where they will be useful unless our brewers have forgotten the recipe.

AGEN, a French station, is experiencing a lot of jamming. Well, if they are to succeed, they must try try, try agen.

Deliberate Jamming!

OF all the questions exercising the minds of wireless experts and amateurs at the moment that of "jamming" is undoubtedly the most serious.

A very small amount of consideration will make it obvious that the science of wireless has reached a stage where only the difficulty of obtaining clear reception over distances prevents commercial telephony proving a success.

This question of jamming is the chief reason why morse transmissions still retain their supremacy over telephony, since a code message may be read through distortion and interference that would render the reception of speech farcical.

Different Forms of Jamming

Jamming, of course, takes many forms. There is jamming by "static"; or atmospheric interference caused by electrical discharges in the ether which may not be eliminated from the transmitted wave by any means yet known to science.

There is jamming by another station tuned approximately to the same wavelength as the station we wish to receive; or interference by a harmonic of another station. This latter form of jamming is a difficult one to control since every station can be heard on so many fractions of its true wavelength that the task of arranging wavelengths so that interference is at a minimum is not easy.

Then there is jamming, operative over a local area, by badly handled receivers. This type of nuisance is again on the increase, and there is no obvious remedy that can be put into practice at present.

Finally we come to the worst form of interference of all—deliberate jamming.

Deliberate Jamming

The number of people possessing wireless receivers who still show their dislike of the B.B.C. programmes by oscillating and thereby ruining the reception of everyone else within a wide area is, unfortunately, large. And amateur transmitters occasionally heterodyne concert programmes by a continuous wave transmission

which is more or less successful in ruining the music.

But after all this form of vandalism is only a petty felony indulged in by a type of mental degenerate whose suppression is not difficult. For the honour of broadcast "fans" as a whole let it be said that the class who cause this annoyance is limited to a very small minority indeed of wireless enthusiasts. And there is a type of interference which is much worse than this.

Wireless experimenters will have noticed how many times serious and important experimental transmissions and relays have been ruined by interference from outside stations which, by its very characteristics, cannot be anything else but deliberate.

On the Saturday night of the last of the Transatlantic Tests when the B.B.C. were relaying from the Savoy Hotel, the part of the programme transmitted immediately after eleven o'clock was entirely spoiled by a C.W. transmitter whose morse signals were so loud as to almost drown the B.B.C. programme.

This transmitter was using a set so flatly tuned that he also blocked out any signals which might have been received on a wave of sixty odd metres. Had the B.B.C. attempted to relay K D K A that night, as they might have been expected to do, they would have failed. K D K A was almost inaudible through that interference.

Here we have a very obviously deliberate attempt to ruin an experiment which is of the greatest international importance.

Capt. Eckersley Complains

Earlier on during the week when the B.B.C. did actually relay K D K A they were subject to a very similar sort of interference throughout the experiment. At a later date a howling receiver provoked Capt. Eckersley to most sarcastic comments, which, however, failed to stop the nuisance. Listeners must have remarked the fact that each of Capt. Eckersley's comments was followed immediately by a particularly devilish screech from the oscillator.

It is impossible to find any excuse

for this sort of thing, and there is no doubt that the B.B.C. intend to take energetic steps to put a stop to it in the interests of the listening public generally.

Then again, during the wireless test week, it was obvious that the transmissions from certain American stations were deliberately prevented from reaching England by the simple means of superimposing a C.W. howl on the exact wavelength. The fact that this jamming was quite deliberate is proved, in my opinion, by the fact that the perpetrators of the "howls" did not even take the trouble to modulate their carriers and so counterfeit the appearance of a genuine station as they might easily have done.

Serious Interference

This deliberate interference with long-distance work and consequent baffling of experiments of universal importance to humanity has been gradually getting more serious until it has reached a stage where it is capable of completely ruining internationally laid plans.

It was a curious feature of the recent relay of Brussels from 5 X X that the reception of the Belgian station on that evening was very unusually bad and "mushed." Immediately 5 X X ceased to relay direct reception improved materially.

No harmonic of 5 X X—though one comes near to it—interferes with Brussels.

The One Point

The one point, of really startling moment, which arises out of this matter of deliberate jamming is the question of its origin. Difficult though it is to believe, I personally have been forced to consider the possibility that some of this interference, especially during wireless week, is of a nature which precludes the possibility of its being caused by amateurs.

The howls that were heard on the wavelengths of certain well-known American stations during the tests must have struck anyone who heard them as too powerful by far to have emanated from an amateur transmitter.

(Continued on page 295)



It was bound to come!

Always we are told there is some new feature of modern life that is wantonly corrupting the juvenile mind.

Once it was penny-dreadfuls; then roller-skates had a bitter turn, till the evils of the cinema figured in every children's court and ousted them. Now—of course—it is broadcasting.

Loud are the wails from scholastic quarters. One headmaster notices a marked falling off in the standard and quantity of his pupils' homework, due, he asserts, to the evening temptation to listen-in instead of to toil over algebra and French. Someone else sounds a grave warning about the children's health, because they sit up so late to hear the B.B.C. programmes all through that they arrive at school jaded and inattentive in the morning.

As recently as last summer this "suffering from lack of sleep" complaint, by the way, was attributed to the pernicious (according to school authorities) Summer Time.

Poor kiddies! they're always catching it somewhere. Whereas, supposing for a moment that all these grave allegations against listening-in are true, it isn't the fault of broadcasting at all. Since the days of Cain and Abel there's been a persistent plot among all children to stay up as late as they possibly can; the juveniles wouldn't be juvenile if they didn't want to emulate Daddy and Mum as far as possible.

But Tommy proposes and Mother disposes—or ought to. There are

many quite humane ways of driving a reluctant child to bed, let me inform the schoolmasters, if parents will use them.

Myself, I greatly admire the ingenuity of successive generations of small people in always having the most modern excuse—such as listening-in—to put up for consideration.

As for homework suffering, that's one more reason to add to the many cogent ones that already exist for abolishing homework once and for ever. Teachers, please think it over!

Those Domiciliary Visits

IF—and please notice that I put that IF in capitals, to draw attention to its presence in this sentence—the P.M.G. carries out his alarming threat of using his legal powers to search our houses for wireless pirates and their equipment (a power that he has always had, but which the public has overlooked until recently), we may moan platitudes about an Englishman's castle. But what a fine opportunity for fresh trade in wireless commercial circles!

Turning over the latest issue of THE WIRELESS MAGAZINE, we shall find our eyes riveted to such advertisements as this:

"Finest Unlicensed Sets Obtainable. Suited in every way for fine transmission, but disappear completely when domiciliary search is made. Aerial pulls down the chimney while police are knocking at the door, and set is instantaneously

folded into special sooty box undetectable when stored in chimney. Gas fire quite unaffected and gives rise to no suspicion. For houses where coal is burnt, send for details of our special mock-cinder covered hiding box."

In other cases the aerial will camouflage itself as a clothes line, with the boys' shirts drying across it, when danger is scented. And the vogue for secret rooms (but this time they will only need to be big enough for the most expensive set) will be as great as it was in the good old days of the Commonwealth.

If you're building your own house—so many are nowadays, luckily—remember how well worth while it is to spend ten pounds on a secret hiding-place in order to save ten shillings a year!

Studio Breakdowns

Who would be an announcer when one of those occasional hitches in transmission or programme occurs suddenly at a station? For myself, I fail to think of any more nerve-racking task than being forced, at a moment's notice, to improvise items with any resources to hand.

With a number of entertainers present, the gap can be bridged by extra items from some of them; but sometimes a breakdown occurs under more awkward circumstances. I remember once arriving at 2 L O to give a ten-minute item on an afternoon programme, the bulk of which should have been filled with orchestral music relayed from a cinema.

(Continued on page 333)

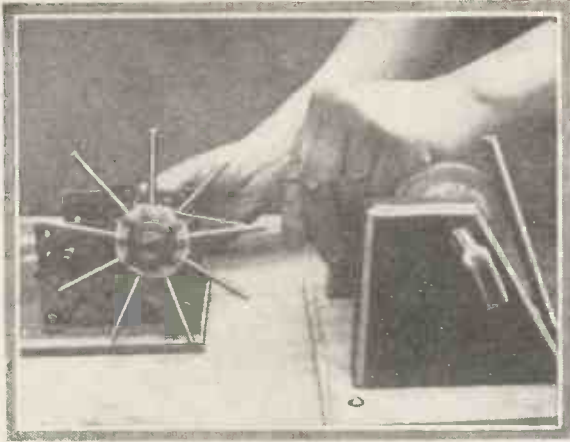


Fig. 18.—Winding Machine in Use.

Practical Coil Winding

MAKING A SIMPLE WINDING MACHINE *for* BASKET COILS.

IN making a simple winding machine, such as illustrated in the photographs and sketches (Figs. 16 and 17), the chief item would appear to be the ratio of gearing. A ratio of nine to one does not produce too low a speed at the spider. The "machines" illustrated are made up of ordinary Meccano parts temporarily confiscated from a set belonging to a junior member of the family. The uprights could, of course, have been made out of wood just as easily, and if Meccano parts are "not in stock" at home and have to be purchased there is no need to bother with the pierced plates of the apparatus shown in the pictures. Fig. 18 shows the machine in use.

Worm Gear

Another point is that only two wheels need be purchased if the standard worm gear is used in preference to the double train of spur wheels. This scheme (Fig. 17) is also a desirable one in that it gives a lower gear ratio as well as being a cheaper proposition, where new parts have to be obtained.

The general success of this winder

led to an experiment with a fully automatic winder, also largely made up of Meccano gears. Before this was done an improved spider centre was made on a lathe which was available. In view of this and other spoke formers being employed on

wood or fibre which may be left in the coil permanently as a means of supporting the coil are employed, a split boss may be used. This design of former is illustrated in the sketch (Fig. 20), and is shown in the photographs of the winders (Figs. 16 and

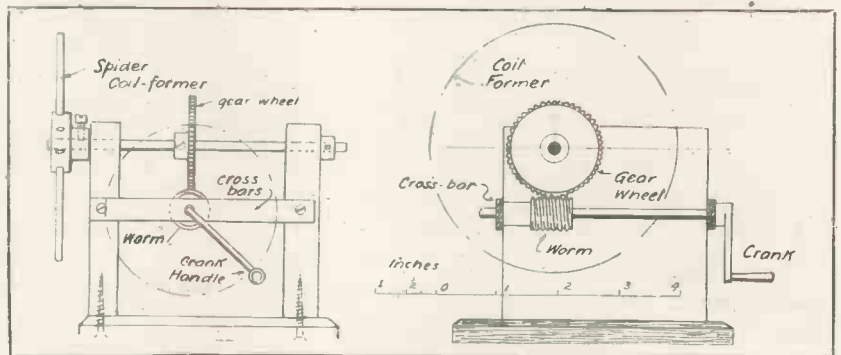


Fig. 17.—End and Side Elevation of Winding Machine.

various devices made up of the above mentioned constructional-toy components, the bore of the spindle hole of these and other formers was standardised at $\frac{3}{8}$ in. This is perhaps not the best size from the point of view of winder design, but it is convenient to adopt a size which is universal to such gear wheels and fitments.

It would be better, under other circumstances, to make shafts $\frac{1}{4}$ in. in diameter, as there is then a lesser tendency for the parts (i.e. gears and spider bosses) to slip round on the shafts. The set screws securing them grip much better on the larger diameter of shaft. Securing the pegs of a former into the holes in the boss by friction or by screwing has already been referred to. Where, as will be suggested later, spokes of

18). It consists of a boss drilled and set-screwed to fit a $\frac{3}{8}$ -in. shaft, with a screwed spigot in front and a milled nut. A clamping washer is fitted between the nut and the face of the boss. After the parts have been made they are placed together and drilled out for the rods exactly on the line of the slit. In this way two half-holes or radial grooves for the spokes or pegs are formed in the boss and the clamping washer.

Winding Boss with Set Screws

This style of boss is perhaps not so good as an ordinary one when used with metal spokes as with wood or fibre pegs, as there is little or no give in steel or brass. An equal degree of gripping on all spokes is therefore difficult to obtain unless a paper washer is placed between the pegs and the clamping washer. Of course, it would be possible to arrange set screws at the back of the

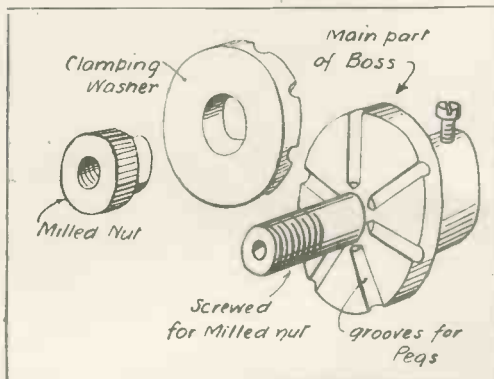


Fig. 21.—Split Boss Dismantled.

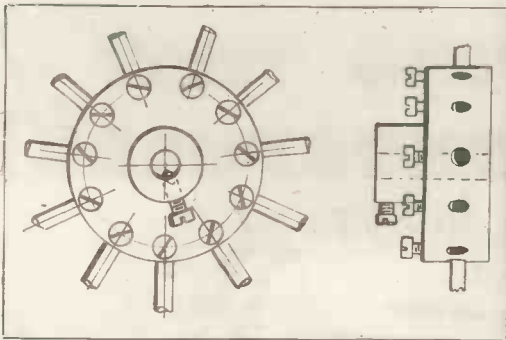


Fig. 19.—Plain Boss with Set Screws.

boss similar to those often used in an ordinary solid boss. Fig. 19 shows a plain boss in which the metal spokes are secured by separate set screws.

This method allows rods of slightly varying size to be used for pegs and successfully prevents the annoyance occasioned when a peg of a spider former becomes loose or falls out during the operation of winding a coil.

Split Boss

The split type of spider former was more or less specially designed for a method of supporting a basket coil on wooden or fibre spokes. This should prove quite a satisfactory arrangement where a single basket coil with 15 or 19 alternations per layer is desired. As a rule, such coils are wound on fibre disc formers, and owing to the larger size of central blank spacing require big clamping washers to secure them to the standard holder.

The reduction in the amount of dielectric material near the coil is for electrical reasons considered desirable.



Fig. 23.—Back View of Coil.

With the split boss (see Figs. 20 and 21), the coil complete with the spokes may be lifted out bodily by undoing the clamping washer. A small nine-spoke coil was wound on a former made as in Fig. 20 in quite a few minutes with match-stick supports and then lifted out and put into the holder without withdrawing the spokes. The supports rendered the coil quite rigid, and only the smallest modicum

of shellac varnish was necessary to stiffen the wires.

Two views of a spoke-supported coil are shown in Figs. 22 and 23.

In such cases where a tape-covered basket coil of rather large



Fig. 22.—Front View of Coil.

dimensions is required, and to increase the rigidity of the structure, 17 or 19 spokes are employed in the former, the pegs can be removed when the coil has been wound. In place of the pegs, fibre strips of a width equal to the diameter of the pegs may be inserted in the open portion of the formation.

In doing this do not remove all the pegs at once. Take out one at a time and put in a strip, fitting the same as tightly as possible. The strips can be a little longer than absolutely necessary, and slightly tapered in width. The excess of length can then be cut off. H. G.

(To be continued)

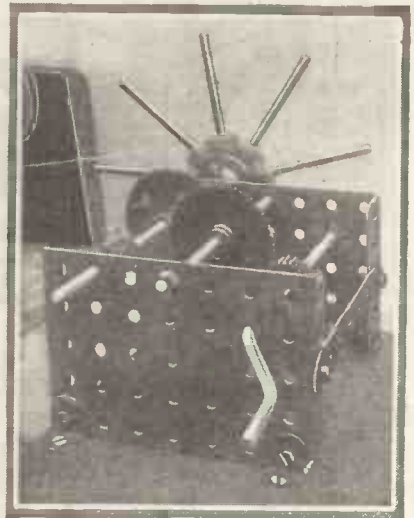


Fig. 16.—Winding Machine.

Deliberate Jamming

(Continued from page 292)

Some Continental stations, as well as British stations, were also subject to interference during their attempts to reach the States, La Petite Parisienne in particular. Yet it seems, from reliable information at my disposal, that there was no interference in America.

Organised Attempts

However one looks at it, the whole thing remains a mystery. Suggestions could, possibly, be made. But at the present stage it would be inadvisable.

It is obvious, I think, that organised attempts are being made to block serious experiments in the relaying and reception of long-distance telephony. It is equally obvious that some of these attempts, at any rate, are too successful to be blamed upon the amateur alone. On certain occasions I am convinced that very high-powered transmitters have been at work. E. C. D.

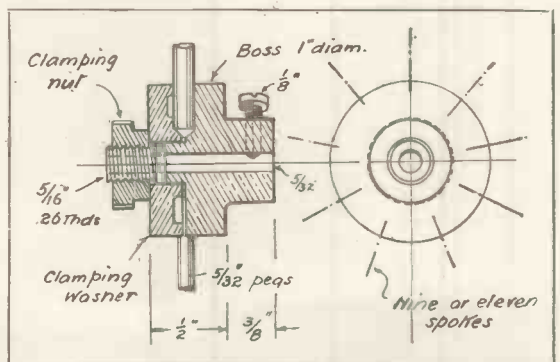


Fig. 20.—Details of Split Boss.

GETTING THAT ATMOSPHERE!

BY
W. MASON HIRST



(Illustrated by Will Owen.)

IN order that there may be no misunderstanding let me say at once that I write of atmosphere figuratively and not literally. All atmospheres—there are many varieties—are of interest to the wireless enthusiast, but the atmosphere I have made a special study of is that which a dictionary (Cassell's) describes as: "Any pervading in-

tellectual, moral, religious, or other influence by which one is surrounded; as in the expression, 'He lives in an atmosphere of suspicion.'"

Overdoing It

Figurative atmosphere is no new thing. We have it in the holly and mistletoe with which we decorate our homes at Christmas-time, in the

corn and fruit at our harvest thanksgivings, in the burning of incense at mystery plays, and in many other ways. Since the advent of broadcasting there is a grave danger of overdoing this atmosphere business.

If a stop is not put to the ever-growing custom we shall have firms starting business as atmosphere producers and suppliers of atmospheric accessories, and the cost of our wireless hobby will be increased.

With a little thought and ingenuity suitable atmospheres—if you really want them—may be produced at home, and at a small cost, as I hope to prove.

Mine Disaster

The first atmosphere we were asked to produce—now some months ago—was when we were given a very realistic description of a mine disaster. The "turn" included explosions and heartrending cries, and in order to make the affair as realistic as possible, and the distress of the entrapped miners more harrowing, we were asked to turn out all the lights and sit in darkness. Those of us who did as requested are not likely to forget it.

The second official dose of atmosphere was prescribed for us last Christmas Eve, or thereabouts, when we were taken through the city of Canton. To get the proper Oriental effect on this occasion, we were asked to turn out all the lights, light up



"Its proper sulphuretted or Venetian-like atmosphere."

paper Chinese lanterns, and burn a little incense.

We had neither paper lanterns nor incense at our house, so made shift with cups of China tea and exploding a few Chinese crackers, but the experiment was not a success.

My neighbour—a perfect demon for atmosphere—was more successful. He purchased a picture of a Chinese pavilion (he hadn't time to build one) to gaze at during the broadcasting, and sat with a tube of Chinese white in each hand.

Niagara

We are promised (I very nearly wrote "threatened") the roar of Niagara by wireless, and when this item comes along I advise the bathroom as the listening-in salon, the blocking up of all sink and drain pipes and the turning on of all taps an hour or two before 2 L O starts. This should result in a good atmosphere.

For Canadian or Russian "tours" or songs, our comfortably warmed rooms are most unsuitable if the best atmospheric results are required.

Fairly Realistic!

On these occasions I advise a visit to the fishmonger and the purchase of large blocks of ice to serve as seats. These should be placed in a room with no fire, and with all the doors and windows open, when a fairly realistic atmosphere should result. The colder the night the more realistic will be the broadcast songs or "scenes."

Venice and Venetian songs can only be enjoyed in the atmosphere of canals. To secure this, obtain from the chemist some sulphuretted hydrogen or a solution of sodium sulphide and scent the room with it.

Gilbert and Sullivan

Gilbert and Sullivan's *Gondoliers*, for example, is good at all times, but those who hear it in its proper sulphuretted or Venetian-like atmosphere are unlikely ever to forget it.

The *Mikado* and other Japanese pieces are heard at their best in rooms decorated with wistaria blossoms, the listeners wearing Japanese silks, using Japanese paper fans, and sitting on japanned chairs.

If the aerial can be earthed in *terra japonica* (Japan earth or catechu) so much the better.

Desert or sheik songs and tales should be heard in a warm and very stuffy room. Hot and dry sand should be sprinkled down the neck and about the room, and if no mosquitoes are obtainable a good substitute may be found in the itching powder sold by vendors of jokes and tricks.

Fragrances

The more or less pleasing effluvium of a Bedouin encampment may be successfully imitated by burning old

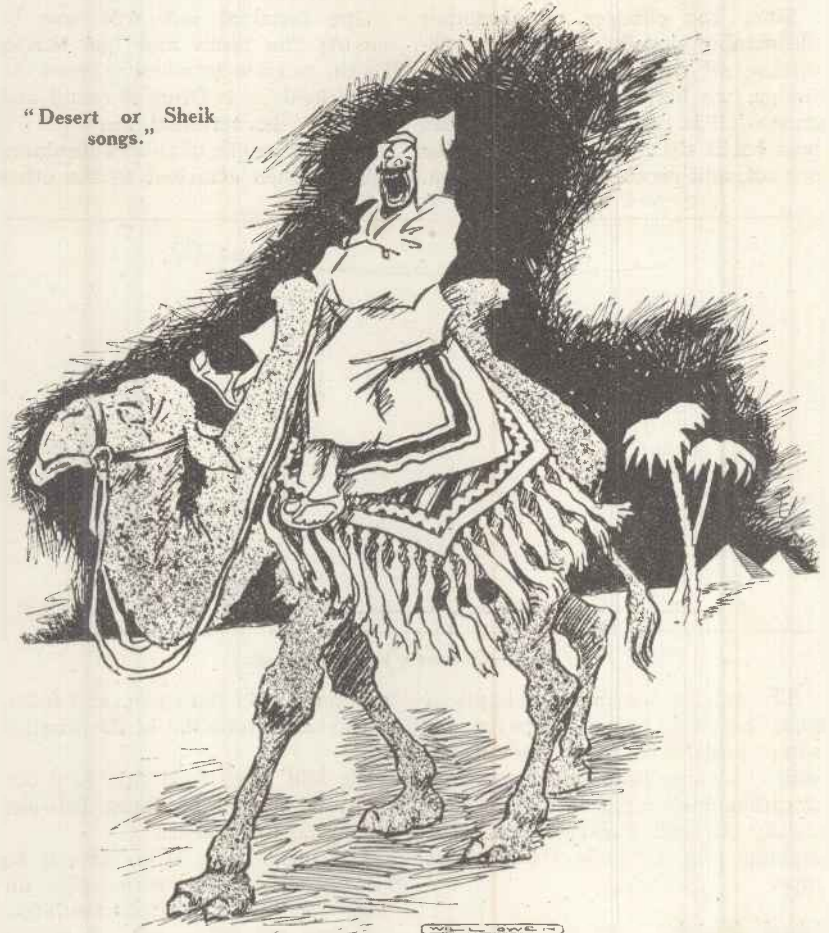
For American "scenes" and songs listeners should partake of chewing-gum, talk—when talking is allowed—through the nose, and wear horn-rimmed spectacles.

A few golden sovereigns might also be placed upon the table, and children should be allowed to rush about the room playing "Blind man's buff," in order to produce the characteristic American "hustle."

(N.B. The host should always keep a sharp eye on the sovereigns.)

The effect might be heightened

"Desert or Sheik songs."



boots (with rubber soles and heels attached) in a brazier, or in an ordinary fireplace having the chimney stopped up.

French love songs and gay Parisian life are best rendered in an atmosphere of patchouli, a perfume obtainable from most chemists, while the scent of French life *proper* may be truthfully rendered by frying onions and adding water to a little calcium carbide placed in a saucer.

The onion-acetylene atmosphere produced in this way is really most effective.

by having on the table some bags of flour priced at a ridiculously high figure.

Added Joys

These are but a few of the ideas I have worked out to add to the joys of listening-in.

I am now at work upon others, and will write about them in due course, feeling sure that they will be acceptable to those who desire to have broadcast items rendered as realistically as possible, with the right "atmosphere."

IN the last instalment much stress was laid upon the importance of having good aerial and earth connections. It has been said, and there is in it a good deal of truth, that of the two connections the earth is the more important, for whilst broadcast signals may be got with a poor aerial, and sometimes with no aerial at all, nothing worth listening to is ever received with an inferior earth.

Since the chances of obtaining pleasurable results from any receiving set depend upon these two things, we had better find out at once what is the best aerial and the best earth that we can arrange for our set, and proceed to rig them up.

Absolutely for the Novice!

so that only its ebonite sleeve touches the wooden casement.

One terminal nut will now be outside the room and one inside. To the outside terminal is fixed the aerial lead by twisting it round and screwing the terminal up.

A short length of rubber insulated cable is then attached to the other

of the series has to be tied to the top of the mast, or may preferably be arranged so that it may be hauled up there by rope and tackle, like a flag to a flagstaff.

Now for the second suspension point nearer the house. For this a similar chain of insulators is used, the wire of the aerial being passed through the last hole

of the first of them, and turned round a few times on itself. In that way the whole length of aerial and lead-in wire will be continuous right up to the lead-in tube, with neither twisted nor soldered joints; this arrangement is an advantage, though not an absolute necessity.

Common Type of Aerial

If the house stands well out in its own garden and has a high side wall, with perhaps a fairly tall chimney, the near end of the aerial wire may often be anchored to the side of the house itself, or to the side of the chimney stack, insulating it well with two or three insulators in series, as already described, and if possible preventing the lead-in wire from passing down close by the house wall (Fig. 1).

Where a wire might touch the wall of a house it should be held off by being passed through a reel insulator, the reel insulator being itself held in a stout iron or mild-steel wire loop on a long pointed peg. The point of the peg is well driven into a crevice of the stone or brickwork (Fig. 2).

Having described an aerial as we should like it to be, for the best reception of British broadcasting, we will now proceed to the "next-best"

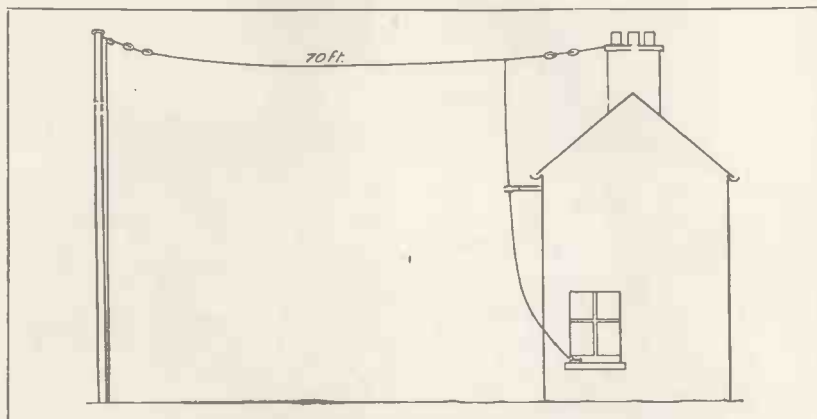


Fig. 1.—Common Type of Aerial.

The standard aerial is a hundred foot length of 7/22 gauge copper wire, either bare or enamelled, which means that seven strands of rather fine copper wire have been loosely twisted together to make a single proportionally stouter wire rope.

Ideal Aerial

The ideal is to get at least a 70-foot run of this wire suspended horizontally between masts at a height of 30 feet or so above ground level, the remaining thirty feet of the wire coming down to the house, where the end of it must be attached to a lead-in tube.

A lead-in tube is a tube of ebonite or compressed fibre through which runs a brass rod carrying a terminal nut at either end.

A hole may be made through the wood of the window sash, or the window may be slightly opened, and the lead-in tube pushed through

terminal inside the room, and taken to the aerial terminal of the wireless set.

We still have to decide how our aerial wire shall be slung between the supporting masts.

The usual way is to attach to the far end of the wire either an "egg" or "shell" pattern insulator.

Either pattern is made of glazed porcelain with two holes, one for the aerial wire and the other for a piece of light strong cord, such as hemp or ordinary blind cord.

In form, the porcelain is curved so that rain falling on to the insulator is not likely to make a serious short circuit between the wire and suspension cordage. Either kind of insulator costs only a few pence.

Though one insulator at each suspension point will do fairly well, it makes for safety and efficiency to string up two or three in series, one after the other, connecting on the extra ones by cord loops. The last

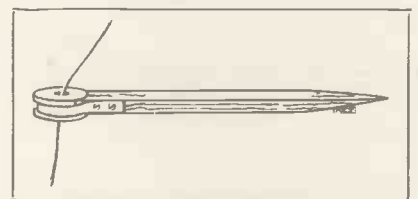
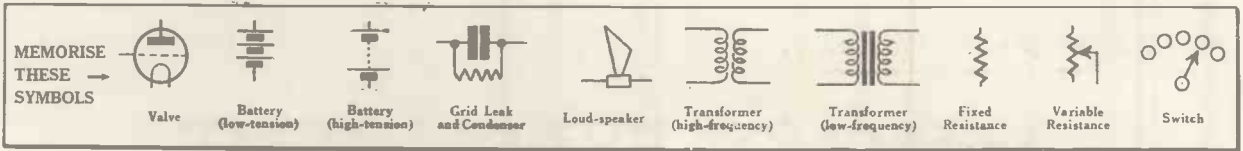


Fig. 2.—Wall Peg with Insulator.

aerial suitable for the man who has to make the best of things as they too often are.

Suppose the house has no large garden, but only a very small one, or just a backyard, and the aerial can, therefore, only have a clear run in its horizontal stretch of twenty



or thirty feet. Such an aerial will pick up enough wireless radiation to give passable results, providing the nearest broadcasting station is proportionately nearer, or providing the receiving set is proportionately stronger.

No Garden

If, however, the house has no garden at all, an aerial may be rigged up between masts on the roof, or between a mast and a chimney stack, or between two chimney stacks. The shorter the wire and the nearer it is to the roof the weaker will be any received signals

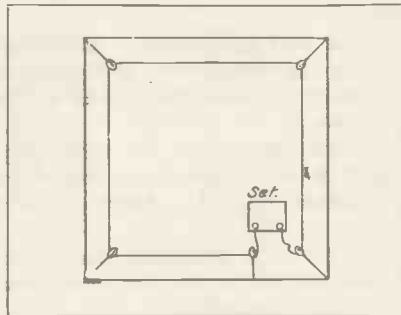


Fig. 5.—Aerial Round Room.

In Fig. 3 I have sketched a typically bad aerial. In this case the wire, besides being short and very close to the roof, has to double back on itself on the way to the lead-in tube, and pass close to the house wall from which it is only held away by a reel insulator.

Inferior as such a low aerial would be in any event, the doubling back on itself further decreases its effectiveness by almost half. Yet with a powerful receiving set, or with a broadcasting station not many miles away, even this aerial will pick up enough energy to give pleasurable broadcasting, so there is hope for most of us. Its range will, however, be short.

A word about double-wire and multi-wire aerials. For moderate

or long range reception on British broadcast wavelengths these are of no special advantage. For long-range reception they are generally a positive disadvantage, and since they are comparatively elaborate, with their spanning spars, and their extra weight places greater strain especially in windy weather upon the masts and masonry to which they may be anchored, they should be avoided.

When the wind swings a double-wire or multi-wire aerial, first one and then the other wire is brought nearer earth.

This brings about a waxing and waning in the power of the speech or music received.

"Fading"

Waxing and waning in the loudness of reception is called "fading." The particular sort of fading above described would be cured by unshipping one wire of the aerial and using a single fairly taut wire only.

There is another kind of fading not due to the aerial at all, but due to climatic conditions beyond our control.

Double-wire aerials may give slightly louder reception with crystal sets when quite near to a broadcasting station.

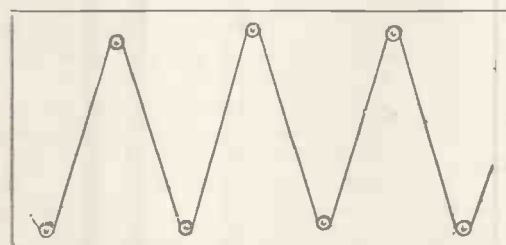


Fig. 4.—Attic Aerial.

Where a double-wire aerial is used, however, great care should be taken to ensure that each wire is of exactly the same length.

Flat dwellers may not be able to rig up an outdoor aerial at all.

Indoor aerials are not so efficient, but, like poor outdoor ones, are far better than nothing, and fairly satisfactory except for critical results at long range. One form of



Fig. 3.—Bad Aerial.

indoor aerial, especially suitable for erection in an attic under the roof of a house, can be arranged by attaching insulators along two opposite walls, near the ceiling, and at a distance apart of 3 feet or so, and running the aerial wire through their free holes in a continuous zigzag fashion (see Fig. 4).

A less ostentatious form of the same kind of aerial, though not so good, is far more suitable for a sitting-room in a flat, or suite of apartments. Here the insulators are attached to cords about 6 inches long, one cord and insulator being fixed at each corner of the room, well above the picture rail.

The aerial wire will have to be threaded through all four insulators, after which one end of the wire must be attached to the aerial terminal of the receiving set and the other end of the wire to the earth terminal. (See Fig. 5.)

COLIN BENNETT.

To be continued



The Key to Television

WHY NOT EXPERIMENT WITH SELENIUM CELLS?

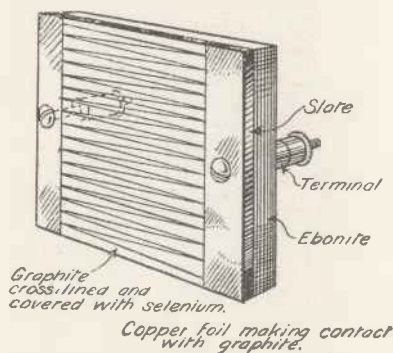
A Special Article for the Amateur
by DR. E. E. FOURNIER D'ALBE

THE selenium cell is destined to figure largely in coming developments of wireless communication.

Not only is it sensitive to light in much the same way as the eye, but its power of "converting light into electricity" is much greater than that of any other known substance, whether element or compound.

Amateur Construction

The making of selenium cells is a fascinating pursuit which can be



Construction of Selenium Cell.

taken up by any amateur. Certain precautions are necessary to guard against deleterious effects of selenium vapour.

There is no reason why really satisfactory selenium cells should not be made by any amateur armed with a small equipment and a good stock of patience and perseverance.

The smell of selenium vapour has been compared with that of horse-radish, and is not unpleasant except in large doses.

It is not, strictly speaking, poisonous, nor is it, indeed, a vapour at all, but a sort of fine red dust

which easily settles down and can usually be avoided by keeping well above it.

The nostrils of some people are irritated by it, but the author remembers acquiring an immunity to this effect after a short period of experimenting.

In any case, the vapour can be entirely avoided by means of a fume cupboard or by conducting the operations in front of a fire with a good draught.

A suitable fume cupboard can be improvised by burning an oil lamp in an unused fire grate and working near the lamp.

What is poisonous is hydrogen selenide ("seleniuretted hydrogen"), but this is not found in the course of the operations here described.

Commercial Selenium

Commercial selenium closely resembles a stick of liquorice in appearance. In its "vitreous" state it is an insulator.

If gently heated to about 205° C., it becomes grey and crystalline, and if cooled and then again exposed to that temperature for some hours it acquires its valuable property of being sensitive to light.

Although it can then be described as a conductor of electricity, its resistance is still very high. If we were to take a cube of this grey crystalline selenium 1 cm. each way and apply tinfoil to opposite surfaces, we should find that its resistance is about 100,000 ohms.

The resistance of a square film a tenth of a millimetre thick would be 10 megohms between opposite edges, and this resistance would, by Ohm's law, be independent of the size of the film so long as the thickness remained constant.

Making a Cell

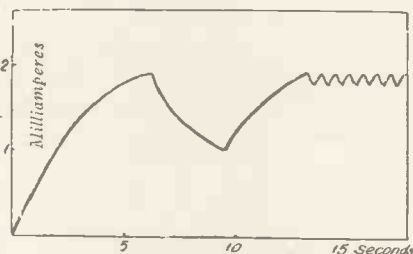
A simple selenium cell of that order of resistance may be made as follows: Cut a sheet of soapstone or slate (unglazed porcelain is even better) 2 in. by 1 in., and about 1/8 in. thick.

For half an inch from either end cover the surface with soft graphite, leaving a square inch blank in the centre.

Heat the slate or other support in a Bunsen flame and smear selenium on by rubbing a stick over it.

Leave the graphited ends bare near the edges, as they must serve to make contact.

The selenium should at this stage



Response of Selenium.

present an appearance like Brunswick black. It must now be gently heated until it turns grey.

When the colour begins to turn the heating should be made still more gradual, as otherwise the whole surface tends to go black again.

When the selenium has turned quite grey, it must be allowed to cool to an ordinary temperature. Afterwards it is heated again to melting point, and kept at that temperature for two hours.

If a small portion melts and turns black, cool immediately, when it may return to the grey crystalline state.

After the final cooling, the slate may be perforated with an ordinary arrow-headed drill to attach terminal screws. Brass washers make contact with the graphite.

The resistance should now be from 5 to 15 megohms in the dark, according to the thickness of the selenium film, and should fall by at least 30 per cent. in bright daylight.

If it is not sufficiently light-sensitive, the above annealing process should be repeated.

Low-resistance Cells

Selenium cells of lower resistance may be made by reducing the gap to a single cross line about a fiftieth of an inch wide. The line, instead of being straight, may be curved or zigzagged to increase its length, the resistance being inversely proportional to that length.

The resistance may thus be brought down to some 20,000 ohms, with a sensitive surface about a square inch in area. For larger areas, several cells may be connected in parallel, and the author has constructed a composite cell of this kind having a resistance of only 500 ohms.

Now this sort of conductivity is quite unattainable by any other light-sensitive substance.

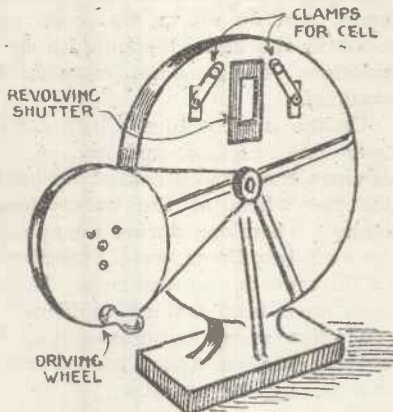
"Photo-electric cells" of colloidal potassium or rubidium have resistances of about a million megohms. It may be safely said that the current obtainable by the action of a beam of light of given intensity is twenty times greater in selenium than it is in any other known substance or combination of substances.

It is quite feasible to obtain a useful current of three or four milliamperes per square inch from a selenium cell exposed to bright daylight.

Intermittent Illumination

When intermittent illumination is used the variation of resistance is proportional to the slowness of intermission, but all intermittent light produces some fluctuation of current, even if it only lasts for a thousandth of a second, and this fluctuation is audible in a telephone without amplification.

Then why speak of the "lag" in selenium any more than in a sensi-



Device for Testing Cells.

tive photographic plate? In both, the action sets in immediately the light is turned on, but is proportional to the duration of the light.

It follows that in a selenium cell the amplitude of the change in resistance under intermittent light is inversely proportional to the frequency of intermittence.

This again means that selenium gives less effect in high audio-frequencies than in low ones. But that fact is largely counterbalanced by the greater sensitiveness of the ear to higher pitches.

All this should be borne in mind when testing selenium cells.

A good source of intermittent light is an electric fan run at maximum speed. A gas-filled lamp should be placed immediately behind the vanes of the fan, and the selenium cell mounted in a clamp on the other side, so that the vanes cut off the light from its entire surface in passing. A similar arrangement is shown on this page.

The cell should be placed in circuit with an H.T. battery of some 80 volts and a pair of headphones.

On running the fan a low hum is heard in the phones, which rises in pitch as the fan acquires speed. Any smell of selenium vapour shows that it is being overrun.

The voltages should vary in proportion to the width of the gap bridged by the selenium.

For a gap of one millimetre, 40 volts is a safe limit. The author has, however, used as much as 1,000 volts on suitably spaced gaps.

Other Methods

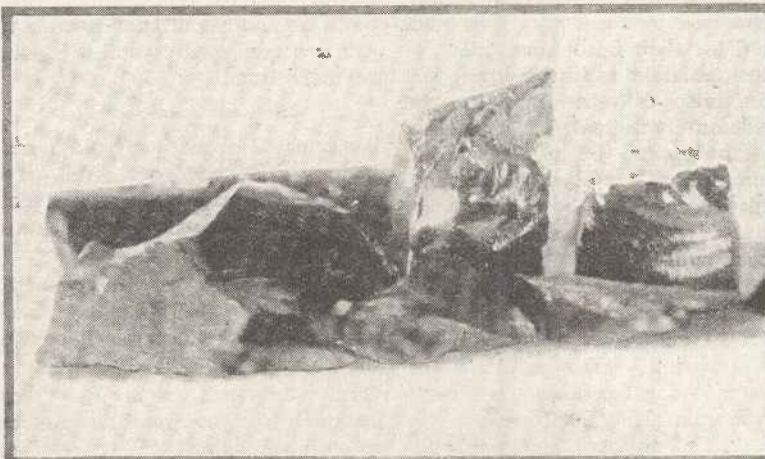
While graphite has the advantage of having no chemical action on selenium, it is not the only material that can be used as electrodes.

Graham Bell, the inventor of the telephone and the photophone, used a pile of brass washers separated by washers of mica slightly smaller in diameter. Alternate brass washers were connected in parallel, and the outer surface of the pile was covered with selenium.

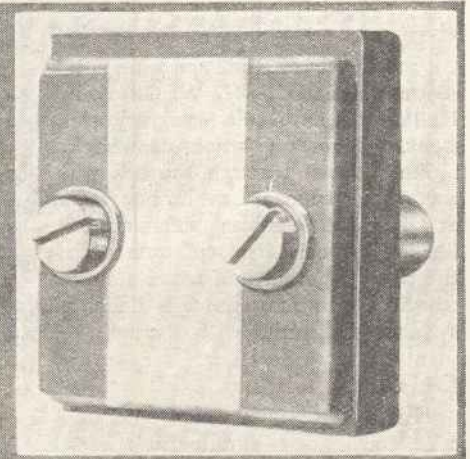
The result was a cylindrical "cell" very suitable for use at the focus of the searchlight mirror used for reception.

Shelford Bidwell introduced a type of cell consisting of two platinum wires wound side by side in a plate of slate or soapstone; and some

(Continued on next page)



Vitreous Selenium.



A Selenium Cell.

THE ROMANCE OF EMERGENCY CALLS

PERHAPS the most famous and dramatic danger signal of all is the SOS signal (...---...). Before this signal came into international use, the distress signal was CQD (-.-.-.-.-), which a good many people have translated as "Come Quick, Danger!" (Probably a more correct version would be "All Stations, Danger!")

It was found, however, that CQD was an altogether too cumbersome signal for use in an emergency, and, moreover, difficulty might be experienced in identifying it. Therefore the SOS signal was brought into use as the International Distress Call.

Easily Identified

The SOS signal is one that can be readily identified, even though several stations may be sending at once. Some will have it that SOS stands for "Save our Souls." The signal was chosen because ...---... is distinctive, and is called SOS only because that happens to be the morse translation. The three dots, followed by the three dashes, and again three dots, stand out well from other signals.

In sending the SOS, it is the practice to lay stress on the "O" portion of the signal so that --- is made the main part of the trans-

mission. The signal is sent at full power, at a speed of about five words per minute, and is repeated several times.

A ship's operator, upon hearing the distress call, will at once cease any signalling he may be engaged upon, and do all in his power to assist in the signal reaching its destination. The same applies to shore stations.

On the smaller ships, which carry only one wireless operator, it is obvious that watch cannot be kept for the whole of the twenty-four hours. Therefore, during the operator's off-duty hours, certain members of the crew act as watchers. These men have been trained to identify a wireless emergency signal and upon hearing such a signal immediately call the regular operator.

Emergency calls are always being listened for, and no matter at what hour such calls may be sent, there are sure to be several stations which will respond.

There are many lightships stationed at various points off our coasts guarding treacherous sandbanks or dangerous shoals. The more important of these vessels are equipped with wireless apparatus and are able to deal with any emergency calls in their respective localities. These light vessels use a wavelength of 230 metres.

A short list of some of the vessels is appended, together with their call signs:

Tongue Light Vessel	G V F
Gull Light Vessel	G V C
East Goodwin Light Vessel	G V B
South Goodwin Light Vessel	G V D
Cross Sand Light Vessel	G V A
Sunk Light Vessel	G V E

Safety Signal

Another wireless emergency signal is the Safety Signal, T T T (---). This is always sent as a prefix to a message affecting the safety of any vessel. Messages relating to the proximity of icebergs, derelicts, typhoons or floating wreckage would always be prefixed by the Safety Signal, which would be repeated several times with full power. Any station hearing the Safety Signal will help in the message reaching the station for which it is intended.

It is as well that these emergency signals should be known by all amateurs, particularly by those whose stations are on the coast, for it may happen that such a signal may be heard and very valuable assistance might be rendered by taking the message, or, if one cannot read morse, by reporting the reception of an emergency signal to the authorities. S. W.

Why not Experiment with Selenium?

(Continued from previous page)

very fine cells of this type were subsequently made by J. W. Giltay in Holland. These cells are very efficient, but have one serious drawback.

The current through the cell will sometimes concentrate in one spot and fuse the selenium. The surface tension of the latter will then draw the wires together and make a short circuit which may damage delicate apparatus in series with the cell.

Cox's Cell

This danger is avoided in Cox's cells, consisting of innumerable brass strips separated by mica.

These cells have been successfully used for greatly amplifying submarine cable messages.

A somewhat similar construction is now used by Professors Barr and Stroud for their optophone cells.

It is a mistake to suppose that the conductivity of selenium cells can be indefinitely increased by reducing the gap bridged by the selenium. Selenium does not obey Ohm's law, mainly because it is a mass of crystals rather than a homogeneous substance.

Professor F. C. Browne, a very distinguished American investigator of selenium, gets over this difficulty by preparing large crystals of selenium, the process requiring several months.

He thus obtains a remarkable degree of constancy which is con-

spicuous by its absence in the ordinary cell.

Selenium is at its best when used in intermittent light, and a well-made selenium cell is as reliable for such use as a good crystal is in wireless detection.

WHAT can I do with my old aerial? asks a correspondent. Well, if it is left in the garden, it should make a decent tight rope for the cats of the neighbourhood.

THAT was a very near shave—as the experimenter said when the hacksaw slipped and cut off the end of the catwhisker.

ONE microfarad, says an expert, is equal to 900 jars. Or, reduced to everyday language, to one year of married life.

The Morse Would Hammer Through!

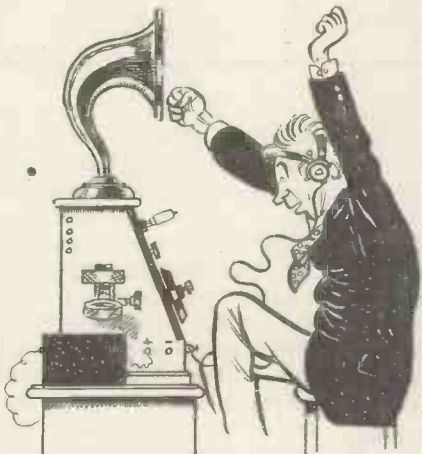
By RENÉ BULL



! ! ! ! ! ! ! ! ! ! ! !



!! !! !! !! !! !! !! !! !!



!! !! !! !! !! !! !! !! !!



"WHAT EVER IS THE MATTER, DEAR?"
"I CAN'T GET ANYTHING EXCEPT MORSE OUT OF THIS
CONFOUNDED THING!"



"THAT ISN'T MORSE DEAR - IT'S THE MAN LAYING THE

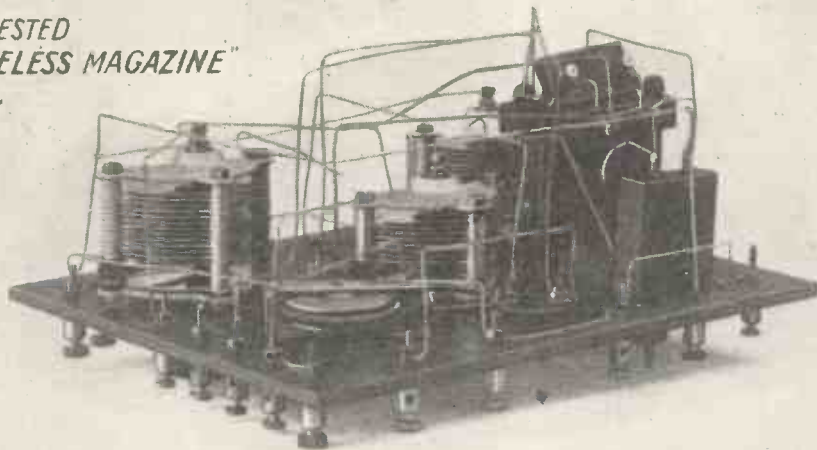


CARPET ON THE STAIRS."

René Bull

A Highly-selective Valve-crystal Reflex Set

AS BUILT & TESTED
IN "THE WIRELESS MAGAZINE"
WORKSHOP.



At Last, A REFLEX SET THAT IS SELECTIVE!

INASMUCH as many—perhaps most—reflex sets suffer from the disadvantage that they are not sufficiently selective, the Technical Staff of THE WIRELESS MAGAZINE decided to design a receiver with which really sharp tuning would be possible.

The result is described and illustrated in these pages.

A special—and unusual—circuit is employed, embodying the theories and principles outlined in the article

"Some Reflex Mysteries Solved," that appeared in last month's issue of THE WIRELESS MAGAZINE.

Circuit

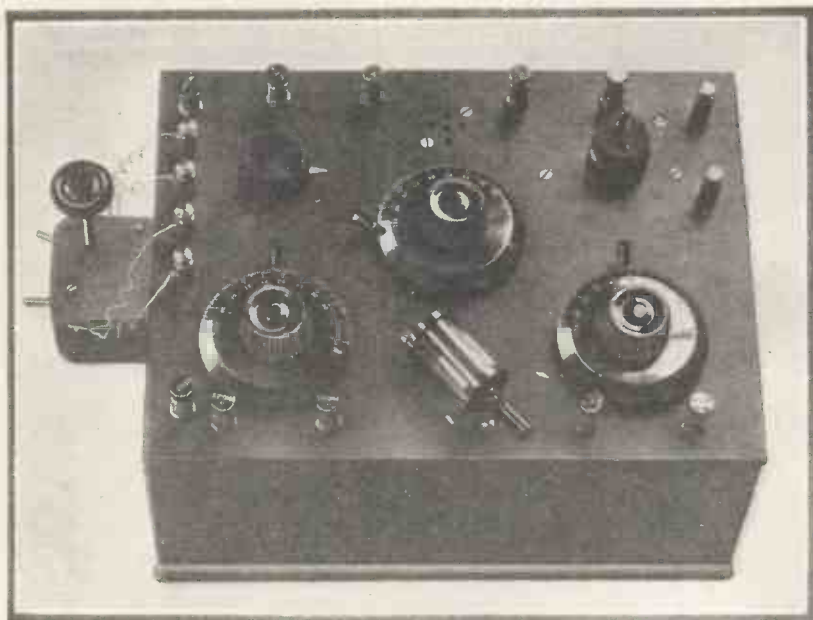
Referring to the circuit diagram, Fig. 1, it will be seen that a loose-coupled tuning system is employed; this gives good selectivity. The transformer, H.T. and L.T. batteries are all at earth potential. No damping is introduced into the aerial

circuit, so that critical tuning is obtained. The coupling together of the anode and grid coils is rendered unnecessary, for sufficient capacity exists between the electrodes of the valve to give a reaction effect.

A fixed condenser of .5 microfarad capacity has been introduced into the crystal circuit to ensure that the current flowing in the anode circuit of the valve is not suddenly switched through the crystal when the anode coil is taken out. This blocking condenser stops the passage of direct current, but allows the passage of oscillating current.

Components Required

- 1 ebonite panel, 12 in. by 10 in. by $\frac{1}{4}$ in. thick (Siemens).
- 2 .0005-microfarad variable condensers with fine adjustments (Wilkins and Wright "Utility").
- 1 .0003-microfarad variable condenser (Wilkins and Wright "Utility").
- 1 panel-mounting crystal detector (Burndept).
- 1 two-way coil holder ("Polar" Junior).
- 1 L.F. transformer (Radio Instruments).
- 1 .0003-microfarad fixed condenser (Lissen).
- 1 .5-microfarad fixed condenser (Mansbridge type).
- 10 terminals.



Top View of Panel, showing Positions of Components.

A Blueprint Panel-drilling Template and a Coloured Wiring Diagram of this Highly-selective Valve-crystal Reflex Set are given Free with this issue

- 1 valve holder.
- 1 single coil holder (Ediswan).
- 1 6b-volt H.T. battery (Ediswan).
- 1 6-volt 30-ampere-hour (actual capacity) accumulator (Exide).
- 1 grid-bias battery (Ediswan).
- 1 valve.
- Set of broadcast wavelength coils (Gambrell A, B and C).
- Square tinned-copper wire.
- 1 oak cabinet to suit (Pickett).

The Panel

Too much emphasis cannot be laid on the necessity of using good-quality ebonite.

The panel should be cut to the size indicated in the list of components.

Free Blueprint

A blueprint of the panel showing the positions and the sizes of the holes to be drilled for the specified components is given with this issue.

Lay the blueprint flat on the panel and mark through with a sharp steel point. Holes of the sizes shown should then be drilled at these points. Unsightly scratches on the panel will be avoided if the blueprint is used as a template in the way described.

Assembling

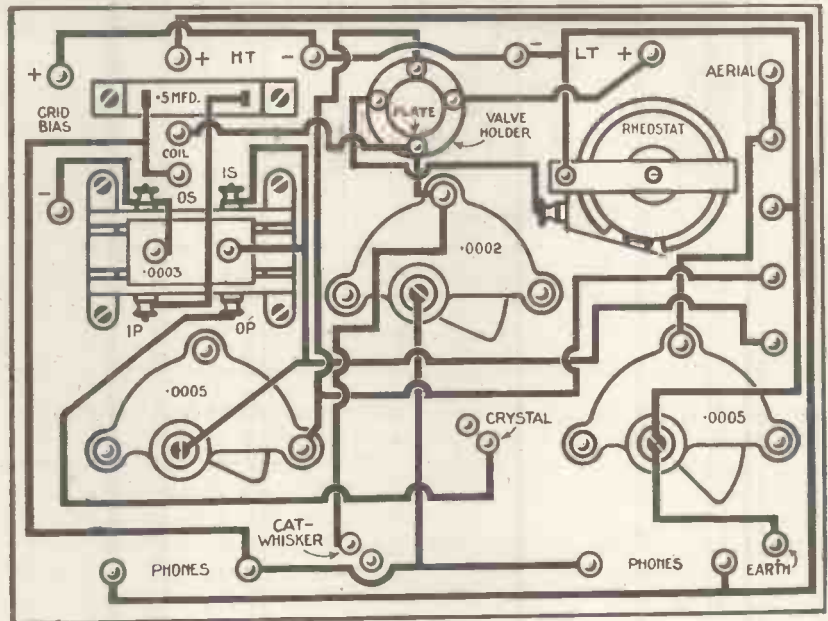
With the aid of the coloured plate and the photographs no difficulty should be encountered in fixing the various components to the panel.

It may be found that the condenser dials stick up too much from the panel, thus detracting from the appearance of the set. This can be remedied by inserting an ebonite distance-piece between the condenser and the under side of the panel so that less of the one-hole fixing screw sticks up through the panel.

Wiring Up

Wiring may be started as soon as the assembling is finished. Small pieces of apparatus, such as the fixed condensers, coil holder, valve socket and the rheostat, should be wired up first, otherwise the network of wiring formed above will make easy access to them impossible.

Referring to the coloured wiring



This is a reproduction of the Free Coloured Wiring Diagram.

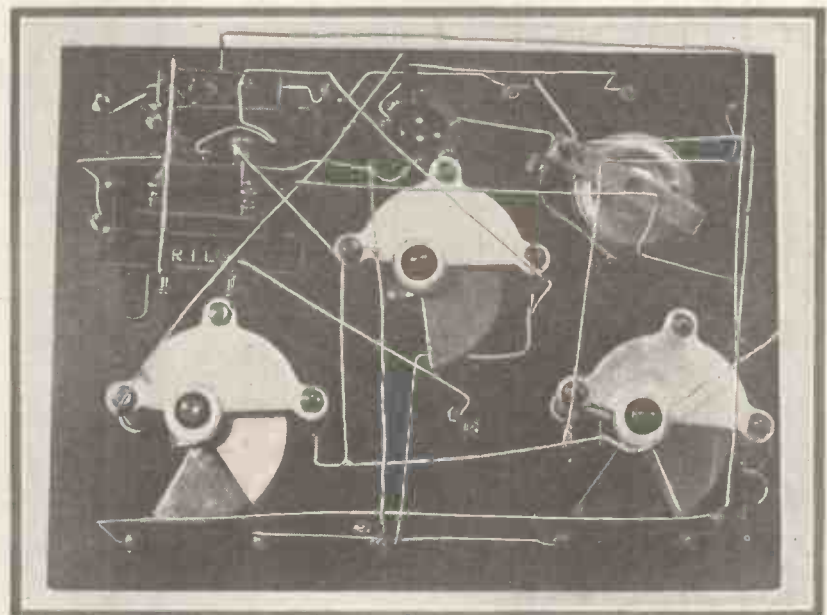
diagram, start with the filament-lighting circuit, shown in red. The plate circuit of the valve should be connected up next, and then the remainder of the wiring completed.

Terminals are provided on the panel for connecting to the two-coil holder mounted on the side of the case, thus avoiding untidy flex con-

nections from the coil holder through the case to the instruments.

It is important to check the wiring thoroughly in conjunction with the wiring diagram.

In order to obtain the best results, it is necessary that the valve is so adjusted that it does not detect. This should be done as



Back View of Panel, showing Wiring.

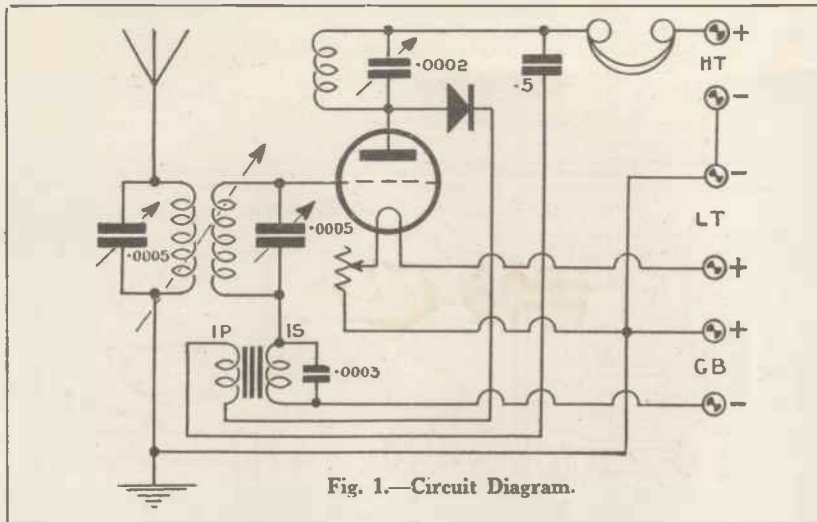


Fig. 1.—Circuit Diagram.

follows: Connect the aerial, earth, batteries and phones to the proper terminals and tune in any station that is working at the time. Take the catwhisker off the crystal. If signals are still received the valve is detecting. By judicious adjustment of grid bias and H.T.

voltage, detection by the valve may be checked.

The secondary and aerial coils should not be kept too close together. It will be noticed that the farther apart these two coils are from one another the easier it is for the set to oscillate.

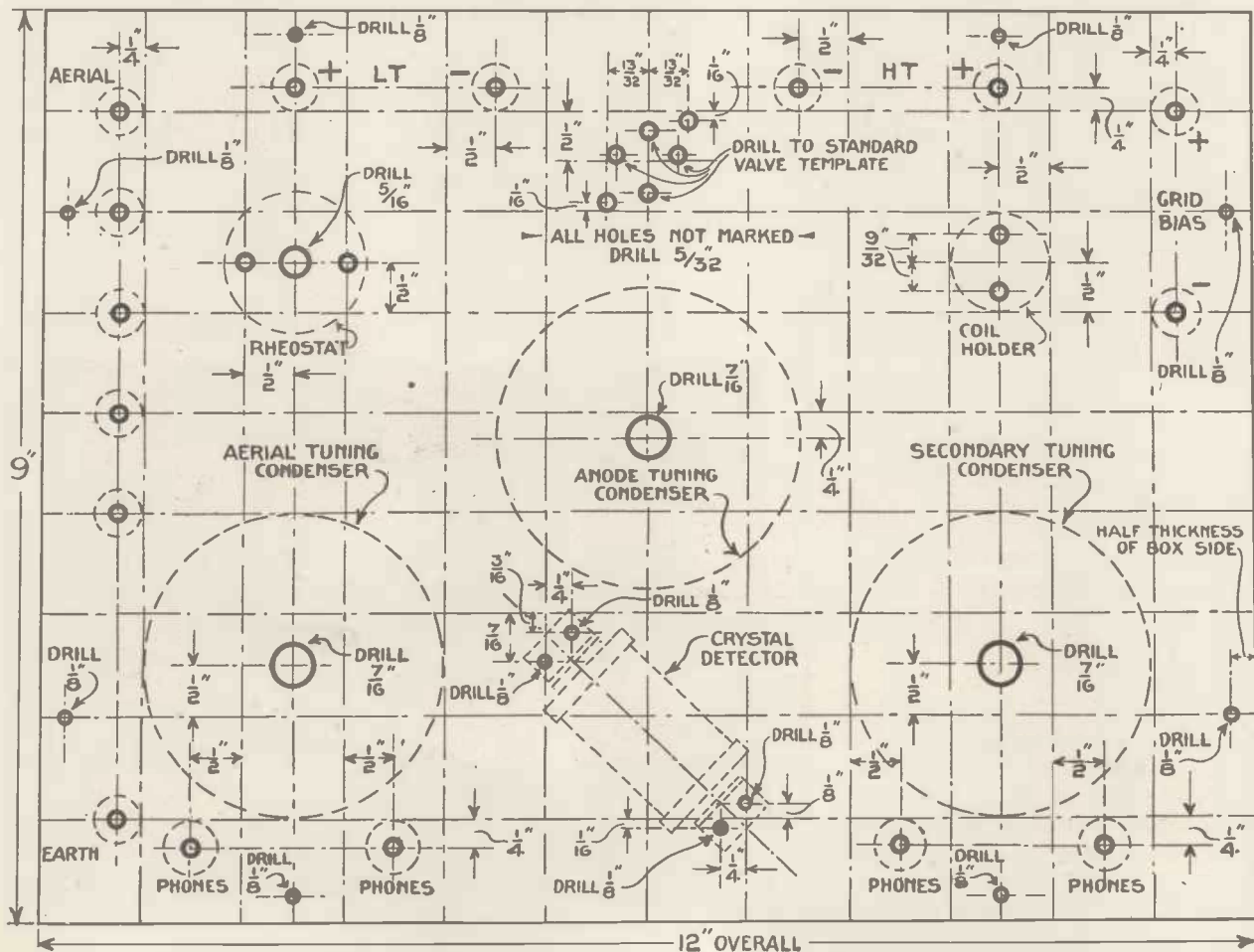
ELECTRON EMISSION

THE appointment of Professor O. W. Richardson as Yarrow Research Fellow recalls the fact that he was the first to study the emission of electrons from hot bodies. This was in the early days of the century, after Becquerel had discovered radio activity, and all the world was diligently searching for new and more wonderful rays and radiations.

Before Richardson commenced his work, the real cause of the "Edison effect" in electric bulbs was unknown. There was a blackening of the bulb except when it was shaded from the glowing filament by another portion of the filament itself. This is now known to be due to alpha rays, or helium atoms evolved from the glowing body.

The emission of electrons, proved by Richardson, has since found an enormous field of application in the wireless valve with which we are all familiar.

B. A. R.



Above is a reproduction of the Free Blueprint Panel-drilling Template.

WIRELESS definitions: Atmospherics—the noise that annoys.

SEVERAL of the wireless journalists in America are women. Specialists on loud-speaker topics, no doubt.

ABOUT the only thing that some home constructors make for themselves is a mass of difficulties.

LISTENERS are now having the pleasure of hearing some of the theatre bands that previously were banned.

AN eight-lettered word beginning with "w" and ending in "s" seems to be all the rage just now.

THE wonders of wireless are unlimited, says an engineer. And the blunders.

HEADPHONES are said to be very sensitive instruments. Some of them are almost too sensitive for words.

QUITE a lot of wireless fans seem to have been ventilating their opinions of the B.B.C. lately.

WIRELESS achievements are getting like women's fashions. There is something new every day.

IF the Radio Society had more branches, it could enable us to get to the root of most of our troubles.

A NEW type of loud-speaker is made of paper. Sounds like a certain morning journal!

WIRELESS prevents that sinking feeling; it is now being used to give instruction in swimming.

CAT burglars and detectives are getting almost as common as catwhiskers and detectors.

THE Wrigley Building in Chicago is to have a broadcasting station installed on its roof. By Gum!

SOME valves are like New Year resolutions. They don't last very long.

LOTS of people believe in using the "L" type of aerial. That's what we call ours sometimes.

WEATHER forecasts we are all listening for: "It ain't gonna rain no mo'."

AN American loud-speaker, ninety feet in height, is said to have been constructed. Another tall story!

AN inquirer asks—Do wireless waves bend? We are afraid we cannot give him a straight answer.

WE hear very little of the wireless death-ray nowadays. It must have died a natural death.

WAVELETS

WIRELESS is becoming very popular in the nursery. But children were always fond of pulling cat's whiskers.

A CORRESPONDENT complains of noises in his loud-speaker. But isn't that what loud-speakers are for?

THE crystal has not yet displaced the valve. Nevertheless, it has many good points about it.

BETWEEN each item, the Nottingham station is broadcasting a series of dots. It seems a dotty idea.

THE Hertzian spark is merely lightning on a small scale. And without the thundering noise that accompanies the latter.

IN a competition held recently, one competitor submitted a receiving set in a cigarette case. He evidently meant tobacco winner.

THE broadcasting of points for motorists is no new idea. Yokels with boxes of tacks have been doing it for years past.

NOW that messages are daily coming across the Atlantic, will the B.B.C. oblige us by appointing a few Anglo-American interpreters?

THE fine bass we heard on the wireless the other night explains what the musical critics refer to as a liquid voice.

AMATEURS who have been experimenting with all-weather leads-in are surely optimists. We only get one sort of weather in this country.

THE Boston studio is draped with dried sugar-cane. Which doubtless accounts for the sweetness of the music in its programmes.

THIRTY-SIX per cent. of the war widows have re-married. So that a corresponding number of men will now be listeners-in.

LEWISHAM Guardians have fitted a loud-speaker in their Children's Home. Such kind actions speak louder than words.

BRITISH listeners are not advised to waste their time trying to pick up Holland. Most of the stuff would be Dutch to them if they got it.

WE read in the press of electric drills. Let us pray that this is not a new form of physical culture for wireless experts.

THE cross words we read about in puzzles are not half so cross as those used by listeners in reference to atmospherics.

"FOOLPROOF" sets make very acceptable presents, except when specifically described as such to the recipients.

THE reason why violin music comes through so well on the wireless is that the instrument is a sort of second cousin to the catwhisker.

IT is believed in some quarters that wireless will ultimately displace newspapers. What a calamity that will be for the fried-fish shops.

SEVERAL Russian ballets have been broadcast recently. And bullets, too, if the newspapers are anything to go by.

A NEWCOMER to wireless has been boasting that he has picked up the Eiffel Tower. We trust the police made him put it down again.

LOUD-SPEAKERS are now installed in Westminster Abbey. Previously they were housed across the road, in the House of Commons.

IF howling in Glasgow is as bad as some listeners allege, why don't the municipal authorities make bagpipe playing a notifiable disease?

AN M.P. is broadcasting on "Curiosities of Parliament." We hope, for the sake of peace, that he does not mention them by name.

AUSTRIAN M.P.'s are to listen-in in their smoking-room. Our members, of course, get enough listening in the debating chamber.

THE time signal seems to be very popular with listeners-in. Unless of course, the set happens to be installed in the local hostelry.

SEVERAL Oxford poets are reading their own poems from 2 L O. This is a case of making the punishment fit the crime.

THE press is discussing the effect of wireless on the sun. That is a question that hardly concerns us in this country.

BRADFORD City Council are considering the question of broadcasting their discussions. This Yorkshire humour can be carried too far.

STOKE-ON-TRENT is broadcasting *Married Life*, which it describes as a farce in one act. Most of us would prefer to call it a tragedy.



Mr. Bruno Walter.



Miss Wynne Ajello.

Broadcast Music of the

THOUGH there is still a tendency on the part of the B.B.C. to increase the high-brow or classical character of their programmes, they are, at the same time, striving to give not only the most familiar works, but contrasts in the same programme.

International Symphony Concert

By reason of its interest to London audiences, possibly the outstanding concert of the month was the third International Symphony Concert, held at the Opera House, Covent Garden, which certainly went far to prove that art is above nationality. Otherwise the enthusiasm, one might almost say hysteria, evinced by a packed "house" for the German conductor, Bruno Walter, and the vocalist, Wilhelm Rode, is hard to understand.

Mr. Walter, with his long experience as operatic conductor in Berlin, Munich, and Hamburg, conducted in a manner quite typical of his nation as to precision and methods, while Mr. Rode's delivery of the excerpts from *The Flying Dutchman* and *The Valkyrie* was rather more reminiscent of the operatic stage than the concert platform. Obviously, while this suited the taste of the audience in the hall, for the listener-in it left much to be desired.

Perhaps next time we shall be favoured with artists drawn from our own resources.

It was refreshing to turn to the work of Mr. Robert Radford, one of the principal basses and a director of the British National Opera Company, whose name figured in the cast of Haydn's *Creation* broadcast from 2 L O and 5 X X, as well as earlier in the month from Manchester. Few singers have a finer diction or range of tone.

"La Bohème" from Liverpool

Two other members of the same company have been heard this month in Dennis Noble and Jeanne Chevreau, when a studio performance of *La Bohème* was given at Liverpool by the B.N.O.C., conducted by Mr. Percy Pitt. Mr. Noble is gifted with a fine presence as well as a voice of unimpeachable tone and power, and these qualities have made him a valuable addition to the company. He has made a tour of the stations for broadcasting purposes.

Miss Chevreau is the Parisian harpist, also a member

of the B.N.O.C., and has played with distinction in the great operatic performances at Covent Garden and His Majesty's Theatre, as well as at the International Concerts and in the studios. She will be remembered for her expressive performance of Debussy's "Danse Sacrée et Profane" at 2 L O.

One of the best-known violinists is Miss Winifred Small. This month her tours led her to Belfast, where she played in conjunction with Maurice Cole in a programme framed to interest both high- and low-brows. Frankly, I am not intrigued with the lengthy Sonata of John Ireland, though it has gained a place in modern British compositions. But it is only right to say that Miss Small makes pleasant hearing of any work, and very dainty are her renderings of the lighter items, such as those of Senaglia or Kreisler.

Belfast also had a personal talk for schools from Mr. E. Godfrey Brown, the Musical Director of the station. Mr. Brown has conducted most of the principal orchestras in the kingdom, and takes his broadcasting work very seriously. One is often tempted to think that his work in this direction will tend to stop emigration, for many sons of Ould Oireland have become as firmly attached to their broadcasting station as to their country. Indeed, it is surprising what a great influence broadcasting does have on listeners.

As might be expected, some excellent music has been transmitted through 5 X X, with artists of high artistic value, including Sapellnikoff, the Russian pianist.

An operatic concert included the singing of Miss Gwladys Naish. Often termed "the Welsh Nightingale," Miss Naish possesses a voice unequalled for



Mr. Robert Radford.



Miss Gwladys Naish.



Mr. E. Godfrey Brown.



Miss Winifred Small.

and Musicians Month

coloratura and operatic scenes, and she has broadcast many times from 2 L O.

The relay stations have often the best of it, for they possess what is practically a stock company, and the really good artists become fixed stars of the broadcast firmament. Under this category falls Percy Frostick, a celebrated solo violinist who has broadcast from Leeds-Bradford since the opening of the stations, and made noteworthy his recitals on that old-world instrument the viola d'amour. A pupil of Wilhelmj at the Guildhall School of Music, he made his debut as a child prodigy at a Queen's Hall Promenade Concert, in later years becoming a member of the famous orchestra itself. For several years he was first violin with the Royal Opera Company, Covent Garden, and toured the world with the Quinlan Opera Company. In addition to his work with the Brighton Municipal Orchestra, Mr. Frostick has played solos at all the big festivals.

Most concert-goers will agree with me, I think, that a Wagner concert without

Horace Stevens is like the play of *Hamlet* without the Prince. An Australian by birth, he started his musical career at the age of seven, and later became a lay clerk of St. Paul's Cathedral, Melbourne. His first appearance in this country was made at Queen's Hall, with Sir Henry Wood, in 1919, after he had been through the war; here he established himself for all time as the Wagnerian singer par excellence by his rendering of Wotan's Farewell.

In Every Great Festival

He has appeared since in every great festival, in oratorio and in opera, and, indeed, last year created



Mr. Horace Stevens.



Miss Esther Coleman.



Mr. Dennis Noble.



Miss Edythe Kinch.



Mr. Percy Frostick.

the part of Wotan for the B.N.O.C.'s performance of *The Valkyrie*.

Instead of a Foreigner

It is utterly impossible to give any idea in this space of the extent and the sheer musical value of Mr. Stevens's work, and one can only say that it would have been more seemly for him to have sung the Wotan excerpt again at Covent Garden last month, and retrieved the concert from its foreign atmosphere.

Classical music is often in the ascendant at Bournemouth, which has become the musical hub of the Southern coast. Great success was achieved for the special Liza Lehmann programme by Miss Esther Coleman, the well-known classical singer, and a favourite with all listeners. She has made a speciality of singing without accompaniment, one of the most difficult of arts, and her renderings are always enjoyable, especially when she sings old-world music, where the freshness and purity of her voice are valuable assets.

Miss Edythe Kinch is another popular singer at this station, and she is widely known throughout the provinces for her songs, both on the concert platform and before the microphone.

Philharmonic Society's Concert

Among other events, mention must be made of the relaying from Liverpool of the Philharmonic Society's ninth concert, the conductor being George Schaevoigt, the solo violinist who has recently resigned from his work as leader of the Hallé Orchestra. He will probably be heard more frequently now in solo work, with his own orchestra, the Catterall Quartet.

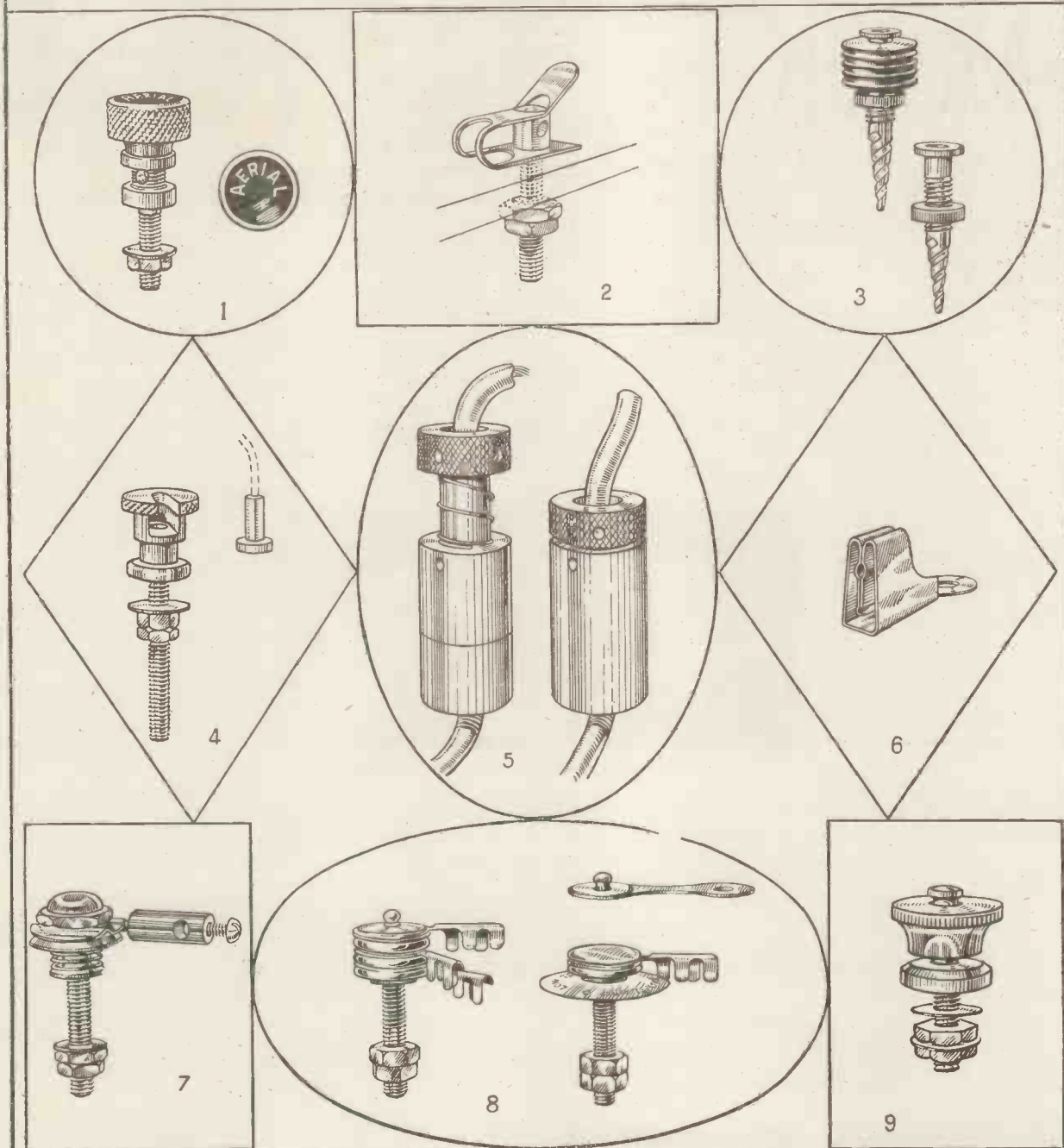
Kutcher String Quartet

Another fine example of quartet music was provided by the Kutcher String Quartet, well known at 2 L O. Led by Mr. Samuel Kutcher, a virtuoso pupil of Albert Sammons, his coadjutors are also well-known soloists in George Whitaker, Leonard Rubenstein, and John Barbirolli.

Their outstanding item was Robert Chignell's Pianoforte Quintet, in which they were joined by Miss Ethel Bartlett, also a popular broadcasting artist.

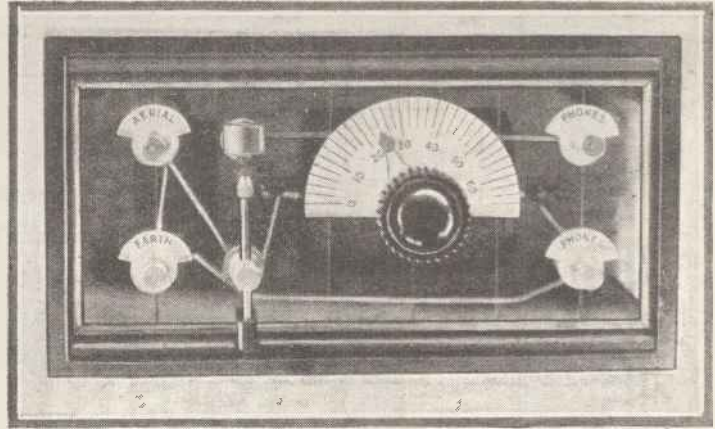
STUDIOS.

TERMINALS UP-TO-DATE



1.—Belling-lee indicating terminal for spade and pin connections. 2.—Igranic spring-clip terminal. 3.—Clix plug and socket terminal. 4.—Mousley terminal, with nipple on lead. 5.—Marconiphone terminal, with internal connection (operated by a slight turn of the terminal head). 6.—Klutch terminal for instantaneous connections. 7.—Ediswan spring terminal for phone tags. 8.—Newey snap terminal, allowing any number of connections to be made to one terminal. 9.—Sterling terminal, with boss to keep nut in place.

A GLASS-PANEL CRYSTAL SET



GLASS-DRILLING, with its attendant risk of breakage, and its requirement of skill and use of special tools, is not necessary in the construction of the novel glass-panel crystal set shown by the photographs and described in this article.

An entirely new principle is used which, while giving results equal to a drilled panel, calls for no special workmanship or instruments. The construction is easily within the capabilities of the novice.

Referring to Fig. 1, it will be seen that the panel is built up of strips of glass laid side by side, all components being fastened through semi-circular slots cut in the edges of the glass, as shown in Fig. 2.

Slot Cutting

The method of cutting the semi-circular slots is illustrated in Fig. 3. A round secondcut (medium) file of good quality is used of a diameter approximately equal to the size of the hole required. In the case of No. 4 B.A. terminals, etc., a $\frac{3}{16}$ -in. diam. file is employed. These files are obtainable for about 6d. from most tool dealers.

Care should be taken to get a file not too fine and not too coarse,

the technical designation of the correct grade being—as mentioned previously—"secondcut."

As regards the glass, this should be of good quality, and may conveniently be old photographic plates. Microscope slides, obtainable from optical-

Great interest is at present being taken in glass panels for sets. Apart from its beauty, such a panel has high insulation properties, and costs no more than one made of good ebonite. In this article is described a method of making a glass-panel crystal set which is novel in that no glass drilling is necessary.

and chemical-apparatus dealers, can also be used. These measure 3 in. by 1 in., and were employed by the writer in the set here described. If these are not readily obtainable, however, two quarter-plates cut up into strips of the same dimensions will answer quite well.

Unless the constructor is in possession of a glass-cutting tool, the cutting of the strips should be

entrusted to the local glazier, who will do the work for a few pence.

Seven strips are needed for the panel, holes for the various components being provided as shown in Fig. 1. For the variometer, which must be of the one-hole-fixing type, as shown in Fig. 4, a fairly large hole will have to be cut. The variometer used by the writer is fitted with $\frac{1}{8}$ -in. diameter spindle which passes through a $\frac{3}{16}$ -in. diameter bush, thus necessitating the cutting of a $\frac{7}{32}$ -in. diameter hole for fixing.

Fixing Panel Strips

Fig. 5 shows the method of holding the panel strips together. Two feet of $\frac{1}{4}$ -in. square brass tubing should be obtained and cut into two 7-in. and two 3-in. lengths. One corner of each strip is then filed away, giving the section shown in Fig. 6. The ends of each strip are mitred so that the framing will fit neatly round the edges of the panel.

An end view of the crystal detector is shown in Fig. 7; this diagram also illustrates the method of fixing the terminals, etc., to the panel. No metal parts must be allowed to come into contact with the glass itself,

(Continued on next page)

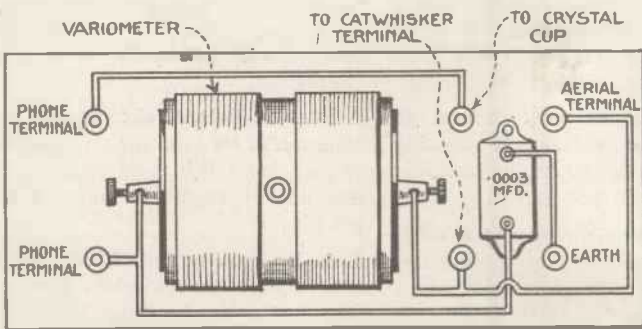
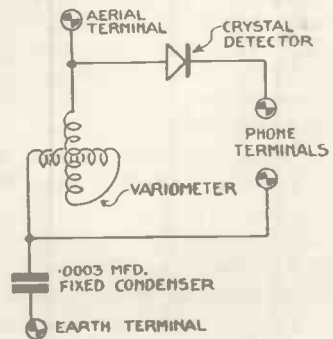


Fig. 9 (left).—Wiring Diagram.

Fig. 8.—Circuit Diagram.



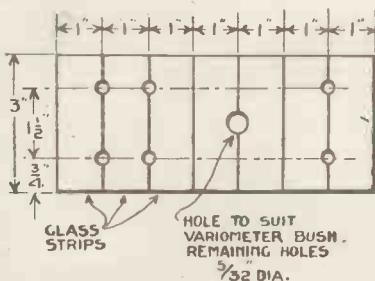


Fig. 1.—Details of Glass Panel.

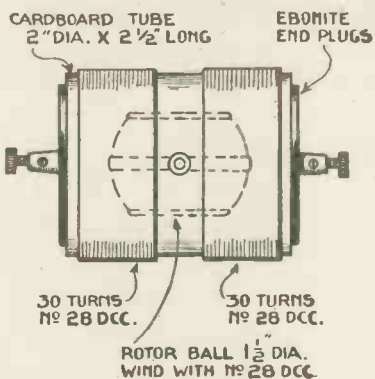


Fig. 4.—Variometer Details.

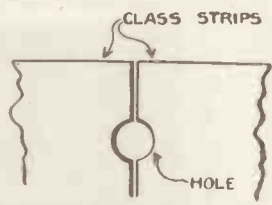


Fig. 2.—Semicircular Slot.



Fig. 6.—Section of Tubing.

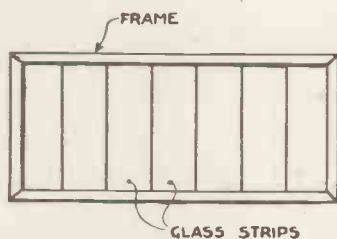


Fig. 5.—Method of Holding Strips.

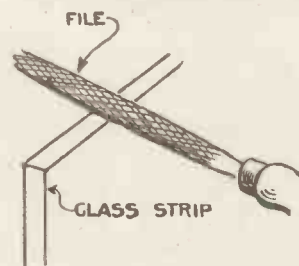


Fig. 3.—Method of Slotting.

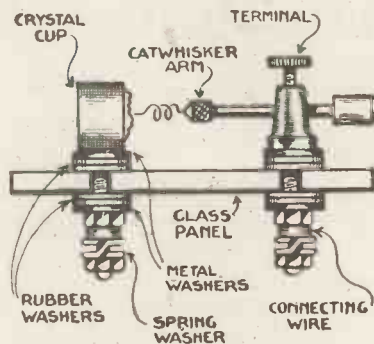


Fig. 7.—Details of Detector.

rubber washers cut from an old bicycle inner tube being interposed between components and panel in order to absorb any shocks or strains produced in tightening up the nuts or using the set.

The necessary connections, which may be made with square tinned-copper wire, are shown in Fig. 8, while an actual back-of-panel wiring diagram is given in Fig. 9. (See previous page.)

It should be noted that the small fixed condenser included in the circuit is held in position simply by the stiffness of the connecting wires and is not fastened to the panel in any way. R. N. W.

RIPPLES

CRYSTALS are very delicate and should be treated cautiously. Listeners-in from the neighbourhood of the Aberdeen station will not need to be instructed how to do this.

CLUBS for wireless enthusiasts are growing in number. A fairly large one, it should be remembered, is very useful for knocking reason into the hard heads of oscillation merchants.

SOME readers of wireless programmes are not certain of the meaning of "mean" time. We understand that Englishmen visiting Scotland apply the term to the period during which places of refreshment are open.

MUCH MARRIED MAN: I first met my wife at a wireless concert.

FRIEND: Yes—

M.M.M.: And I've been listening-in ever since.

CARDIFF is to broadcast *The Pied Piper*. Won't the catwhiskers stand on end when the rats come trooping out!

SIGNALS from New York have been wireless round the world in five seconds. That almost beats the speed at which the Yankee visitors tour Europe.

WIRELESS sets, says our dear Vicar, Keep men at home, away from liquor.

But if you tell this to a brewer, He'll fume, and say they should be fewer.

A SOUTHAMPTON listener claims to have heard Big Ben through seven B.B.C. stations consecutively. That's nothing. We once knew a reveller who one night saw seven Big Bens whilst crossing Westminster Bridge.

AMATEURS should not attempt to tap telephone wires. It usually leads to a gentle tap on the shoulder from the nearest policeman.

THE latest Paris novelty is a loud-speaker in the form of a daintily-dressed doll. We hope it won't prove to be another of those squeaking dolls that are now so popular amongst the children.

It is said that an inventor is developing a system for transmitting heat by wireless. Perhaps he would like to avail himself of the opportunity for experimenting that will be afforded by the visit of our mother-in-law this week-end.

A BIRMINGHAM paper has an article entitled "The Municipal Gramophone." We are afraid that most Town Councils have at least one such member amongst them.

THROUGH a broadcast description of its colour, a flamingo that escaped from Manchester Zoo was promptly recaptured. Lucky it was not a chameleon.

A BOLTON listener says he has a set that works for two minutes and then stops. Well, if it is no use as a wireless set, it ought to make a good bricklayer.

THE headmaster of Liverpool Institute says that wireless is a craze that will soon die out. We hereby appoint him a member of the Antediluvian Society of Die-Hards.

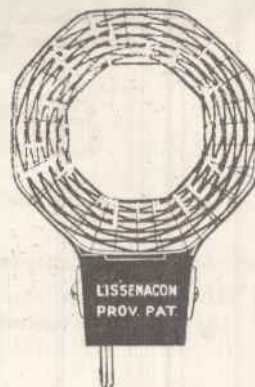
LISSENIUM TYPES OF MAGNETIC CONCENTRATION

With many types of coils the magnetic field is mostly concentrated in the centre of the coil, and the field does not extend to any appreciable degree. The characteristics of the magnetic field in such coils are closely analogous to the ordinary solenoid inductance.

In the case of LISSENIUM (pronounced LISSEN-AGON) coils, however, the magnetic field, in addition to being very strong in the centre of the coil, is also distributed on each side of the coil. This accounts for the remarkably strong magnetic linkage obtained with LISSENIUM coils in reaction circuits, and ALSO FOR THE PECULIAR EFFICIENCY OF THE COILS WITH EDDY CURRENT TUNING.

LISSENIUM TUNING CHART. Note the Intermediate Coils 30, 40, and 60.

TABLE I. Wave-length range when used as Primary Coils with Standard P.M.G. Aerial and .001 mfd. condenser in parallel.			TABLE II. Wave-length range when used as Secondary Coils with .001 mfd. condenser in parallel.		
No. of Coil.	Minimum Wave-length.	Maximum Wave-length.	Minimum Wave-length.	Maximum Wave-length.	PRICE.
25	185	350	100	325	4/10
30	235	440	130	425	4/10
35	285	530	160	490	4/10
40	360	675	200	635	4/10
50	480	850	250	800	5/-
60	500	950	295	900	5/4
75	600	1,300	360	1,100	5/4
100	820	1,700	500	1,550	6/9
150	965	2,300	700	2,150	7/7
200	1,885	3,200	925	3,000	8/5
250	2,300	3,800	1,100	3,600	8/9
300	2,500	4,600	1,400	4,300	9/2



IF YOU EVER WANT COILS WHICH INTENSIFY TUNING—USE LISSENIUM COILS.

SIGNALS ARE ALWAYS STRONGER—

when capacity is low and inductance is high. If, where, say, a No. 35 coil is ordinarily used with added capacity to tune it to a given wave-length, a No. 60 coil can be used, AND WITHOUT ADDED CAPACITY, other things being equal, it follows that signals would be stronger.

In the new LISSENIUM CRYSTAL SET a form of tuning has been introduced which permits of a No. 60 LISSENIUM (pronounced LISSEN-AGON) coil being used, and dispenses with the need of added capacity to tune it. A big signal voltage is built up. But, apart from its high inductance efficiency, too, there are other considerations which place this receiver far above all other crystal sets, NO MATTER WHAT THE PRICE.

THERE IS AN UNDISTURBED ELECTRICAL CIRCUIT, for instance. The only moving part is the metal plate, and although this is entirely unconnected with the electrical circuit, its influence on the inductance is effectively applied through the medium of the magnetic field created.

In conjunction with the principle of EDDY CURRENT TUNING employed in this new LISSENIUM CRYSTAL SET, LISSENIUM COILS ARE PECULIARLY EFFICIENT. No other coils give the same results.

By fitting the appropriate LISSENIUM (pronounced LISSEN-AGON) coil, the LISSENIUM CRYSTAL SET can be used for any station within range. Two coils would be needed for London and Chelmsford, for instance—to change over from one station to the other, take one LISSENIUM coil out, and plug the other one in. On long aerials it would be possible to use a coil one size less in each case, e.g., No. 40 instead of 50; 50 instead of 60; 60 instead of 75; 200 instead of 250.

NOTE.—One LISSENIUM coil must be ordered with each set—the receiver will not be sold without a LISSENIUM coil because the use of these coils ensures very high efficiency.

No paper—no cardboard—no loose contacts—no loose wires—connections are stamped-out strips—the whole receiver is an instrument throughout—robust—and THE MOST EFFICIENT CRYSTAL SET MADE—WITH THE MOST EFFICIENT INDUCTANCE.



- Price of receiver (includes crystal), patent pending **10/-**
- No. 50 LISSENIUM coil (covers 300 to 350 metres on this receiver) **5/-**
- No. 60 LISSENIUM coil (covers 350 to 400 metres on this receiver) **5/4**
- No. 75 LISSENIUM coil (covers 400 to 500 metres on this receiver) **5/4**
- No. 250 LISSENIUM coil for Chelmsford **8/9**

500-520 Woodger Road, Goldhawk Road, Shepherd's Bush, London, W.12.

Telephones: Riverside 3380, 3381, 3382, 1072.
Telegrams: "Lisssenium, London."

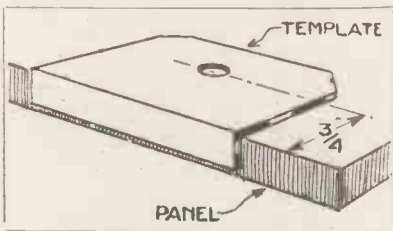
LISSEN LIMITED

Gadgets, Hints and Tips



Panel-marking Template

THE illustration shows a handy little template useful for marking out the positions of terminal holes on



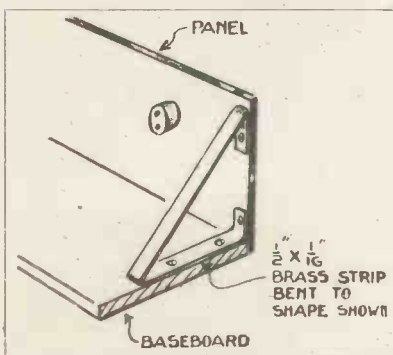
Panel-marking Template.

a panel. As the terminals on most home-constructed panels may be conveniently placed $\frac{3}{4}$ -in. from the edge, the hole in the metal template is drilled for that distance.

To use the device the template is pressed up against the edge of the panel and the outline of the hole scribed through with a sharp instrument. T. M.

Supporting Panels

THE American style of mounting the panel vertically—a baseboard being used to hold some of the com-



Panel Support.

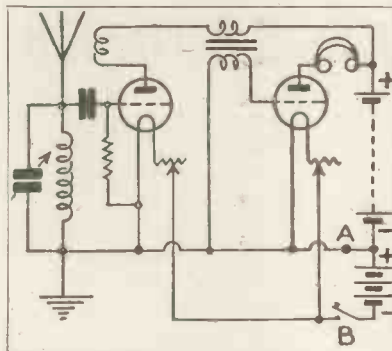
ponents—is rapidly gaining favour in this country. In order to keep the panel securely in place, some kind of support is necessary.

A convenient method of making this is shown in the illustration—two

metal strips being used which are bent to form angle brackets. Holes will, of course, have to be drilled for the necessary attachment screws. B. M. S.

L.T. Switch

ALTHOUGH unnecessary in a single-valve set, a switch in the L.T. circuit is very convenient when one is using a multi-valve receiver. Yet, unless care is exercised in the addition of this simple fitting, the reader may one night find that its presence has



Position of L.T. Switch.

been responsible for the fusing of all his valves.

It is not uncommon to find the switch placed in the L.T. positive lead, that is, at A in the accompanying diagram. It will be seen that an accidental connection between the aerial and reaction coils will not affect the valve filaments when the switch is closed, as the H.T. current simply flows along the L.T. positive busbar.

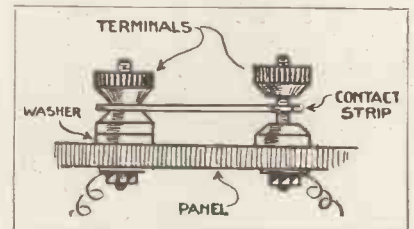
When the switch is open, however, as it would be when changing coils, all the H.T. current goes through the filaments, with disastrous results.

The switch should be placed at B. H. S. R.

In your constructional work you must come across a wrinkle now and then. When you do, send it to us. We pay for everything we print.

Potentiometer Switch

SETS with a potentiometer should be fitted with a switch in order to prevent waste of the L.T. current.



Simple Switch.

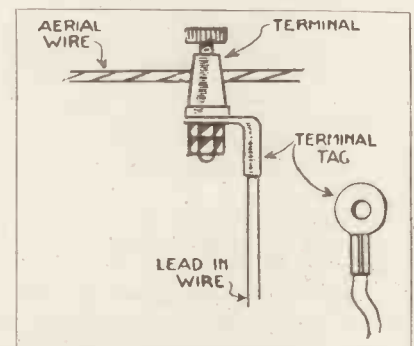
A very simple type of switch which may be mounted on the outside of the panel is shown in the illustration.

Two W.D. terminals are required, together with a brass strip which has a hole in one end to fit the terminal shank, while in the other end a clearance hole is provided.

The terminals are spaced so that when the nut of the switching terminal is screwed out the strip makes no contact. S. A. C.

Lead-in Tip

It is often inconvenient to solder the lead-in wire to the aerial, es-



Fixing Lead-in.

pecially in exposed positions where the efficient use of a heating lamp or soldering iron would be almost impossible. Here is a simpler method.

(Continued on page 316)



Brandes Superior
"Matched Tone"
Headphones

PRICE

20/-

British Manufacture
(B.B.C. stamped.)

All Brandes products carry our official money-back guarantee, enabling you to return them within 10 days if dissatisfied. This really means a free trial.

Brandes Superior *Matched Tone* Headphones are admirably versatile. It's hard to imagine them fitting snugly to the tenderest curly head and yet fulfilling their duty on the head of the expert who sits down to long hours of serious experiment. So comfortable, and with a rugged strength of construction to protect their delicate adjustment, they are excellent for family use. Primarily designed for long-range telephony from expert technical knowledge, their *Matched Tone* feature brings in the most distant signals with purity and strength. The experimenter finds that they bring the best results in trans-atlantic and trans-continental reception. One gentleman writes from Walton-on-Thames: "I received Australia on Brandes and consider they are the most sensitive 'phones I have used. I am much pleased with their general performance." Ask your Dealer for Brandes.



... every one of these advertisements will show an added advantage in the construction of Brandes Headphones.

Look at the illustration above. See how snugly the 'phones fit the head. A gentle pressure on the crown, a firm clasp to the ears, and the rest of the head band is held well away from the hair. This means long-wearing comfort and the shutting out of extraneous sounds. Strength and firm beauty of line typifies their finished construction.

British Manufacture
(B.B.C. stamped.)



Table-Talker
42/-

The *Table-Talker* is another Brandes quality product at moderate price. Its full round tones are wonderfully clear and pleasing. The horn is matched to the unit so that the air resistance produced will exactly balance the mechanical power of the diaphragm. This means beautiful sound balance. Gracefully simple of line, it is finished a shade of neutral brown and is 21 ins. high.

Brandes
The name to know in Radio

Brandes, Limited, 296, Regent Street, W.1.
WORKS: Slough, Bucks.

Superior "Matched Tone" Headphones

TRADE MARK

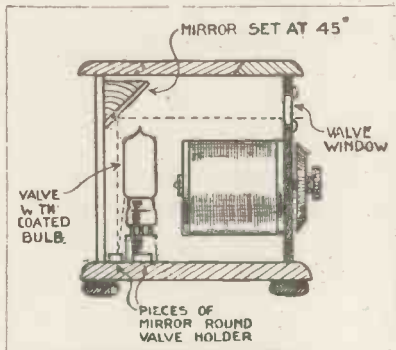
Gadgets, Hints and Tips

(Continued from page 314)

An ordinary phone terminal is threaded on to the aerial wire and a metal terminal tag to which the lead-in wire has been fixed is secured to the leg of the terminal by means of a nut or nut and locknut. W. B.

Filament Light

THE bulbs of many dull-emitters and of some bright-emitters are opaque.



Reflecting Filament Light.

This makes it almost impossible to see whether the filament is alight from the fronts of many sets.

The use of a small mirror arranged as shown, however, will enable the degree of filament heat to be gauged without having to open the lid.

M. R. P.

Vibration Absorbers

MICROPHONIC noises due to the vibration of the electrodes of dull-emitter valves can be eliminated to a large extent by resting the set

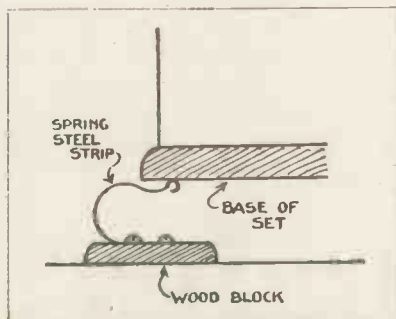


Fig. 2.—Spring Steel Strip.

on spring feet of the type shown in the illustrations.

The device shown in Fig. 1 consists of an ebonite or hardwood rocker mounted on some type of bearing at the centre. The weight of the

receiver is balanced by means of an elastic band.

In the second type, Fig. 2, a piece of spring steel strip, which may be obtained from an old clock or gramophone motor, is used. If the set is particularly heavy two or

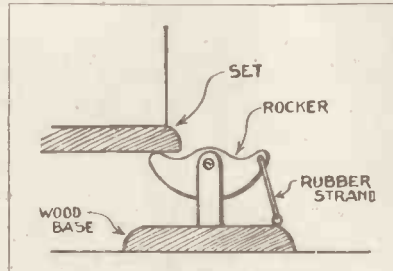


Fig. 1.—Rocker on Bearing.

three laminations of the strip steel may be employed.

A vibration absorber will of course be required for each of the four corners of the receiver.

G. R. D.

Indoor Earths

It frequently happens that amateurs who are unable to erect outdoor aerials find equal difficulty in obtaining a satisfactory indoor earth connection.

There may be no water pipe within a reasonable distance and gas pipes should be avoided because of their high-resistance joints.

Quite a satisfactory counterpoise earth can be made in many cases by placing several strands of wire under the floor covering.

As far as is practicable these wires should run directly underneath the aerial.

S.

Accumulator Care

EVERY amateur who uses an accumulator for valve filament lighting should see that the level of the electrolyte is always maintained about $\frac{1}{4}$ in. above the plates.

D.

Variable Grid Leak

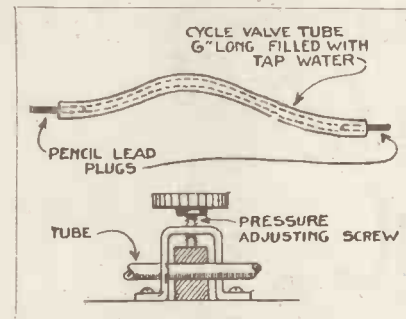
QUITE a good grid leak can be made by filling a piece of ordinary cycle valve tubing with tap water and plugging up the ends with 1-in. lengths of lead obtained from a blacklead pencil.

To give a resistance of one megohm the tube should be approximately 6 in. long, other resistances being obtained by using longer or shorter tubes as required.

Resistances up to infinity (as tested by a meggar) are obtainable by compressing the tube at some

point in its length, preferably in the centre, a device similar to that shown in the lower part of the diagram being used. Alternatively the tube may be passed through the clamping hole in a large phone terminal and the pressure adjusted by means of the terminal screw.

Care should be taken in filling the tube with water not to include any air bubbles. Probably the safest method is to use a fountain-pen filler and pass water through the tube until no bubbles are discernible when the tube is held up to the light.



Variable Grid Leak.

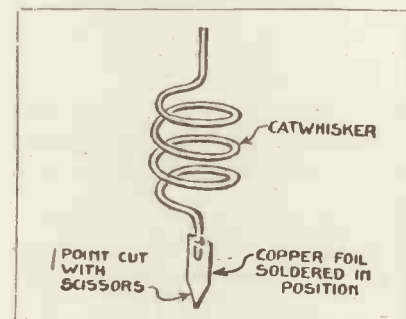
The plugs may then be inserted in the ends and the leak tested.

C. A. L.

Good Catwhisker

A POINTED catwhisker often gives better results than a contact having a blunt end; with the ordinary wire catwhisker, however, it is difficult to produce a really sharp point.

The illustration shows a reliable method of obtaining a pointed crystal contact, which, if carefully made, will be found to give superior

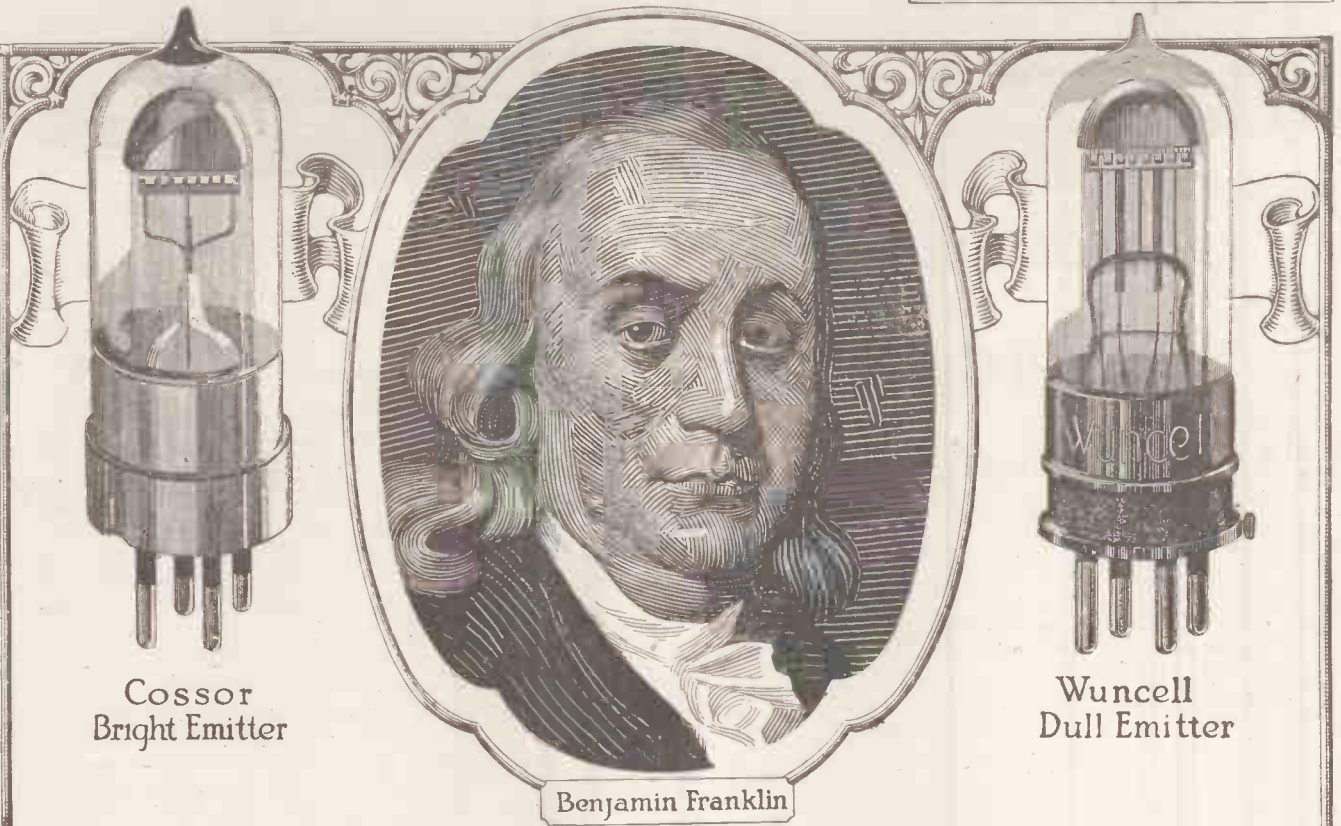


Good Catwhisker.

results to the ordinary blunt type.

Care should be taken in using the contact not to damage the point by too much pressure on the crystal.

D. B. M.



Cossor
Bright Emitter

Wuncell
Dull Emitter

Benjamin Franklin

Benjamin Franklin's gift to Radio

TO all wireless enthusiasts Benjamin Franklin should be remembered as the first man ever to attempt the extraction of electricity from the atmosphere. His early kite-flying experiments effectively demonstrated that in very damp weather when the atmosphere was heavily charged with electricity that a strong electrical current ran down the wet string.

To-day, in this country, there are more than a million Benjamin Franklins busily engaged night after night in extracting electrical energy from the ether and converting it into enjoyment. Some do it by means of simple Crystal Sets and others by means of more efficient Valve Sets. Of all the Valve enthusiasts, by far the greater proportion are

Cossor users—for there is no Valve more popular in Great Britain.

With their arched filaments and their electron-retaining hood-shaped Anodes the P1 and the red-topped P2 are a familiar sight in every Wireless shop. And now comes the Cossor Wuncell—an entirely new type of Dull Emitter—which bids fair to attain an even greater measure of popularity.

In this short space we cannot tell you its many advantages—how its filament, when glowing, is all but invisible; how volume for volume it is fully the equal of our own Bright Emitters; how in current consumption and long life it is unexcelled—all these points are fully covered in a large interesting Folder which your own dealer can give you free, or which we will send you on receipt of a postcard.

No. 3 of a Series.

Cossor Valves

My Favourite Circuit

1.—SELECTIVE CIRCUIT

By F. W. OSBORN

I THINK it can be safely said that the ideal wireless receiver should combine the following features:— Long - range reception (including proportionate strength of signals at shorter ranges); selectivity; simplicity of control; stability; maximum strength for minimum number of valves, i.e. high efficiency; reception over a wide band of wavelengths, including particularly the very short ones; ability to repeat normal reception under normal conditions. And perhaps of less importance, constant tuning, i.e. a certain range per inductance no matter what the natural capacity and inductance of the aerial to which the receiver is coupled.

Neutrodyne Circuit

There are circuits employing H.F. amplification which are efficient and stable, as, for example, the neutrodyne, but they have at least three or four tuning adjustments, and it is not easy to keep stray capacities down so that the receiver will function efficiently on the very short waves. Likewise they also require a large number of inductances per set of wave-bands.

A much different circuit is the Reinartz, with which the writer has been experimenting lately. A diagram is given (see Fig. 1) which the reader will observe consists of a detector valve with reaction (capacity), preferably followed by one or two valves as low-frequency amplifiers. A description of such a set

appeared in "Amateur Wireless," No. 127, November 8, 1924. This receiver comes nearer to the ideal receiver than any other the writer has yet tried. With a reasonably efficient aerial-earth system all the B.B.C. stations should be comfortably audible in the phones, using 2 valves, and give loud-speaker signals at 20 miles.

Selectivity

Its selectivity is also remarkably high, so much so in fact that even with Polar .0005 microfarad con-

Under this heading from time to time will be published the opinions of prominent amateurs as to what they consider to be the best circuits for different uses.

This month particulars of a special one-valve and of two two-valve circuits are given.

densers with their extended scale and straight line, fine tuning adjustments are necessary to tune B.B.C. stations in accurately.

As regards controls it is ideal, there being but two: the grid tuning condenser with fine adjustment, and the reaction condenser. All that is required is to advance the reaction condenser a few degrees at a time whilst tuning with the grid condenser, until signals are heard, and then intensifying them with a slight

adjustment of the reaction condenser. Some idea of the fineness to which the reaction can be adjusted can be gained from the fact that it is possible to bring the receiver to such a delicate state that a received signal will throw it momentarily into violent oscillation, to cease immediately and become quite stable, as the signal ceases. The receiver should not of course be used in this state. Other points are: It is quite stable in normal operation; valves are used to their best advantage, since the intervalve coupling is by low-frequency transformer; with such a receiver, using preferably a low-capacity type detector valve, a range of wavelengths from about 90 to 2,600 metres is possible. Its efficiency is, however, apparently greater on the shorter waves, say below 600 metres; the aerial circuit is aperiodic, only the grid circuit being tuned; and undoubtedly the special coil winding due to Mr. Chapman is the best. With this coil the small aerial coil is not electrically connected to the grid coil except as earth potential, but it is closely coupled to it for its length, being wound on together with the grid coil.

Aperiodic Aerial Circuit

The aerial circuit being aperiodic makes the receiver almost capable of calibration as the tuning of the grid circuit is almost constant. The interposition of a small fixed condenser between the aerial and the set makes it entirely so. A larger tuning range per grid inductance is also obtained.

(Continued on page 320)

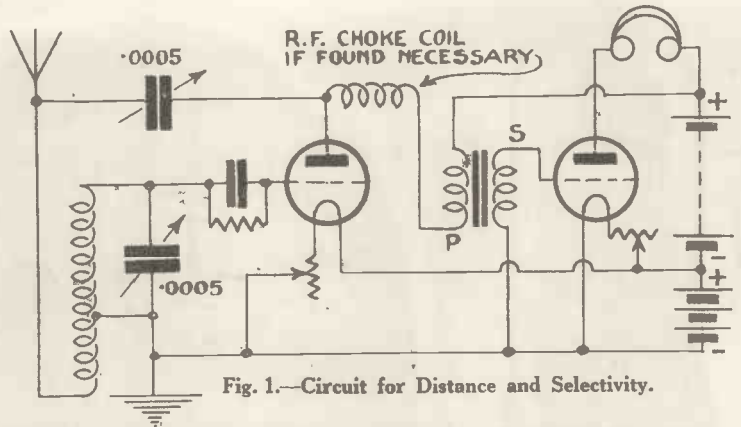
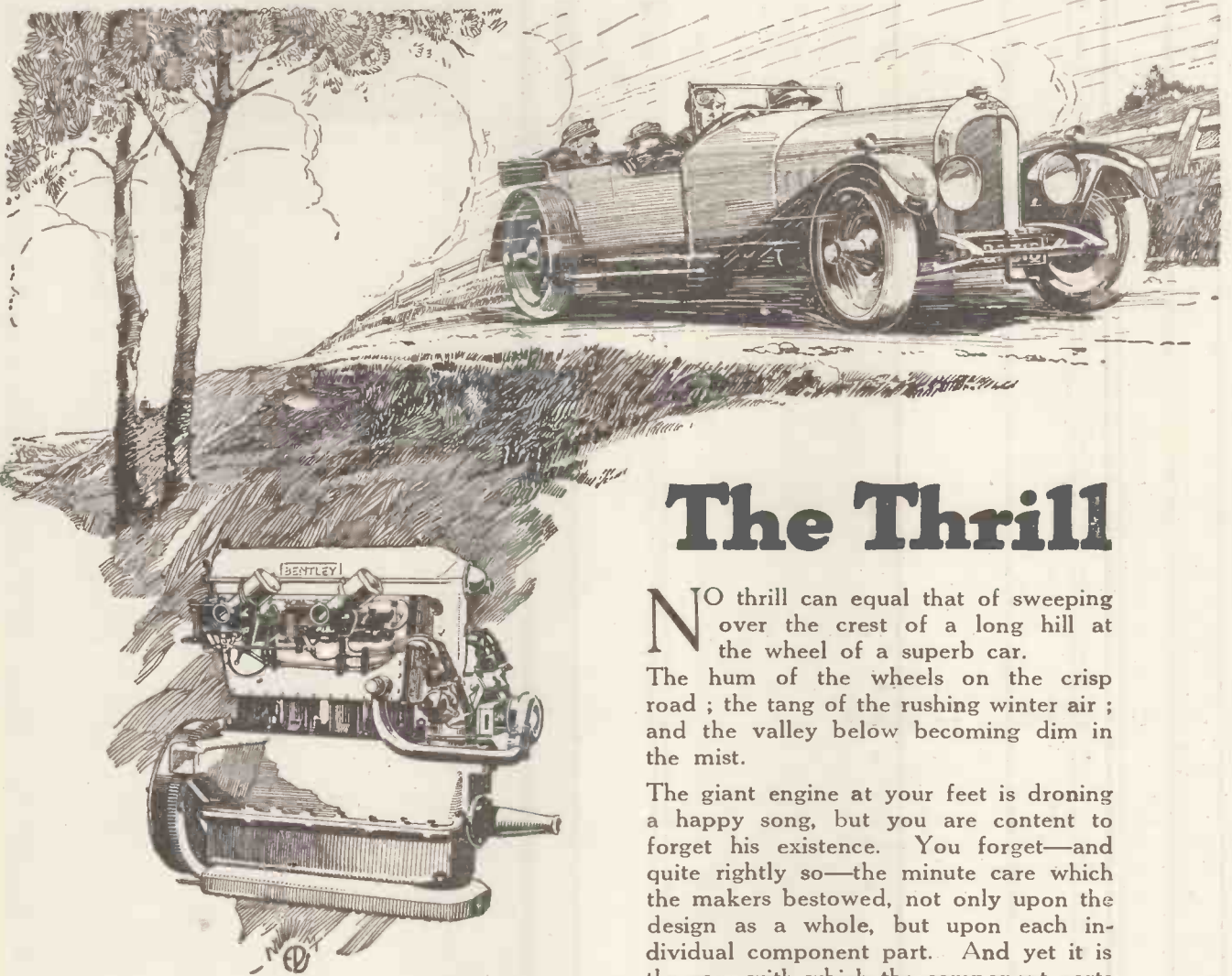


Fig. 1.—Circuit for Distance and Selectivity.

MEMORISE THESE SYMBOLS												
	Crystal Detector	Aerial	Earth	Headphones	Fixed Condenser	Variable Condenser	Fixed Coil	Coil with Slider	Coupled Coils	Variometer	Wires Joined	Cross Wires not joined



The Thrill

NO thrill can equal that of sweeping over the crest of a long hill at the wheel of a superb car.

The hum of the wheels on the crisp road; the tang of the rushing winter air; and the valley below becoming dim in the mist.

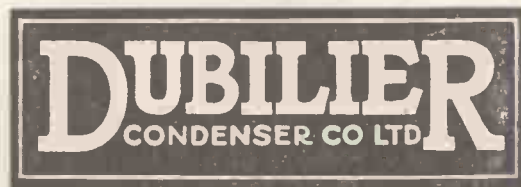
The giant engine at your feet is droning a happy song, but you are content to forget his existence. You forget—and quite rightly so—the minute care which the makers bestowed, not only upon the design as a whole, but upon each individual component part. And yet it is the care with which the component parts are selected and tested that decides the success of the whole car.

The same is true of a wireless set.

We have specialised for over 12 years on the production of better and still better condensers, because we realise how important it is for a wireless set to have only components of the highest possible efficiency.

That is why we advise you, in your own interests, to

Specify Dubilier.



Advt. of the Dubilier Condenser Co., Ltd., Ducun Works, Victoria Road, North Acton, London, W.3. Telephone: Chiswick 2241-2-3.

CIRCUITS FOR DISTANCE AND SELECTIVITY (Continued from page 318)

Altogether it is a circuit that can confidently be recommended. The main thing is to eliminate stray capacities as much as possible, keeping leads very short and to use a generous gauge wire for winding the coils, using never less than No. 22 gauge. They should preferably be of some low self-capacity winding.

Recently the writer read a description of a further modified circuit by the inventor himself. This is claimed to be more selective still, capable of calibration, and will receive as low as 30 metres; and at the first opportunity it is his intention to experiment with this—of which, perhaps, more at a later date.

F. W. O.

2.—TWO SPECIAL CIRCUITS

By 5 Y M

As a matter of fact I have three favourite circuits. I will, however, ignore the special form of Reinartz, which I think quite unbeatable as a simple circuit for long-distance work below 200 metres, and confine myself to the two circuits I use for telephony reception above 200 metres.

One of these is illustrated in Fig. 1. It is not particularly selective, but it enables rapid searching to be done, there being only two adjustments to make, one the reaction-coil coupling and the other the setting of the tuning condenser.

Circuit Characteristics

A simple arrangement of three terminals enables the tuning condenser to be put in parallel or series without the use of a switch. With the aerial connected to terminal A and terminal B connected to the earth terminal, the condenser is in parallel with the inductance. When the aerial is connected to terminal

B and the connection from B to earth opened, the condenser is in series. The use of a variable grid leak is not necessary, but is a refinement added to enable many different kinds of valves to be tried. Normally the usual .0003 microfarad

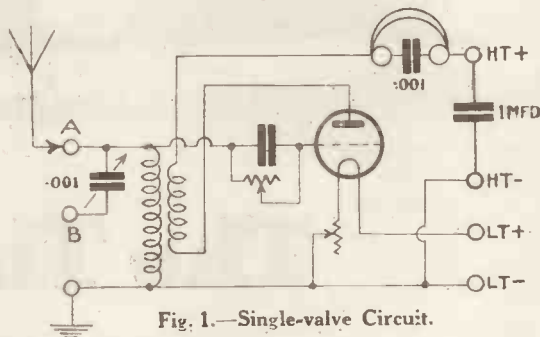


Fig. 1.—Single-valve Circuit.

condenser with a 2 megohm grid leak is all that is required.

For selectivity and for working a loud-speaker on a reasonable number of broadcasting stations I use a modified "tuned-anode" circuit, as shown in Fig. 2, connected to a two-stage note magnifier. In my opinion this circuit gives the utmost selectivity that can be obtained without the use of secondary tuning and wave-traps, which almost always cut down power. This circuit is not adapted to rapid searching because there are three adjustments to be made—the aerial tuning, the anode tuning and the coupling of the reaction coil. A further complication is introduced by the fact that an inductance is inserted between the plate of the first valve and the grid of the second, and is variably coupled with the plate coil.

This grid coil is most useful, and boosts up the signal strength considerably.

The provision of separate H.T.

leads enables just the right amount of potential for efficiency to be put on the filament-plate circuits.

Naturally this circuit gives much louder signals than the single-valve; but the complications of tuning make an accurate wavemeter almost a necessity when going for weak and very distant stations.

Final Remarks

There is one other little refinement to this circuit that may be mentioned. Switches in the H.F. circuit are an abomination, but it is possible to use this set as a single-valve without any switch. Sockets are inserted at points A and B. By making a flex connection between these two points and turning off the filament of the H.F. valve, the detector valve only is used. When this connection is made I can find no difference between the performance of the set from that of the small single-valve shown in Fig. 1.

5 Y M.

A CORRESPONDENT writes from Glasgow to say that the one thing he cannot master about his set is the

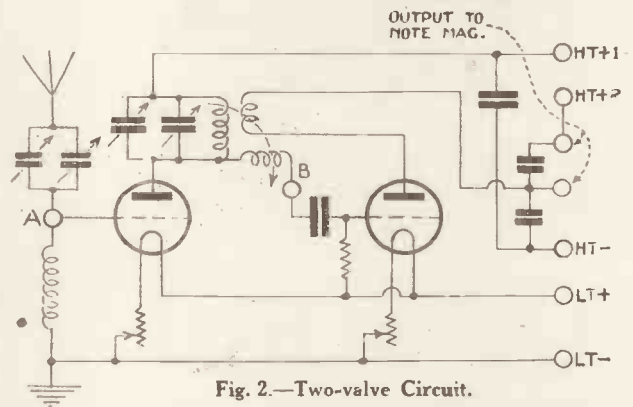
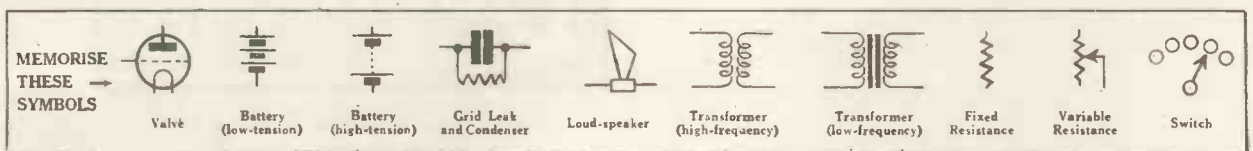


Fig. 2.—Two-valve Circuit.

tuning. That is the worst of having been reared in an atmosphere of howling bagpipes.

It has been suggested by some malicious person that listeners-in should be called upon to pay Entertainment Tax. We hope that the Chancellor will not entertain the idea.





Bring them all in—

not only the naturally loud notes that any receiver is bound to get, but those elusive passages that leave one guessing. An "ORMOND" Transformer catches and magnifies even the faintest whisper without distortion. The highly finished manufacture of "ORMOND" Products inspires the confidence of users. To those who appreciate the dependable values offered by a house with a reputation to maintain we say SPECIFY "ORMOND" PRODUCTS—ALWAYS.

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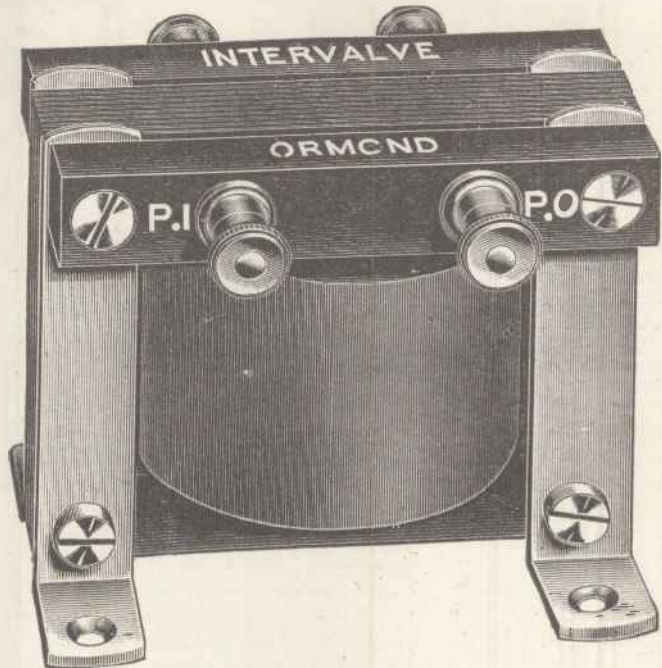
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This Transformer has been entirely redesigned as the result of extensive research, particular attention having been paid to:—

- (1) Elimination of objectionable resonance.
- (2) Correctness of ratio.
- (3) High Resistance of primary.

The use of grid cells is strongly advised. To obtain the best results the Transformer should be connected as follows:—

- P.I. to + H.T.
- P.O. to plate of detector or last L.F. Valve.
- S.I. to grid of next valve.
- S.O. to negative side of grid cells.

The positive side of grid cells should be connected to negative L.T.

It is recommended that the primary be shunted by a fixed Condenser having a capacity of from .0015 to .003 MF. The secondary should be shunted by a variable high resistance, a good quality variable grid leak is most suitable.

Grid cells should be tried from 1.5 to 6 volts to obtain best results.

The testing of these Transformers is most searching, each being tested on our own aerial before being boxed.

Price
15/-
each

25 Years' British Manufacturing Experience

A NOVEL AND CHEAP CRYSTAL SET

TO make this novel crystal set you will require a baseboard 5 in. by 8 in., four terminals, two pieces of wood each 2½ in. by 1 in. by ½ in., a small amount of No. 26 enamelled copper wire, one wooden meat skewer, crystal detector, two nails, two screws and two large cotton reels.

Wind the wire on one of the reels and, after leaving a length of 6½ in., wind the second reel in the same way (see Fig. 1). Slip the skewer through the two cotton reels and nail the ends of the skewer to the end pieces. These are afterwards screwed to the baseboard (Fig. 2).

The set is wired up as shown in Fig. 3. To tune in the local station move the cotton reels to and fro along the skewer until loudest signals are heard.

D. RYAN, Brockley, S.E.4.

⊗ ⊗ ⊗ ⊗

"AS LOUD AS FATHER'S!"

SEVERAL readers have written to say that they have made up a set similar to the one described in my corner in the first number of THE WIRELESS MAGAZINE, and are quite pleased with the results. One reader, Fred Munn (Belfast), states that he "found it a huge success" and received 2 BE, the local station, on it as loud as "father does on his set which cost £2."



MR. FLY— BROADCASTER

MARY LIND-SAY CROMBIE (Dyce, Aberdeenshire) writes of an amusing incident that occurred whilst she and sixty other girls were broadcasting from the Aberdeen station. She says: "We were singing folk songs when suddenly there was a great noise. Everything was immediately switched off, and search made for the cause of the interference."

"The noise was eventually found to

be due to a fly walking across the microphone!

"To prevent any such occurrence in the future, a piece of fine netting is now stretched across the front of the microphone." This must surely be the only case on record where a fly has performed before (or was it on?) the microphone.

⊗ ⊗ ⊗ ⊗

MIND YOUR PHONES

THE phones used for wireless reception are very delicate instruments, and if not carefully handled soon go wrong.

On no occasion should the earcaps be tampered with. The distance from the magnets to the diaphragm has been minutely estimated by the manufacturers, and if the earcaps are tampered with the probability is you will undo all that the makers have done.

(Continued on page 324)

Arthur Magee, one of my By Beith (Ayrshire) readers mounted the set on an old gramophone record and received ideal music and speech from Glasgow, twenty miles away, whilst James Carter (Melton Mowbray), aged 10 years, started making

The prize of 10/6 for the best contribution received during the month has been awarded to D. Ryan. I have also awarded 7/6 to G. Niell, for the simple aerial-earth switch on page 324. To all other contributors 5/- will be awarded.

the set one night, and the same night his mother and father were receiving America through London.

I am very pleased to hear of these successes and hope others will let me know of their experiences with apparatus described in my corner.

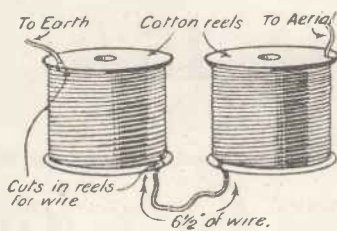


Fig. 1.—The Reels Wound.

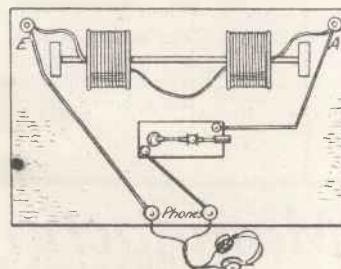


Fig. 3.—Wiring Diagram.

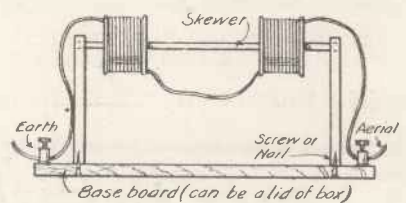


Fig 2.—The Reels Mounted.

B.T.H. Headphones

The original pattern B.T.H. Headphones achieved a remarkable reputation for sensitiveness and tonal quality. Many improvements have since been made, with the result that to-day B.T.H. Headphones are the most comfortable and convenient instruments of their kind. Some of the more important constructional features are given below:—

Price

per pair **20/-**

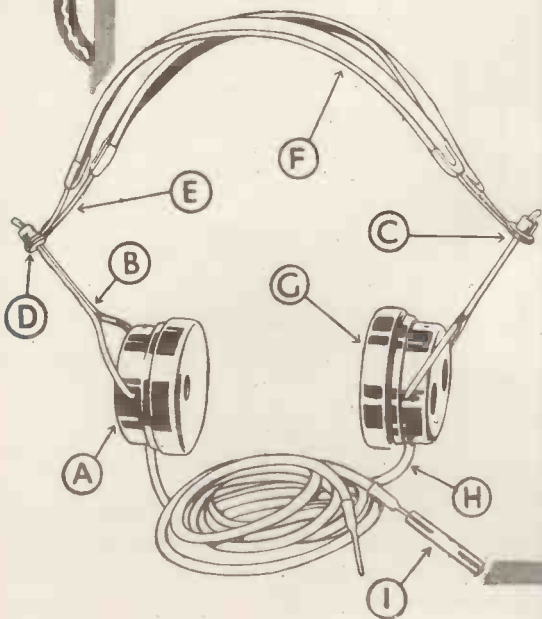
(4000 ohms)

Weight with cord $9\frac{1}{2}$ ozs.

- A The body is of special non-resonating material.
- B The stirrup moves freely within the slider, and takes up and retains its position without any locking device.
- C The stirrup cannot be completely revolved in the slider. Kinking and twisting of the cord are thus avoided.
- D The special slider adjustment obviates the use of screws.
- E Spring steel headbands give the exact pressure required for perfect hearing with ut. dis. comfort. There is no "scissors" movement.
- F The leather covering gives perfect comfort.
- G The earpieces fit closely to the ears.
- H Best quality flexible cord.
- I Nickel plated series connector.

Obtainable from all Electricians
and Radio Dealers.

Advert. of The British Thomson Houston Co., Ltd.
Crown House, Aldwych, London, W.C.2



COUSIN CRYSTA'S CORNER

(Continued from page 322)

A TELEPHONE EXTENSION BOARD

TO make a telephone extension board you will require four terminals, the lid of a boot box and a few lengths of spare wire. The terminals are fixed to the box lid as shown in Fig. 1, after which they are wired up as shown in Fig. 2.

To use the board connect two pieces of flex from the phone terminals of your set to the terminals 1 and 3. The phones are connected to the terminals 2 and 4.

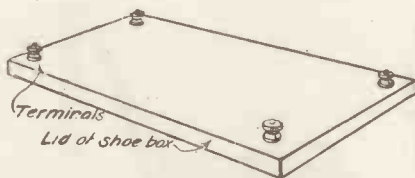


Fig. 1.—Positions of Terminals for Telephone Extension Board.

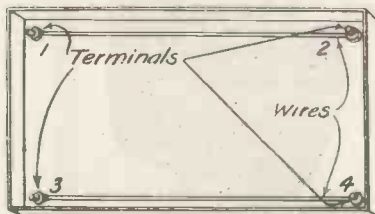
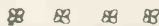


Fig. 2.—Wiring Diagram for Telephone Extension Board.

By using the right length of flex from the set to the board you can listen-in at any distance from the set you like.

DENYS HAYNES, London, W.14.



A SIMPLE AERIAL-EARTH SWITCH

A SIMPLE switch for earthing the aerial when the set is not in use may be made in the following manner. Obtain a piece of ebonite $2\frac{1}{4}$ in. by $\frac{1}{4}$ in. and $\frac{1}{8}$ in. thick. Bore the ebonite as illustrated in Fig. 1 and mount terminals in the positions indicated.

The switch is a piece of brass 5 in. long, $\frac{1}{2}$ in. wide, and $\frac{1}{16}$ in. thick. Holes and notches are cut in the brass strip as shown in Fig. 2. A knob may be fixed to one end of the switch if desired.

GORDON NIELL, Belfast.

COUSIN CRYSTA'S LETTER

THIS month I am giving a few items selected from the large number of contributions that have reached me in response to my appeal.

Whilst the contributions in many cases have been of that variety desired, others have been of no use to me, for the simple reason that they lack originality.

I must impress upon my readers the fact that only items that are original, brief, and of general interest can be accepted.

So go ahead once again, and do let me have some nice little contributions. Don't forget I pay 10s. 6d. for the best contribution received during the month, and 5s. for all items used.

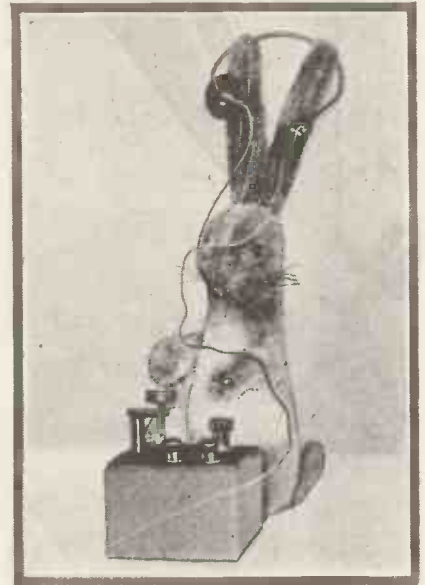
PHOTOGRAPHS, PLEASE!

It has occurred to me that many of you may have photographs of yourselves taken whilst listening in. I should very much like to reproduce some of them in my corner, so I have decided to offer a prize of 12s. 6d. for what I consider the best photograph received during the month. I will also pay 7s. 6d. to the senders of each other photograph I use.

Address all entries to:

"Cousin Crysta,"

THE WIRELESS MAGAZINE,
La Belle Sauvage,
London, E.C.4.



Bunny Listens-in.

ACCUMULATOR TIPS

THOSE of my readers who use valve sets should take care that the accumulator receives sufficient attention. Accumulators are rather expensive things, and lack of attention will soon result in their becoming practically useless.

Here are a few useful tips which, if followed, will safeguard your accumulator and add appreciably to the length of its life.

Always keep the terminals smeared with vaseline to prevent corroding.

Never leave your accumulator in a run-down condition. As soon as the "juice" shows signs of flagging get it re-charged at once.

Always see that the plates are covered with fluid. If they are not, add distilled water.

Even though your accumulator has not been used, remember it should be recharged at least once a month.



'WARE DUST!

DUST is one of the greatest enemies of wireless reception, and if allowed to accumulate on the H.T. battery there is a risk of it providing a path for the current from one terminal to the other. To guard against this the battery should always be kept in its box with the lid on.

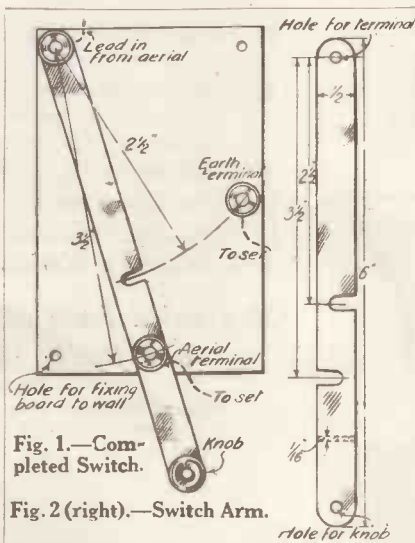
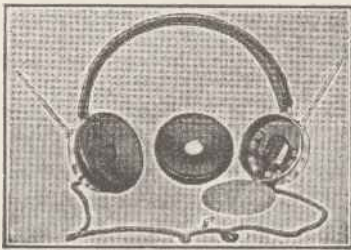


Fig. 1.—Completed Switch.

Fig. 2 (right).—Switch Arm.

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THAN **11/6** PAIR
4,000 ohms Double Headbands
TRIED, TESTED & TRUE

Hundreds of thousands of wireless enthusiasts are buying Headphones daily.

DO THEY KNOW WHAT THEY ARE PAYING FOR?

If only they stopped to think and compared values, would they pay twice as much for practically the same article?

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We should think not! And we cannot too strongly advise you to

TAKE WARNING

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I.M.I.

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HEADPHONES

Handle them, screw off the cap and examine the inside, try them on and note the comfort over your head and the close fitting at the ears, and you will realise what satisfaction means at a small cost only.

Obtainable from all dealers.

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Perfect Range

There is a **concrete** reason for the marvellous range of tone in an organ. Perfect reproduction of many instruments from wind pipes, demands perfect harmonics.

This perfect range of tone in an organ is produced by what is known as “voicing,” or the special treatment of the mouth of the pipe. In the Radiosun Loudspeaker, perfect range of tone is produced in exactly the same way.

The Radiosun VOICED LIKE AN ORGAN

Every tone is faithfully reproduced in music and speech.

The better the reproduction the greater the carrying power.

True reproduction needs a perfect range of tone with clarity, not a blare of music and a background of low harmonics.

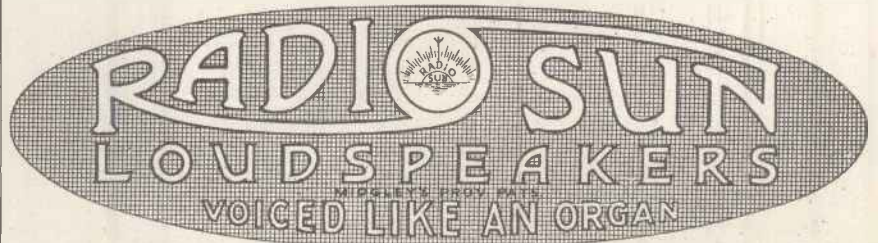
The features of the Radiosun Loudspeaker are :—

**Perfect Range of Tone,
Clarity and Carrying Power,**

which mean true reproduction.

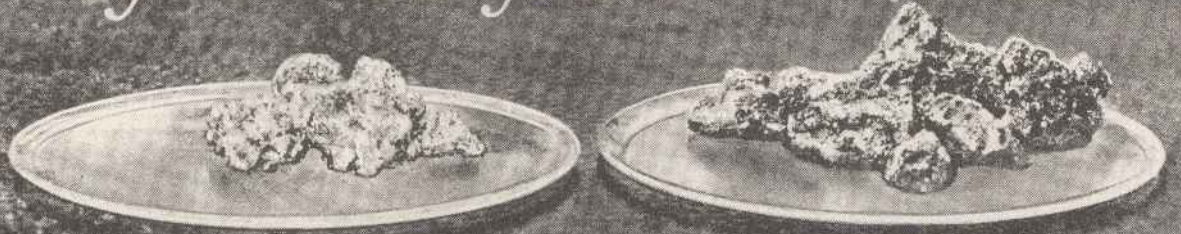
Write for leaflet, “The Wonderful Difference,” and ask your dealer to arrange with us for a demonstration.

The Radiosun Loudspeaker, in Sunlit Mahogany Finish, £5.



AUTO SUNDRIES LTD.,
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Why not make your own Crystals?



Some methods of making Galena Crystals simply explained.

GALENA is a chemical compound of lead and sulphur, and its remarkable suitability for the duty required of it in wireless is shown by the number of crystals given under the pseudo-mineralogical names terminating in "ite." As far as can be ascertained, galena heads the list for sensitivity, its only rival being a particular compound named telluride of gold and lead.

There are a number of points which influence the sensitivity of the crystal, and as a matter of interest it may be explained that synthetic galena is more sensitive than the natural galena, which would tend to show that sensitivity is influenced by chemical composition, electrical resistance and hardness.

Light-ray Catwhisker

With regard to chemical composition, it has been found that galena containing the sulphides of silver or antimony is more sensitive than the pure mineral. The question of hardness reminds one that galena and lead sulphide exhibit considerable photo-electrical activity. When experimenting with a view to substituting a light ray or an ionised beam for the catwhisker, it was also found that this activity is dependent on the condition of the surface, density and molecular structure.

Contrary to what has been said regarding the sensitivity as a rectifier of natural and synthetic galenas, chemically prepared sulphides were found less active than mineral sulphides, but when compressed into pastilles under pressure (about 8,000 atmospheres) similar results to those of mineral sulphides were obtained.

These facts are mentioned because they outline a new field of research for the experimenter.

With regard to the apparatus required, much depends upon the

interest which has been aroused and how deeply one wishes to investigate the matter of galena-crystal manufacture. A list of apparatus and chemicals which would provide ample material for several weeks' experimenting is given below, but many of these can be dispensed with if one wishes to adhere to one particular method of making a crystal.

The apparatus might include a balance and weights; porcelain crucible and lid; fireclay crucibles and lids; Bunsen burner; pestle and mortar; tripod; fireclay triangle; crucible tongs; and a microscope.

In addition the chemicals required are lead sulphide (precipitated); lead sulphide (native galena); galena and galena argentiferous (sold as minerals for analysis); silver (book of leaves); sulphur; antimony (metallic powder), lead oxide and lead.

Fig. 1 (p. 328) shows a porcelain crucible on a tripod which is used in preliminary experiments. It incidentally shows how to hold crucible tongs.

Preparing Galena

Lead sulphide or galena may be prepared: (1) By mixing sulphur with molten lead (strips of lead take fire in sulphur vapour, and burn with a vivid glow, depositing half-fused globules of lead sulphide). (2) By heating lead oxide with excess of sulphur. (3) By the action of sulphuretted hydrogen or an alkaline sulphide on oxide or salts of lead. (4) By passing carbon disulphide over lead heated a little above redness. Crystals of lead sulphide are formed. (5) By passing sulphuretted hydrogen into a solution of 3 grammes of lead nitrate ($Pb(NO_3)_2$) in 250 cc. of 10 per cent. nitric acid (HNO_3 aq. at $15^\circ C.$). This produces well-formed crystals of lead sulphide, but if only 1 per cent. of nitric acid is present, the

precipitate is amorphous. (6) Crystalline lead sulphide is produced by the action of lead oxide on thio-urea. Addition of sulphuretted hydrogen to a lead salt in presence of hydrochloric acid (HCl aq.) sometimes produces a red precipitate of what is chemically indicated as $3PbS PbCl_2$. On warming and passing in more sulphuretted hydrogen, lead sulphide is formed. (7) Prolonged action (66 years) of sea-water on metallic lead has been shown to have produced galena. (8) By immersing cinnabar (mercury sulphide) in a solution of magnesium chloride contained in a glass tube, dipping a lead plate to the bottom, and leaving, the tube well closed for six weeks, a film of lead sulphide is deposited on tube. (9) By reduction of lead sulphate with carbon, carbon monoxide or other carbonaceous matter at red heat, the carbon or carbon monoxide being oxidised to carbon dioxide, thus leaving lead sulphide. (10) Crystalline lead sulphide can be produced by heating amorphous lead sulphide with exclusion of air.

Of these methods, Nos. 3, 4, 5 and 6 are not likely to appeal to the experimenter, owing to the use of noxious materials. They are, however, included in case readers may care to experiment with them. Method No. 7, for an obvious reason, will hardly appeal to the average experimenter, though perhaps in due course we may hear of some enterprising nautical reader who has tickled the keel of his ship with a catwhisker.

In contradistinction to method No. 9, No. 8 has, with slight modifications, a sphere of utility, for it should be remembered that galena can be used as a rectifier in forms other than the well-known crystalline form; for example (a) as a thin layer

(Continued on page 328)

The Great
"HOW-TO-DO-IT"
Weekly

A paper devoted entirely to helping all who like to turn their hands to some useful domestic job or interesting practical hobby.



Q MONEY-MAKING

It helps you to make profitable use of your spare time.

Q MONEY-SAVING

It gives reliable help with in-and-out-door repairs and construction.

Q PRACTICAL

It is written and illustrated throughout by people who know the amateur's difficulties and needs.

Special Offer

To Readers of "The Wireless Magazine." A free copy of the current issue of "The Amateur Mechanic" will be sent post free to any reader who sends a postcard before April 18th to the Editor, "Amateur Mechanic," 5. La Belle Sauvage, E.C.4.

"The Amateur Mechanic" makes all the difference to you between failure and the supreme satisfaction that comes from "something attempted, something done." It is edited by Bernard E. Jones, editor of "The Wireless Magazine," Cassell's "Work" Handbooks, "Amateur Wireless," and other famous technical publications; and the contributors to it—each an expert in his own department—not only know the Amateur's difficulties, but know exactly how to direct the Handyman to achieve his purpose. The articles are simple, practical, clear and illuminating.

3^D EVERY THURSDAY

Cassell's

Why Not Make Your Own Crystals?

(Continued from page 3, 6)

of powder on a metal plate (requires applied potential to start rectification), (b) as deposited film on metallic surface (a simple way to obtain a sulphide film on metal is to place the metal in sulphuretted hydrogen until blackened). These two forms of rectifier are particularly interesting, in that they tend to substantiate the new theory that rectification is a surface phenomenon.

Method No. 9 may have its adherents, but the reduction of lead sulphate to lead sulphide is not so simple as might be expected.

Loss of Sensitivity

Lead sulphate occurs in Nature as anglesite, and can be artificially produced by roasting lead sulphide or precipitating lead salts with sulphuric acid. Lead sulphate is a poor conductor of electricity, and does not rectify, and a coating of lead sulphate on a galena crystal is usually responsible for its depreciation—not the grease film.

We have now to consider the simpler methods, Nos. 1, 2 and 10,

ments if average care is taken, but the reader should be warned that, apart from the question of lead poisoning, sulphur, for example, on being added to molten lead, catches fire, bursting into a vivid blue flame.

Considering first process No. 1, the analysis of lead sulphide usually accepted indicates that it comprises 86.6 parts of lead and 13.4 parts of sulphur. We may then adopt these proportions in making our crystal in accordance with method No. 1. A sufficient quantity of lead is placed in a crucible and melted, and sulphur is added in excess, to compensate for waste by combustion, and allowed to cool gradually.

This particular method produces crystals which are only moderately sensitive, and "spots" are few and far between, possibly on account of the fact that a certain quantity of lead sulphate is formed, owing to access of air. The same defect can be found in method No. 2, but much better results would be obtained if air was excluded from the crucible.

It is a good plan to experiment first with small quantities of material in a crucible in the manner shown in Fig. 1, applying heat from a Bunsen burner for, say, half an hour, and allowing the material to cool very

natural galena is not often found pure, but more often with a content of silver, or occasionally gold, and sometimes iron, zinc, antimony and copper.

Method No. 10 has been found to give excellent results. In a mortar thoroughly mix together, with the aid of a pestle, sulphur, lead sulphide and silver or antimony in the following proportions: lead sulphide, 88 parts by weight; sulphur, 10 parts by weight; silver or antimony, 1 to 2 parts by weight.

Then place in a fireclay crucible, and lute on the lid with clay. Place this in a muffle furnace, or in a fire in the kitchen range, for about half an hour at an orange heat, after which allow to cool very gradually, or allow the fire to die out.

Removing the Crystal

When cool remove the crucible lid, and chip away the fused mass. It will probably be necessary to break the fireclay crucible.

Remember, the slower the cooling process, the better will the crystals be found. If rapid cooling is effected, the crystals produced will have the same defects as those made according to methods 1 and 2.

Method No. 10 is also useful for



Fig. 1.—Crucible on Tripod.



Fig. 2.—Specimens of Natural Galena.

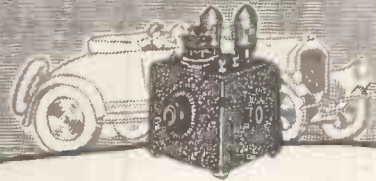
but perhaps it should first be explained that lead sulphide produced by a "dry" method (say Nos. 1, 2 and 10) has the same properties as galena. Lead sulphide produced by a wet method (say No. 5) is amorphous, but can be made crystalline by heating with exclusion of air, preferably with a little sulphur. There is little danger in these experi-

gradually—for example, by gradually reducing the flame of a Bunsen burner over a period of an hour, and finally allowing the crucible to cool by itself.

As previously indicated, the addition of a metallic sulphide to the mixture or compound formed will increase the sensitivity of the crystal product. As a matter of fact,

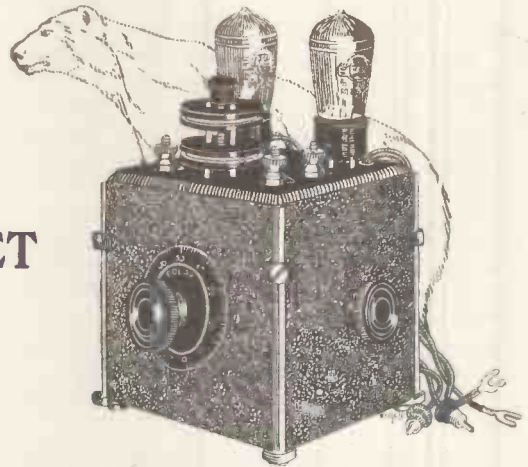
reviving or rejuvenating old or "dud" galena crystals. Break them up with a hammer, and mix them with sulphur and antimony as required, and treat in the manner indicated above. The photograph, Fig. 2, shows specimens of natural galena, while the leading photograph illustrates specimens of galena prepared as described. H. J. H.

PROGRESS



THE POLAR TWIN-SET

EFFICIENT
SELECTIVE
COMPACT
ROBUST



A sound engineering proposition built scientifically from best British material by skilled British Instrument Makers with extensive wireless experience

PRICE: £5:10:0
PLUS ROYALTY £1:5:0

The Polar Twin Set is the latest Broadcast Receiver produced by
Radio Communication Co., Ltd.

All the technical resources at our command have been focussed on the design of a set which, though compact, extremely robust and simple to adjust, will give the best performance possible with the number of valves used.

The Polar Twin Set gives a better performance than any other 2-valve set on the market, and it represents the best value for money yet offered by any Wireless Manufacturer.

There is no woodwork on the set.

Once installed and adjusted one knob only is used to switch the set on and off and to control volume.

Many elderly people who have always wanted wireless but who have been afraid of the complicated apparatus offered them are now proudly demonstrating their Twin Sets to their friends.

The fact that no other set ever produced has sold so much by recommendation indicates the satisfaction of our clients.

This is the first time we have been in a position to advertise this popular set to the public. Hitherto our entire output has been absorbed by the demand from those who have in some way or another seen, heard, and wanted it.

If you are interested in this set, ask us (or preferably your dealer) to send you our 16-page descriptive and instructional booklet. If you are not really interested, please don't.



RADIO COMMUNICATION CO., LTD., 34-35, NORFOLK ST., STRAND, W.C.2.

In writing to advertisers, please say you saw the advertisement in THE WIRELESS MAGAZINE.

WILL WIRELESS ASSIST THE POLICE ?

(Continued from page 263)

Many of the German agents who were in this country prior to and during the early part of the war made considerable use of wireless. They had an appreciation of its possibilities which we can hardly fail to share, in view of what was accomplished by them; and the medium which was invaluable to them must be invaluable also to the police.

But the police must, for obvious reasons, use a wireless system of their own, where secrecy is desirable, just as the German agents used a system of their own—information broadcast by the B.B.C. being just as likely to reach the criminals concerned as the rest of the community.

The B.B.C. provides a very useful means of circulating descriptions of missing relatives, but only in a serious case, such as murder, would it be policy for the description of a wanted person to be circulated; and then not till several days after the police had failed to track the criminal.

I do think, however, that even the B.B.C. is a better medium for broadcasting descriptions of wanted persons than the newspapers.

Newspapers, in spite of their large circulations, are not read by everybody, and most of us who do read newspapers read in them only such items as interest us.

Some people, for instance, buy a paper only to read the leading article; others to read the literary notes, or the gossip columns. But listeners in hear what they would not, perhaps, ordinarily read; and the spoken word makes more impression on their minds than the printed word that does not hold their attention.

Also, the man in a remote corner of the country who may hardly ever see a newspaper greedily devours all the news that reaches him on his crystal or his one-valve set, and it is quite on the cards that police news thus broadcast may deal with some criminal hiding in an isolated village where five or six different people regularly listen-in, and would immediately recognise the description of the stranger in their midst.

I have remarked on the extensive use to which wireless was put by German agents, but I have never had any reason to believe that wire-

less is used at all by criminals. Considering the number of wireless stations there are in the world, amateur and professional, commercial and official, I fail to see how criminals could possibly use wireless for their own ends without being detected sooner or later.

I know it has been suggested by fiction writers that criminals use wireless, but fiction writers are supposed to have imagination, whereas police officers are expected to have plenty of initiative but not too much imagination—perhaps that is why I cannot imagine the up-to-date master criminal wirelessly secret instructions to the other members of his gang!

III

Following are the views of:

*EX-DETECTIVE INSPECTOR
HERBERT FITCH*

who was formerly in the Special Branch of the C.I.D. and who, during the war, was largely engaged in rounding up spies, and incidentally was responsible for the arrest of the notorious Mrs. Wertheim and many others.

What the future of wireless in relation to crime will be it is quite impossible for any man to foretell, but slow as the police are commonly alleged to be in adapting modern contrivances to their own use it must not be forgotten that they are already making a fairly extensive use of wireless.

When they have occasion to send enquiries or instructions abroad with the least possible delay they make use—like other business people—of the Marconi system; and they have developed the art of crime detection, at all events in some of its phases, to such a degree that they can send a wireless description of a man's finger-prints to, say, the New York police, and within half an hour or so know for certain whether or not the man they have detained in this country has any place of dishonour in the American equivalent of our own Rogues' Gallery.

The Marconi system suffices for international police purposes because there isn't really a sufficient volume of business—if one may so express it—to justify a separate

and private high-power police system.

Then, again, we must not forget that there is a wireless transmitting station at Scotland Yard. It was installed after I left, to be sure, but it is there—probably, I should say, in the telephone room on the third floor.

It is used in conjunction with a "wireless tender," which is a motor-driven vehicle something like a motor ambulance in appearance, by the Flying Squad.

The officers sit inside the vehicle with a wireless set and an operator in their midst, and with headphones over their ears; and when this motor goes out in quest of a "cat" burglar, or any other undesirable person, the Flying Squad inside it are in touch with Scotland Yard all the time, no matter where they may be. Scotland Yard has also its own wavelength, so that the communications which pass between headquarters and the Flying Squad are not likely to be tapped.

The advantage of the "wireless tender" should be manifest.

Let us suppose that the Flying Squad are careering through North London in pursuit of some malefactor when suddenly the Yard receives news to the effect that the said malefactor has just been seen in Kensal Green. In less than five minutes, probably, the information has reached the ears of the Flying Squad through their headphones, and off they go to Kensal Green, round the very next street corner, and without the loss of a single instant.

The American and foreign police are ahead of ours in their methods, no doubt, but in this country progress has to go hand in hand with caution.

We have no "third degree" system; no crime reconstruction with which to terrify some possibly quite innocent person; and if the police were to club a troublesome citizen into unconsciousness instead of asking him to move on (the sort of thing that is done every day in New York) the fat would be properly in the fire.

Consequently our police authorities have to be careful not to develop their resources in any direction

(Continued on page 322)

GECOPHONE

REGISTERED TRADE MARK

Headphones

*“Happy are the Heads
that wear these Phones”*

They always bring satisfaction to the user because of the many advantages embodied in their design, and the perfect reproduction they give.

The comfortable pigskin headband is easily adjustable, and provides a ready means of obtaining just the right pressure of the large earpieces for comfort and perfect reception.

No thumbscrews are used.

The connecting cord, instead of dangling under the chin or in front of the user, is placed at the side, an obvious advantage over other types.

PRICES

CAT. NO.	OHMS	PRICE
B.C. 80	120	20/-
B.C. 85	2000	20/-
B.C. 86	4000	20/-
B.C. 87	6000	30/-

therefore ask for

GECOPHONE

Headphones

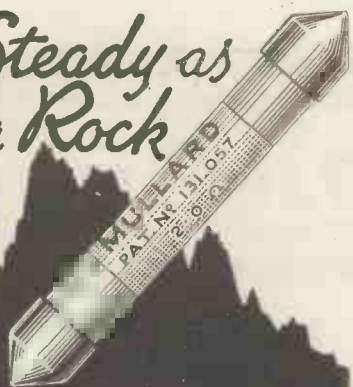
Sold by all
**GECOPHONE SERVICE DEPOTS,
WIRELESS DEALERS, STORES, Etc.**

(Manufacturers & Wholesalers only)

THE GENERAL ELECTRIC CO., LTD.,
Head Office: Magnet House, Kingsway,
London, W.C.2.

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Steady as
a Rock



MULLARD EVER-REST GRID LEAKS

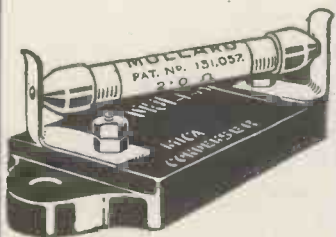
are silent in use and constant in value. Absolutely unaffected by climatic conditions.

Made in two types :

- (1) For Grid Leaks with suitable condensers ; and
- (2) For anode circuits of resistance amplifiers.

EVER - REST Grid B
.3 to 5 megohms 2/6 each.

EVER-REST Anode B
.02 to 0.1 megohms 2/6 each.



Complete with high standard and guaranteed exact capacity fixed condenser.

Grid B with .0003 mfd.
Condenser Type M.A. 5/-.
Mullard Condensers only.

Type M.A.
.0002-.004 mfd. 2/6 each.

Type M.B.
.005-.01 mfd. 3/- each.

MULLARD
EVER-REST
GRID LEAKS

Advt. (Mullard) Nightingale Lane, Bulnam, S.W.12.

Will Wireless Assist the Police? *(Continued from p. 330)*

which may even appear to interfere with the liberty of the subject; and that rather hampers things.

During the war, we made considerable use of the detectaphone, which I suppose comes somewhere between the telephone and wireless.

There were detectaphones at Brixton Prison so that we could listen-in to the conversations of German prisoners; and at the house in Cromwell Road, Kensington, on the top floor of which the captured crews of Zeppelins were interned, detectaphones were built into the walls, so that the prisoners could give themselves and their friends away without being any the wiser.

But public opinion would never permit of detectaphones being used to listen-in to our own imprisoned wrong-doers' remarks. In the English view it wouldn't be cricket.

All police headquarters throughout the kingdom ought to be in wireless communication with one another, and doubtless will be before long: in fact the police may be a little better equipped already, on the wireless side, than most people imagine.

Naturally Scotland Yard is not going to noise abroad all its little alterations and improvements. It is just as well, all things considered, that criminals (at all events) should continue to regard the Yard as old-fashioned!

IV

Just as much in favour of wireless are the views of:

**EX-CHIEF INSPECTOR
CHARLES ARROW**

the well-known crime investigator, who had a very distinguished career at the Yard.

There are immense possibilities in the use of wireless as an aid to the detection of crime and the capture of criminals, but comparatively few of these possibilities, in my view, have so far been exploited.

The police have always been conservative in adopting new ideas, and will doubtless be in the same position in regard to wireless. Of course, it has already been used officially in a restricted kind of way.

Wireless offers a wonderful field

for the prevention and detection of crime because it annihilates space and masters time; and even in the case of notices broadcast by the B.B.C. it has a huge audience—a far greater audience, indeed, than any combination of newspapers could command.

In my view, the police would do well to make considerable use of the B.B.C.—and a regular time should be set for the transmission of notices (say immediately after the weather reports) so that those who are interested, and especially police officers, would know when to expect them.

The police do not seek the assistance of newspapers without duly considering the benefit which may incidentally be given to the criminal, and they would not use the newspapers if they did not think the risk of putting the criminal on his guard was more than compensated for by the publicity secured.

The same thing applies, of course, to the assistance of the B.B.C.

I consider that Scotland Yard should take up wireless very seriously, not merely the public services, but a private service also. Every important police station throughout the country should be equipped with a receiving set, so that Scotland Yard could become a kind of clearing house for the reception and distribution of police news by wireless.

NEVER let a plumber tamper with your set. He might want to mend a leaky condenser with a soldering iron.

ANSWER to Correspondent: No; sausage aërials are not so called because of the fact that they are often high.

SOME of the language used by amateurs when trying to follow blue-prints would need blue print if we tried to print it.

THE report of a recent wireless meeting stated that it concluded with a loud-speaker demonstration. Sounds more like a Salvation Army meeting.

WHILST wireless waves are said to go eastwards more rapidly than they go west, there seems to be no doubt that the tendency of money is in the opposite direction.

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Wireless Femininities

(Continued from page 293)

For some reason this failed to come through, and the poor distracted announcer had somehow to fill forty minutes till my talk—the final item—was due. There were no musicians or singers there to call upon, so he had to do his best with the station gramophone and player-piano, and by reading selections of verse before the microphone. Extraordinary how long forty minutes can be under those conditions!

Considering his limited resources and the length of time to be filled, he was, as Kipling said of the mariner in "Just-So Stories," "a man of infinite resource and sagacity."

Sight and Hearing

All through history, it seems to me, those two most important senses, sight and hearing, have raced each other for supremacy as factors in the education and development of man.

In the Middle Ages, when none could read except the monks, and a few rich people, and books were almost as scarce as sovereigns are nowadays, education was almost entirely oral—through sermons, morality plays and the songs of the minstrels.

The invention of printing gave a fillip to sight which lasted many centuries, and was strengthened in recent years by the pictorialisation caused by the cinema. In many small towns, of course, the screen displaced the legitimate drama, the appeal of which is very largely to the hearing.

But now broadcasting is effecting a counter-revolution. Our eyes are useless to us as we listen-in; our ears are all-important. We are surely learning to appreciate the beauty and significance of sound—in music and in the singing or speaking voice—as people have not done for some hundreds of years.

Television, when it becomes a practical reality, will probably reverse conditions once more in favour of eyesight.

A. M. M.

A WIRELESS correspondent points out that WAKU station is about four hours west of Greenwich. We had no idea it was on the Southern Railway.



No. 5 of a series

The Living Artiste

PERHAPS you may have experienced the mortification—after spending many hours on the building of a choice Receiver—of hearing some candid friend ask "Is the singer a soprano or a contralto?"

That is just the trouble with many home-built Sets—the tonal quality is so unsatisfactory. Nine times out of ten the root of the trouble lies, not in the loud speaker, but in the Transformers.

If your Receiver is not above criticism—if the piano sounds "tinny"—if the loud speaker seems more responsive to some notes than to others—if the loud passages in an orchestra are an unintelligible jumble—look to your Transformers. They hold the key to the situation.

The making of a good Transformer involves much skill.

Text-books will gaily tell you of the number of turns that should go on the primary and on the secondary windings; they will even let you into the secrets of core-making. But, believe us, there is far more in the making of Transformers than that. Before a single Eureka was released for issue we had spent hundreds of pounds on experimental work. We do not begrudge this expenditure, because the hard school of experience has enabled us to produce the one Transformer that will enable you to recreate the living Artiste.

Concert Grand 30/-

Portable Utilities Co., Ltd.
Fisher Street, London, W.C.1.

Eureka 22/6
No. 2
(For Second Stage)

Supreme **EUREKA** for Tone

Gilbert Ad. 226c

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good
and
guaranteed

PROVED in the light of practical experience to be the equal of any transformer on the market, irrespective of price, the U.S. Super offers alike to amateur and expert the best that Wireless Science can produce.

Every U.S. Transformer is issued with a guarantee.

Ratio 5 : 1

From all Dealers or direct from

THE U.S. RADIO CO., LTD.,
155, High Street,
Lewisham, S.E.13.

Phone: Lee Green 2404.

Wires: Supertran, Lewis, London.

18/6



Super
Transformer



Note the New Earthing Terminal.

Continental Notes

ON several occasions when I have tuned in 1 R O, the Rome broadcasting station, I have noticed that most of the announcements and even the news bulletins were given out by a feminine voice. The call is also frequently shortened to "Radio-Roma."

Italy's main station, I understand, claims to possess the only lady announcer in Europe, a boast which, in my opinion, it cannot uphold. As we all know, the children's hour at 2 L O, as well as at some of the provincial stations, is frequently entirely managed by an Aunt without the interference of "mere man."

Talking of announcers, it is a curious fact that we have not chosen for this title a word of purely English origin. The word "announcer" is derived from the French "*annoncer*," meaning to announce or advertise. On the other hand our Paris and Brussels friends always refer to their master of ceremonies in the studio as "*le speaker*," which gives to this official a very legal and parliamentary glamour.

American Importations

I take it that "broadcast" and "broadcasting" have been imported from the U.S.A. Apparently the French have not, as yet, been able to coin a suitable term, as the verb "broadcaster," with its regular past participle, is in daily use.

Brussels

One hears very little of the reception in this country of the Brussels station, although excellent concerts are transmitted from Belgium's capital nightly. Until quite recently working on a wavelength of 265 metres, it enjoyed a little oasis of its own, but the advent of German relay and Swedish stations has rather spoilt things generally.

However, Radio-Belgique is still quite lusty, and the programmes offer a variety of good music. I wonder whether readers have noticed how, during the last few weeks, Brussels has been suffering from in-

termittent fading effects. As far as my experience goes, it appears to recur at very regular intervals.

Belgian listeners are still up in arms regarding the relatively short wavelength, maintaining that the previous one of 410 metres was very much more favourable. It would appear that the greater part of Belgium is "blind" (or should I say "deaf"?) to the Brussels station and broadcasters in that country would feel tolerably sick were 5 X X to cease its transmissions.

As a matter of fact, from all the reports I see published in Continental papers, the B.B.C. high-power station does a lot towards entertaining Europe.

Eiffel Tower

Have you noticed how transmissions from the Eiffel Tower have improved during the last few weeks? Some of the concerts are well worth hearing. I am afraid, however, that in the near future we shall be troubled by interference from 5 X X if the "Amis de la T.S.F." insist on giving their programmes on 1,500 metres.

As it is, unless blessed with a receiver possessing a selective circuit, the reception of Radio-Paris is frequently spoilt by Chelmsford.

There is a possibility that S F R, owing to interference from Scheveningen (morse), may lower its wavelength to the neighbourhood of 1,100 metres, but would this not be out of the frying-pan into the fire?

It strikes me that too little attention is given to Hilversum (H D O). This station does not advertise, and but casual reference is made to it in wireless journals. The transmissions are very good since the plant, aerial, and organisation have been improved. It is now transmitting on 1,090 metres in order to free itself from other smaller Dutch stations.

Well-known Melodies

When pottering around the continent the other night my attention was suddenly arrested by the well-known melodies of *The Geisha*. With a little patience and care, although somewhat worried by other transmissions, I tuned in Hamburg and assisted at the greater part of Sydney Jones's masterpiece.

On one or two occasions, when abroad, I have noticed how very popular this light opera is in Germany, and I must say that the "Deutsche" translation of the text

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was not at all bad. The singers, chorus, and orchestra were well up to the usual standard.

Broadcasting has proved a great success on the Alster, and two relay stations—Bremen and Hanover—have been attached to Hamburg; in fact the number of licences sold in these cities has been so great that steps are being taken to convert them into main stations for the transmission of independent programmes.

There is a possibility that by the time these notes are in print you may no longer find Hamburg on 395 metres, as, owing to the interference caused by Madrid and Newcastle and the proposed alteration in the wavelength of Leipzig, another position in the now limited broadcasting band will have to be found.

At the same time do not express undue surprise if the transmission comes in at loud-speaker strength, as in the near future the energy will be increased to 5 kilowatts.

A Complaint

With all apologies to Captain Eckersley, I do NOT like the new tuning signal adopted by the London station. It is not the oscillating valve to which I refer, but the excellent imitation of a piano tuner which precedes some of the transmissions.

It may possess advantages, but it is not worthy of 2 L.O. It comes in as a rule just before the sonorous booming of Big Ben. Is not this climbing from the ridiculous to the sublime? I do not doubt that the C.E. will find something more suitable and in keeping with, shall we say, the traditions and high standards of Savoy Hill.

The search for suitable tuning signals is not confined to the B.B.C.; our friends abroad are also devoting some of their spare time to the solution of this problem.

Hamburg uses a dinner gong, but desiring to adopt what is termed there a "pause signal" to denote intervals in the programme is now sending out, in morse, the two letters "H A, H A, H A," thus indicating the name of the city.

Quite a good idea, what? But, to the beginner, on this side, who is trying to coax his receiver into giving him clear reception it must sound as if peals of ironic laughter were coming over the ether!

"JAY COOTE."

In writing to advertisers, please say you saw the advertisement in THE WIRELESS MAGAZINE.

FEATHER  WEIGHT



Dimple Cheeks!

THE kind of Headphones that children want are those that are light in weight, that fit closely to the ears, that have long cords to allow free movement, and, finally, that are really sensitive to the merest whisper.

But aren't these the chief qualifications of Headphones for grown-ups too? If you have always felt that Headphones must necessarily be uncomfortable, heavy and clumsy you have probably never tried Brown Featherweights. Weighing only six ounces (including cords) they are a masterpiece of ingenuity.

And now that they have been reduced in price to 20/- per pair they represent better value than ever. Why not ask your dealer to show you a pair so that you can compare them for comfort with those you are at present using.

Reduced price F. type HEADPHONES 20/- per pair
120 ohms & 4,000 ohms

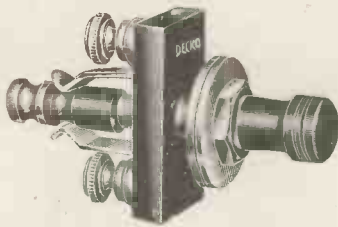
S. G. Brown, Ltd., Victoria Rd., N. Acton, W.3.
19, Mortimer St., W.1. 15, Moorfields, Liverpool. 67, High St., Southampton.

Brown

HEADPHONES AND LOUD SPEAKERS.

Gilbert Ad. 2276.

TRADE **DECKO** MARK



Click!

the contact is sure.

Above is a full size illustration of a really well-designed Battery switch at a very low price yet heavily plated and finished in the finest possible manner.

In cartons bearing the Decko trade mark.

From all dealers, or in case of difficulty write to the Manufacturers.

A. F. BULGIN & CO.,

9-11 CURSITOR STREET,
CHANCERY LANE, E.C.4

TELEPHONE—HOLBORN 2072.

WORKS—CHISWICK.

ONLY
1/6
EACH

THE BIG FOUR

Radio-Plan No. 1.—“EVENING TRIPS TO AMERICA BY THE ‘P.P.V.2’ ROUTE.” This book tells the mere amateur how to build the cheapest, most powerful, and longest range two-valve receiver. Works loud speaker or 20 pairs of 'phones within 30 miles.

Radio-Plan No. 2.—THE “P.P.V.3” and the “P.P.V.4.” The ideal family receivers. Colossal volume, astonishing range. “Like a Guards' Band,” says one amateur constructor.

Radio-Plan No. 3.—THE “T.C.1.” The wonderful little regenerative circuit. Panel costs about 16/-. With this you can scour Europe for programmes—and get them.

Radio-Plan No. 4.—The “P.P.S.3.” The Big Symphony Three. A revelation in tone quality. The circuit for the musical critic, the aristocrat of the wireless world. The super set for the loud speaker. Refined, natural and melodious. The “last word” in wireless. (Ready March 10.)

RADIO-PLANS make construction simple and certain. They are designed so that the novice can get the same results as the expert. There is nothing else like them and our help is free till success is achieved.

RADIO-PLANS can be obtained direct from the publishers and cost

TWO SHILLINGS EACH.

PRESS EXCLUSIVES

(Wireless Publishers),

2 Wine Office Court, Fleet St.,
LONDON, E.C.4.



IMP Battery Switch

Here is the switch you have been waiting for. “On” and “Off” position clearly indicated at all times. Will carry 10 amps. Price **2/9**

Ask your dealer to show you. Insist on the original.

GASTON E. MARBAIX,
27-28, Anning Street, E.C.2
Phone: 15 gate 1294.

What is Wrong with the Wireless Societies?

The accompanying extracts are taken from the winning letters in our recent competition, “What is Wrong with the Wireless Societies?” arising out of an article under that heading. To each of the writers whose initials appear on this page we have awarded a Mullard valve.

Dull Lectures

If a wireless society exists only for the benefit of broadcast listeners it is doomed to failure. If, however, it caters for the experimenter it can be quite successful. Lectures should be arranged so that the amateur attending them feels that it is worth his while.

Except in very remote cases, members will not attend to hear one of their fellow members give a lecture, but if a member from another club or a man from another town is advertised to speak, they will turn up in full force. Lectures, as far as possible, should be delivered by strangers. (L. J. W., Halifax.)

Inefficient Officials

The downfall of the wireless societies is largely due to lack of real enthusiasm on the part of the officials. A vital necessity is a secretary who loves his work and who will make sacrifices. He should

Lack of Publicity

ALTHOUGH I have been experimenting in wireless for two years and have a good many friends, keen wireless enthusiasts, I have never yet heard anyone utter a single word about wireless societies. One sees in the papers that such concerns do exist, but the matter stops there.

If the societies are keen on getting members, the usual method of informing the public that they exist and what they have to offer should be adopted. (G. J. P., Ealing.)

The root of the trouble with wireless societies lies in their total lack of enterprise as regards advertising. Many people do not know where they exist and are ignorant of their precise object. More publicity will go a long way towards solving the problem. (A. J. G. E., S.W.I.)

Avoid Cliques

The curse of all wireless societies is cliques. The multi-valve set owner is apt to look down on the owner of a crystal set, forgetting that the latter is in a position to make discoveries that may easily shake the foundations of the science. Every member should realise that he is part of the society and that it is his duty to serve it. (B. W. O. D., Uxbridge.)

I find that the average wireless society is formed by a few interested amateurs who, as soon as others join, form themselves into a clique. When this happens the rot sets in. If they are to prosper the societies must welcome new members and not allow interest to fade. (W. M., Saltley.)

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arrange his programmes so that they will interest even the most "low-brow" of members, and he should never forget that important technical matters also require attention. (W. E. H., Birmingham.)

Officials should have had a wide general experience as amateurs, and one at least should be a transmitter. I know of societies where none of the officials or committee men have ever handled a pair of phones! Members feel it is useless to approach such officials regarding their troubles. (W. F. G., Peckham.)

Influence of the Press

Wireless societies, in my opinion, are gradually ceasing to justify their existence. In the early days before broadcasting they were practically the only source of information, but nowadays, with the ever-increasing sources of information placed at his disposal through the medium of the Press, the wireless amateur naturally prefers to gain his knowledge in the comfort of the home. To put the matter in a nutshell the average amateur, instead of paying an annual subscription to the local society, would prefer to purchase THE WIRELESS MAGAZINE and "read, mark and inwardly digest" it in comfort. (H. S., Ayr.)

The aerial photograph showing the B.B.C. headquarters (at 2, Savoy Hill, W.C.2) that appeared on page 142 of THE WIRELESS MAGAZINE, No. 2, was taken by Aero-films, Ltd.

LECTURES on "How to Keep Your Teeth" are being broadcast. Personally we always harness ours to the bedpost at night with our suspenders. If they get away then, good luck to them.

AMERICAN stations are issuing stamps to people who pick up their programmes. That is quite all right, but we doubt if there are enough damp tongues in America to lick the stamps when they have been issued.

THE B.B.C. has tabulated a list of wireless inventions that are wanted. We understand that north of the Tweed there is a demand amongst paterfamilias for a receiving set that works on the penny in the slot principle, and that can be disguised as a child's money-box.

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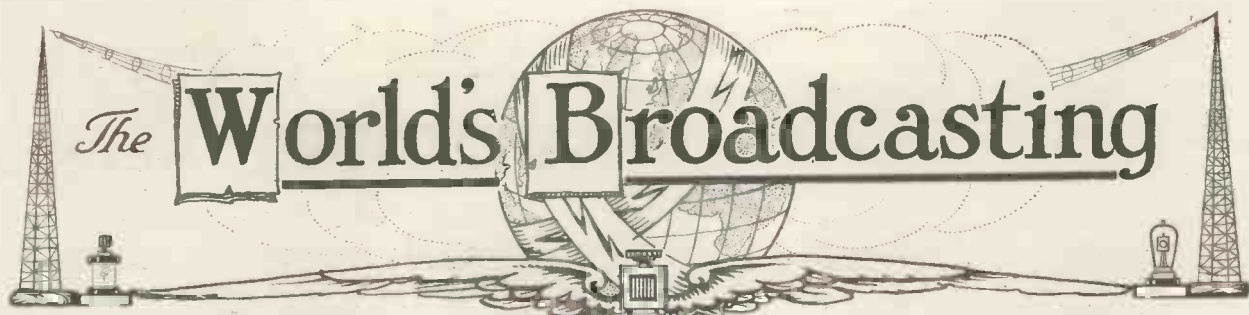
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A Temporary Aerial

IT is amazing what can be done with a temporary aerial at times. I have recently been using a temporary aerial which would be looked upon as one of the very worst aerals it is possible to devise, yet the results obtained with it have been remarkably good.

The open end of my single-wire temporary aerial was secured to a low tree, the height of the aerial wire at this end being a beggarly 15 ft.

Sloping Downwards

From the open end the aerial wire sloped downwards for a distance of some 40 ft. At its lowest point the wire was held down by means of an insulator slipped on the wire, this insulator being tied by a piece of bare wire to a fence. It was necessary to tie the aerial wire down at this point in order to make the wire pass under the branches of a large tree. At this lowest point the aerial wire was only 10 ft. above the ground.

After passing through the insulator at its lowest point the aerial wire sloped upwards to the leading-in end. At this end the wire was secured to an insulator, which was in turn secured to a light pole pushed out of a bedroom window and held in position by the lower window-sash.

A Circuitous Path

The down-lead of the aerial came down at an angle of 45 degrees, passed round a corner of the house and over a small laurel bush, and thence to the lead-in tube. Looking at this temporary aerial from the side, I could not help seeing that in erecting it I had done about every blessed thing I ought not to have done. In fact, one wireless neighbour when he saw my temporary aerial remarked:

"Well, you won't pick up much with that aerial."

But didn't I, though? Not only did I get the local broadcasting station at loud-speaker strength on two valves, but on three valves I got loud-speaker strength from Bournemouth, which is a good 80 miles away. The best feature of my temporary aerial was its selectivity, and I have been wondering whether there is anything in the idea that a low aerial is rather more selective than a high one. A. K.

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Although the crystal is more efficient than the valve as a pure rectifier or detector of wireless signals, it is impossible for an ordinary crystal to feed more energy into the phones than is actually picked up by the aerial.

The valve is not so limited. In fact, by using several successive stages of valve amplification, it is possible to increase the signal energy

high- and low-frequency currents simultaneously.

On the other hand, the ordinary one-valve set illustrates the use of a single valve as a simultaneous rectifier and amplifier. However, in every case where a valve is used to perform a double duty, some of its full efficiency is necessarily lost.

Valve as a Relay

A relay may be defined as any device on which a small applied or "input" force releases or controls a comparatively large "output." For example, a slight pressure upon an electric switch may be sufficient to stop, start, or regulate the speed of a thousand horse-power motor.

Regarding the valve in this light, the input force applied to it is the voltage or electric pressure set up across the aerial inductance A, Fig. 1 (see page 342), by the incoming signal waves.

In the case of a standard P.O. aerial located from fifteen to twenty miles from a broadcast station, the induced E.M.F. will be of the order of a few volts. The aerial energy value, is, however, extremely small, as the corresponding aerial current is measured in microamperes.

Voltage Operated

Here it should be mentioned that the valve is a voltage-operated device. The current flowing on the aerial does not pass through the valve. All that happens is the transfer, from the top of the variometer to the grid of the valve, of a sufficient number of electrons to keep the potential of the latter in step with the changing aerial voltage.

As the grid is of very small capacity, this "electrostatic charge" takes practically no power from the aerial.

Inside the valve there is a constant liberation of electrons from the glowing filament. Under the compelling attraction of the applied H.T. voltage, the emitted electrons are carried forward in a stream towards the plate, passing between the spiral coils of the grid on their way.

When no signals are being re-

ceived, the current in the plate circuit is steady and of the order of a few milliamperes, at a pressure of, say, 80 volts (the applied H.T.), representing in all a power output of roughly a quarter of a watt.

If the grid is made positive by the voltage tapped off from the aerial inductance the electron flow is increased and the current in the external plate circuit rises accordingly.

If, on the other hand, the grid potential falls in step with the aerial voltage, then the electron stream is clogged, or blanketed, and the plate current falls in sympathy.

The precise relation between the applied grid voltage and the resultant plate current is best shown by taking a series of successive measurements and plotting the grid-volts and plate-current readings one against the other in the form of a curve. Fig. 2 shows two typical valve

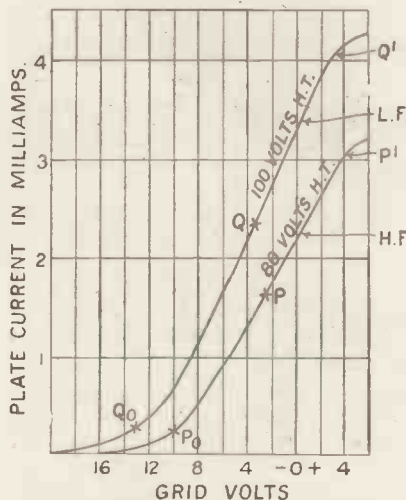


Fig. 2.—Two Characteristic Curves.

to more than a million times its original or aerial value.

The main function of the valve, then, is to amplify—either radio-frequency oscillations or low- or audible-frequency currents. Even when it is being used as a rectifier, the wireless impulses are magnified in their passage through the valve, although in this case some of the amplification effect is deliberately sacrificed for the sake of rectification.

The popular reflex or dual-amplification receiver shows how a single valve can be used to amplify both

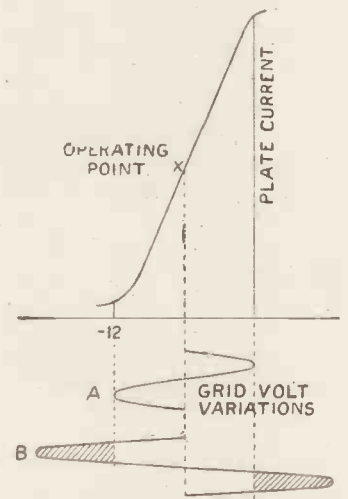


Fig. 3.—Diagram Illustrating Distortion.

"characteristics" of this sort, one of a high-frequency amplifier (P) and the other of a low-frequency amplifier (Q). It will be seen that the two curves are very much alike, except that the L.F. curve is displaced somewhat to the left of the H.F. curve.

For amplification pure and simple, whether of high- or low-frequency currents, the chief requisite is that changes in the plate circuit shall be of precisely the same form as those applied to the grid.

The amplitude of the plate current variations will be much greater than

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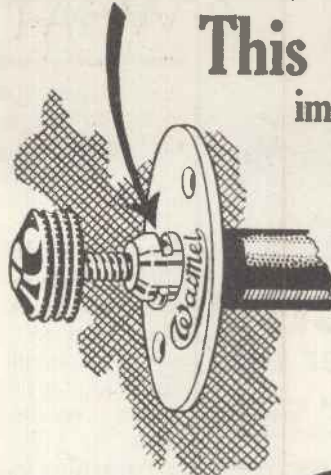


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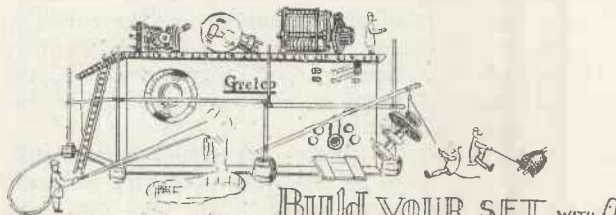
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P.5.

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WHAT YOUR VALVE DOES (Continued from p. 340)

that of the grid voltage changes, owing to the amplifying action of the valve, but the *form* must remain the same, otherwise distortion arises.

Working at Mid-point

It is obvious that in order to secure this constant relative proportion between input and output, the valve should be worked at about the mid-point of the straight line, i.e. at P on the H.F. curve and at Q on the L.F. curve.

When this is the case the applied grid voltage variations can sweep between the points P_0 and P_1 , or Q_0 and Q_1 without passing on to any curved portion of the characteristic. At the same time the amplitude of the plate-current changes are as large as possible, so that the valve will be working at maximum efficiency as an amplifier and without distortion.

It will be remembered that in order to rectify incoming signals the grid potential must be adjusted either to the upper or lower bends of the characteristic curve, or else the leaky condenser method must be used.

If the valve is working at either of the bend points, it is quite obvious that it cannot, at the same time, give an equal amplification to that secured at the straight-line part of the curve.

With a grid leak the rectifying effect is ultimately secured by setting up a grid current, which involves a leakage or waste of some of the applied grid voltage and a corresponding loss in amplification.

In both cases, therefore, the valve, when used as a rectifier, must necessarily operate with diminished efficiency as an amplifier.

Excessive Grid Voltage

Fig. 3 shows the effect of applying excessive grid voltage, say, in the case of a low-frequency amplifier. Provided the grid-voltage variations indicated by the sinusoidal curve A lie within the two vertical lines representing the upper and lower limits of the straight line part of the characteristic, the amplified output will be free from distortion.

If, however, as in the curve B, these limits are exceeded, the shaded portions produce no equivalent effect in the telephone or output

circuit. The higher harmonics necessary to preserve the true quality of speech or music are therefore lost, and the reproduction becomes distorted and unnatural.

The voltage variations applied to the grid of a low-frequency amplifier are obviously much greater in magnitude than those applied from the aerial inductance in high-frequency amplification.

Distortion

When a single valve is used both for high- and low-frequency amplification, as in a dual circuit, the

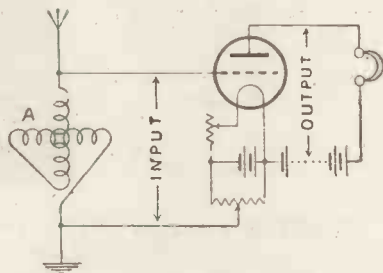


Fig. 1.—Valve Circuit

H.F. fluctuations may be well within the amplitude of the curve A, Fig. 3, but the L.F. voltages may easily exceed the permissible limits, as at B, and thus give rise to distortion.

Generally speaking, it is impossible to get maximum efficiency from the same valve when used for both high- and low-frequency amplification, the best results obtainable being essentially in the nature of a compromise.

B. A. R.

THE Canadian Railway travellers now have wireless, but those on our Southern Railway have to be tireless.

If there be anything in the theory that transmission improves in wet weather, we in this country ought to count ourselves extremely lucky. MANY women are realizing that wireless is more than a toy. Some day we hope, the same truth will dawn upon them with regard to their husbands.

OFFICIAL reports show that there are more juvenile delinquents than ever. We await the inevitable announcement by the Killjoys' Society that this backsliding is due to wireless.

In writing to advertisers, please say you saw the advertisement in THE WIRELESS MAGAZINE.

"Here, just listen to this



-I've never before had such fine reception!"

You can share this lucky fellow's enthusiasm when you have tried a "Uralium" Crystal on your set. "Uralium" is a natural product, and the finest thing in the way of wireless crystals that has ever been discovered. You naturally want the best reception your set is capable of. Well, there is one way to get it. Use—

Uralium

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LIVERPOOL : A. E. Ovington, 29, Sefton Park
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Prov. Patents.



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"CHASEWAY" IS RELIABLE FOR ALL TIME.

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V. Pethick—Advertising—London.

THE BROWNIE WIRELESS

—and the Crystal that made it famous!

For 7/6 you can buy this splendid Crystal Receiver and enjoy broadcasting at a distance of 25-30 miles from a broadcasting station or, with loading coil attached, up to 120 miles from Chelmsford. Complete with solid moulded Ebonite cap, high-grade Nickel fittings, glass protected Detector, D.L.5 Crystal and "Palladium" Catwhisker 7/6

Chelmsford Coil, 1/6.

An ebonite base, of attractive design (as illustrated) to fit all models, is now available at an extra cost of 1/6



Two large pieces of crystal and the essential "Palladium" Catwhisker carefully packed in dust proof case 2/-

From most dealers or direct.

Now for a word about the D.L.5 Crystal—the excellent "Brownie" Rectifier. Possessing a rare sensitivity and stability, it is constantly creating reception records. Get some to-day and enjoy crystal reception at its best.

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(Facing Warren Street Tube Station.)
Telephone : Museum 3747.

D.L.5. CRYSTAL

and

"Palladium" Catwhisker



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2 L O's NEW TRANSMITTER

If all has gone well readers will by now have listened to transmissions from 2 L O's new station which has been erected on the roof of one of London's great business buildings.

To impose two great steel towers on the roof of a building that had not been specially designed to receive them was no light undertaking, and the services of the steelwork designer responsible for the main building (Mr. S. Bylander) had to be brought into requisition.

Aerial Towers

He designed two graceful towers, the taller of which is 125 ft. high, 20 ft. square at the base and 2 ft. square at the top. The taper from base to top is on a curved line. The span between the two towers is 250 ft., but not the whole of this length will be occupied by "live" aerial.

The aerial itself consists of two cables, each 19/16, held apart by two ash spreaders 15 ft. long. In each aerial wire is a couple of sets of eight shackle insulators and the

cables that support the spreader are similarly equipped.

The lead-in takes the form of two four-wire "sausages," which are led to a big pot insulator in the roof of the transmitting room. (These leads may themselves be used as aeri-als.)

There are, in fact, two rooms, one the power or machine room and the other the actual transmitting room. The power room contains two 12-kilowatt motor-alternator sets, each capable of generating current at 500 volts 300 cycles for supplying power to the transformers and rectifying valves.

There are also two motor-generators of 10½ B.H.P. supplying a current of 400 amperes at 32 volts for charging the batteries which feed the filaments of the big transmitting valves. A 15-ft. switchboard contains the necessary switches, fuses and meters.

The 12-kilowatt Marconi Q-type transmitter embraces four panels, containing in all fifteen valves of different types. The rectifiers take their current from two step-up transformers and from these rectifiers

the current passes at a tension of 10,000 volts to the plates of the transmitting valves.

Leading off the transmitting room is the battery room, in which are two complete sets, each of eleven cells, for use alternately, each set being of 800 ampere hours capacity and the discharge rate being 90 amperes.

It should be understood that the actual studios remain at 2, Savoy Hill, W.C.2, the connection to the new transmitter being by means of a number of land-lines which at the West London transmitter terminate on a jack board.

Power and Range

We must say a word or two as to the power and range of the station from the listener's point of view. The B.B.C. are not willing at the moment to state that the station will do much to improve the strength of signals, but they believe that the signal range will be increased by 50 per cent. We are hoping that they are all too modest in their (official) expectations.

SHIPTON PRODUCTS

Wireless Components produced by Shiptons represent just that increase of efficiency which means better results for you. Build Shipton Apparatus into your sets: these will give you the utmost satisfaction. Get Shipton Products from your dealer.

SHIPTON NEW TYPE STRIP RHEOSTATS

The 7-ohm Model is fitted with a fuse, which little device may save you the cost of an expensive valve. In operation they are noise free—quite an important consideration.

- SHIPTON New Type STRIP RHEOSTAT 7 ohm (with fuse) 3/-
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 - SHIPTON New Type STRIP RHEOSTAT 60 ohm 3/-
 - SHIPTON POTENTIOMETER 600 ohm 4/6
- Packed in neat linnenette boxes.

SHIPTON NEW TYPE VERNIER COIL HOLDER

Gives perfect adjustment. Solid Ebonite. No loose connections. 2-way price 4/-. 3-way price 7/6. Nickel plated—2-way price 4/6. 3-way price 8/-. For Panel Mounting.

SHIPTON COILS

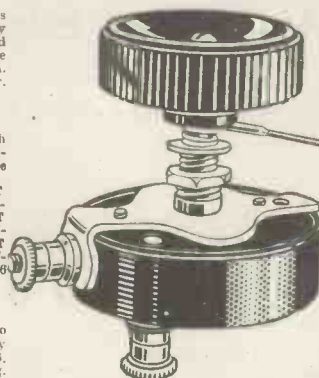
Double basket wound. Enamelled wire. A really highly efficient coil.

Size 1	100-350	4d.
" 2	200-350	5d.
" 3	300-450	6d.
" 4	400-550	7d.
" 5	500-750	8d.
" 6	600-1,000	9d.
" 7	900-1,350	10d.
" 8	1,200-1,800	1/-
" 9	1,500-2,500	1/2
" 10	2,000-3,000	1/4

Double cotton covered coil 2d. extra.

SHIPTON NEW TYPE VARIABLE GRID LEAK

FARADAY HOUSE TEST REPORT T/252/H. The gridleak submitted was tested for resistance at various positions of its handle, and the resistances varied continuously from 0.5 megohms to 6.5 megohms. Silent in operation. Constant under different settings. Can be calibrated accurately. Reliable under all conditions. PRICE 3/-. You cannot afford—if it is good reception you want—to risk an unreliable gridleak. Get a SHIPTON—you can't go wrong.



If your dealer cannot supply send direct to:
E. SHIPTON & CO., LTD.,
 37, TOTHILL STREET, WESTMINSTER, S.W.1.
 Telephone—VICTORIA 7. Telegrams—"RENTFONES, PARL."
 Also at 14, King Street, Covent Garden, W.C. 2.
 Trade Enquiries Invited.

WONDERFUL WIRELESS INVENTION

MAKES "LESS" WIRELESS

Catwhiskerless, Batteryless, Worryless, Fuss - and - botherless Wireless.

Replaces old-fashioned fiddle-fumble catwhiskers and permanent permanent detectors

The new invention—the "Hovimo" Crystal Valve—replaces fiddle-fumble catwhiskers and old-fashioned detectors. Its use means no more fuss, no more bother, no more worry, and no more disappointment—just a certain and speedy end to all your detection troubles.

The "Hovimo" Crystal Valve is easily fitted into any set, and is equally excellent for crystal sets and for circuits employing crystal rectification, as well as for crystal loud speaker systems.

Just a turn of a milled screw and the "Hovimo" Crystal Valve gives you, in an instant, the finest reception of which a crystal is capable—uninterruptedly pure and bell-like tone, which continues even if you move the set.

EVERY ONE GUARANTEED.

HOVIMO CRYSTAL VALVE

EVERY ONE GUARANTEED

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From dealers or post free direct.

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The "Hovimo" Crystal Valve is an entirely new invention, and must not be confused with the Silicon-ber-nite or similar combinations.

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GUARANTEED

The Transformer that is the outcome of long Scientific Research. Perfect in construction, reliable in use, it is tested on Aerial and carries a 12 months' guarantee.

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Latest Standard Model General Radiophones (made by the well-known General Radio Company, Ltd.) are



Super Sensitiveness and Highly Efficient. Air gap adjusted to within one half thousand of an inch. Receivers are matched in tone. Magnets of highly expensive Cobalt Steel. Diaphragms are triple tested. Accurately designed sound chamber gives a natural tone. Beautifully comfortable, highly finished and only weigh 7 ounces. Fully guaranteed.

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We send a pair of these high quality headphones upon receipt of 1/- deposit. If satisfied you send 2/6 more on receipt

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belong to the past; they are replaced by up-to-date articles giving better service. Nobody uses a crinoline or cannon ball now, and for the same reason the valve user goes for the very latest production. Hence the phenomenal sale of the . . .

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DULL EMITTER
2 v. 0.2 a.
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ON A SINGLE VALVE
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The combination of a rare ore of high intrinsic hardness with an element of exceptional purity, giving unsurpassed reliability, sensitivity and efficiency.

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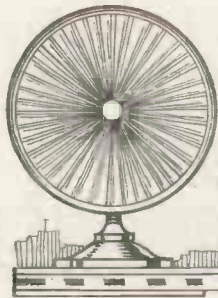
It is VIBRATION-PROOF because the correct pressure is 4 ounces.

CRYSTALS only 2/6	GHANE-TELLITE Detector unmounted 5/6	GHANE-TELLITE Detector Mounted 9/6
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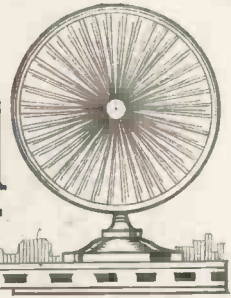
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Questions Simply Answered



Cage Aerials

Q.—Is a cage type of aerial satisfactory?—F. D. M. (Beckenham).

A.—Where an aerial with a large self-capacity is desired, such as for transmitting, the cage type of aerial is used. Such an aerial is inefficient and should not be used for short-wave reception.—X.

Constant Valve Burn-outs

Q.—I have a three-valve dual receiver in which the detector valve is constantly burning out. The rheostat does not appear to regulate the brilliancy of the filament, and yet I always use maximum resistance. What is the cause, please?—G. H. C. (Ealing).

A.—Since the valve appears to last some days before burning out it points to the fact that your valve filament is being overloaded with current. Use a rheostat having a higher maximum resistance and adjust the valve to a lower brilliancy.—M. K. D.

Fixed Condenser Plates

Q.—In constructing small fixed condensers is it necessary to use tin-foil for the plates or is copper-foil as good in all respects?—R. S. D. (Broadstairs).

A.—From the point of view of electrical efficiency there is nothing to choose between the two metals. Copper-foil is generally more robust and is therefore often preferred to tin-foil.—X.

Reaction Coil

Q.—What is the reaction coil often mentioned in conjunction with valve sets, and what is its use?—L. F. T. (Hastings).

A.—The reaction coil is that coil wired up in series with the plate circuit of a detector valve and coupled into the grid coil or aerial coil of the receiver. The incoming signals are amplified by the valve, and in passing through the reaction coil are fed back into the source of supply and are still further amplified through the valve.

Such amplification is known as regenerative amplification.—F. R.

Length of Lead-in

Q.—Would it be best to have a long lead-in and a short aerial or a long aerial and a short lead-in?—J. K. S. (Liverpool).

A.—These points are not the most important to be borne in mind when undertaking the erection of an aerial.

Aerial height is the main consideration up to a certain point, but in addition to this, the horizontal portion plays an

important part in long-distance reception. For the amateur who is restricted to 100 ft. overall aerial length it is as well to compromise, using as high an aerial as possible with a fairly long horizontal spread.

If directional effects are not desired a perpendicular aerial with lead-in wire combined is certainly to be advocated.—M. K. D.

Adding a Power Amplifier

Q.—I have a single-valve receiver and am adding a one-valve power amplifier. Should I use the same H.T. as that used on the detector?—F. P. H. (Glasgow).

A.—The power valve will work much better with about 120 volts on the plate. If your present battery is 60 volts, add another 60-volt battery in series. The grid will require a more negative potential and this may be applied by breaking the connection between the secondary of the transformer and L.T. and inserting a battery of about 6 volts tapped every 1½ volts. The supply from this battery should be varied until the right voltage is obtained, when clear amplification without distortion will ensue.—T.

YOUR QUESTIONS ANSWERED

At some time or other you are certain to come up against some difficulty in wireless that you cannot solve unaided.

Instead of worrying yourself with knotty problems, let the Technical Staff of THE WIRELESS MAGAZINE answer your questions for you.

Replies of general interest will be published each month, but a post reply will be sent without delay to every question if the following conditions are observed.

Ask one question at a time; write on one side of the paper only; attach to it the coupon on page 359; and send it with a stamped addressed reply envelope to: The Editor, THE WIRELESS MAGAZINE, La Belle Sauvage, London, E.C.4.

Transformer Connections

Q.—Which is the right way to wire up a standard low-frequency intervalve transformer?—D. T. M. (Sheffield).

A.—The usual connections are as follow:—

IP to + H.T. IS to grid
OP to plate OS to — L.T.

Some manufacturers now appear to be departing from this rule, so that in order to ensure correctness purchasers should study the instructions enclosed with each instrument.—F. R.

Filament Rheostat

Q.—What gauge and type of wire is suitable for making a rotary rheostat for bright-emitter valves?—F. S. T. (Leatherhead).

A.—No. 23 s.w.g. Eureka resistance wire will be suitable. About 3 yards of wire will be sufficient.—X.

"Freak" Reception

Q.—What is meant by "freak" reception?—C. B. (Birkenhead).

A.—Freak reception is a peculiar change in the range of a wireless station, which takes place without any alteration having been made to either transmitting or receiving instruments. Under "freak" conditions the range may increase considerably only to fall considerably when normal conditions are restored.

In some cases a near-by station may be inaudible to a near-by listener, and perfectly audible to a listener many miles away.—Z.

Aerial for Short Waves

Q.—What is the best type of aerial and earth for short-wave reception?—P. K. (Wem).

A.—This can best be determined by experiment, but a very satisfactory method is to have an aerial consisting of 50 feet of No. 26 s.w.g. enamelled wire, and a counterpoise of the same dimensions suspended directly underneath about 8 feet from the ground.—U.

Fibre Panels

Q.—Can I use red fibre for a panel? It is much cheaper than ebonite.—A. L. M. (Nuneaton).

A.—Fibre should not be used for panels as it is liable to leak badly, owing to its absorption of moisture. Fibre often warps badly. It always pays in the end to buy the best ebonite obtainable; this is certainly more expensive than fibre, but it is reliable.—F. R.

Results with "As Good a Set as Money Can Buy"

SINCE the publication of our first number many readers have written to ask what exactly are the capabilities of the four-valve straight-circuit set described under the title "As Good a Set as Money Can Buy."

We know that this is a good set and are pleased to hear that many readers are getting excellent results with it. One reader writes:

"A four-valve set built to the specification and instructions given in No. 1 of THE WIRELESS MAGAZINE has been giving me excellent results for the last few weeks. All the B.B.C. stations—including relay stations—have been received at good strength, many of them on the loud-speaker, with three valves.

Loud-speaker Reception

"Many Continental stations have been received; some half-dozen German stations come in with ease. I can rely on loud-speaker reception of French stations like "Le Petit Parisien," Radio-Paris, and the Eiffel Tower, while Radio-Iberica is always to be heard.

"Opera from Brussels can be listened to for hours on end. I rarely use four valves for anything, even for loud-speaker reception.

"On the only occasions when U.S. reception was attempted, W G Y and W B Z came through excellently.

"Tuning is fairly selective and very simple owing to the small number of controls. I give below the numbers of the basket coils found to be most efficient.

"For wavelengths between 320 and 400 metres, a 35-turn coil in the aerial circuit, 75 for the tuned-anode and 75 for reaction. London, curiously, comes in best with a 50 for the tuned-anode. Chelmsford and Radio-Paris are best with a 150 for the aerial, 275 for the tuned-anode and 100 for reaction.

"The higher wavelength B.B.C. stations need a 50 for the aerial, 100 for tuned-anode and 75 for reaction. Brussels and the German stations just below 300 metres take a 25 in the aerial, 50 for the tuned-anode and 75 for reaction.

"When I first tuned-in London,

I was rather worried by an unaccountable fading effect. When London was roaring in on three valves, fading would suddenly set in and hardly anything could be heard, even with the use of the fourth valve.

"The trouble has not occurred, however, since I changed the 1.5-megohm grid leak for a 2-megohm one."

Another reader writes:

"I have finished the four-valve set you gave in THE WIRELESS MAGAZINE. I have given it a very severe test on an aerial 25 ft. high.

B.B.C. Stations

"I find all stations come in well and at good strength except Aberdeen. Belgium, Germany and France on short wavelengths are very good indeed.

"You can make what use you like of this letter as I have no hesitation in saying that this is the best set I have handled so far."

DE LUXE RADIO AT BARGAIN PRICES

SUPER CRYSTAL SET
(as illustrated)

32/6

Built to receive CHELMSFORD as well as usual B.B.C. stations. No extra coils needed.

1-VALVE SET

£5.5.0

2-VALVE SET

£8.10

3-VALVE SET

£12.10

Send for particulars:

NATIONAL WIRELESS & ELECTRIC CO.,

42, GRAY'S INN ROAD, LONDON, W.C.1.

Branch: 79, Cannon St., E.C. Tel.: Holborn, 4756



SEND FOR LISTS



THE NEXT BEST THING TO A VALVE!
TRY A SAMPLE TUBE

SENT POST FREE FOR 1/6

"RECTARITE" is not a new Crystal—it is well known to all the old Radio experimenters and most of the new.

The Government used it during the war and are using it now!

Many Crystals look like "RECTARITE," but the results they give are disappointing. "RECTARITE" never lets you down. It is the same to-day as 15 years ago—THE ORIGINAL AND THE BEST! Cut out this advertisement and send it to us together with your name and address, and we will mail you post free our 44-page Radio Catalogue containing particulars of "RECTARITE" and all kinds of Radio components, materials, etc.

WRITE TO-DAY!

ECONOMIC ELECTRIC LTD.

Head Office: 10, FITZROY SQUARE, LONDON, W.1

Showrooms: 373, EUSTON RD., N.W.1

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In writing to advertisers, please say you saw the advertisement in THE WIRELESS MAGAZINE.



What the Reader Thinks

Tuning Notes

To the Editor of "The Wireless Magazine."

SIR,—Many listeners have expressed the hope that the B.B.C. will revert to the old single-note signal tuning and do away with the present method which superseded it.

With the single note it was fairly simple to observe any fluctuation in signal strength. But with a series of notes it is not so easy. With the former method, however, distortion owing to excessive reaction was not so quickly observed.

In my opinion, the old way was better for obtaining quantity; the new way for getting quality. The ideal way would be—to use a well-known expression—"fifty-fifty."—*C. S. Moores (Exeter).*

R.A.F. Telephony

SIR,—I notice that THE WIRELESS MAGAZINE calls attention to the fact that a considerable amount of short-wave R.A.F. telephony can be picked up.

Apparently few amateurs are aware that this telephony alone provides a great amount of short-wave work, and can be picked up by anyone capable of tuning down to the short waves.

The South especially seems to come in for a lot of this telephony between pilots and land stations.

Congratulations on No. 1 of THE WIRELESS MAGAZINE.—*E. P. Farr (Dover).*

Transformer Interaction

SIR,—A friend asked me how the statement that earthing the metal shrouds of adjacent L.F. transformers did not completely prevent interaction could be proved.

I suggested that he should obtain a large horseshoe magnet, a sheet of copper foil and a compass, placing the foil (earthed) between the compass and magnet.

By moving the magnet to and fro, indications of interaction would be recorded by the compass needle.

The horseshoe magnet would take the place of one transformer (really a magnet, when a current is passing through the windings), the copper acting as the shroud and the compass replacing the second transformer (not in the set, of course), indications of the magnetic field penetrating the copper shield being visually recorded by the compass needle pointing always in the direction of the magnet when moved behind the shield.

I will conclude by wishing THE WIRELESS MAGAZINE every success in its future enterprises.—*G. H. Perraton (Plymouth).*

Tram Noises

SIR,—I am using a four-valve set, with loud-speaker, and my house is situated on the main tram-car route. Until a few weeks ago we were everlastingly getting groaning, frizzling noises through the speaker, at times like a roaring, raging sea. I tried every conceivable alteration to the set, but all to no avail. Still the "roaring sea."

I then began to look outside for the explanation and found the roaring commenced when the tram-car was at the foot of the hill; it increased in intensity as the tram approached my house, and ceased immediately after passing. I concluded the trams were the cause of the distortion.

I set to work and made a counterpoise, which is an exact replica of the aerial, but 7 ft. from the ground; this allows ordinary mortals to walk under it. The counterpoise is, of course, well insulated in the same manner as the aerial.

The tone is now more pure, and there is no distortion from trams or elsewhere.—*H. H. Sheardown (Cleethorpes).*

Foolproof Dull-emitters?

SIR,—When is a British firm of repute going to market a valve to consume .06 to .10 ampere at 1.8 to 2 volts?

At present, if we wish to use the most economical valve—as most of us do—we are compelled to use one designed to work at 3 volts, and we are warned against overrunning the valve.

A 2-volt valve would not require a special rheostat, though the control would be somewhat limited, and could not be overrun except by sheer deliberate misuse. But at present the 2-volt valves take .35 to .4 ampere.

When shall we get the fool-proof dull-emitter with economy?—*H. M. Lowe (Middlesbro')*.

(For each letter published next month we shall give a Cossor valve.)

A COMPETITION FOR A COMPETITION

We should like to run quite a number of competitions, but there arises the difficulty of deciding the lines on which the competitions shall be conducted.

In view of this, we are here inviting the co-operation of our readers by holding

A COMPETITION FOR A COMPETITION.

All we ask you to do is to send us a suggestion for a competition which you think would interest our readers.

To the writers of the letters containing, in our opinion, the five best suggestions we will award in order of merit

C.A.V. Tom-Tit Loud-speaker	... value	£1 10 0
Brandes Phones	..	1 5 0
Efesca H.T. Battery	.,	1 3 0
Dextraudion Dull-emitter valve	... value	1 1 0
Peto-Scott Square-law Condenser	... value	17 6

One or more of the suggestions accepted will form the basis of a future competition, the winner of which will be presented with a multi-valve set of considerable value.

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The
**Wireless
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Dear Sirs,

In view of the remarkable results maturing from our full-page announcement in the February issue of the "Wireless Magazine," the writer feels it desirable to express his appreciation of the great value of your publication.

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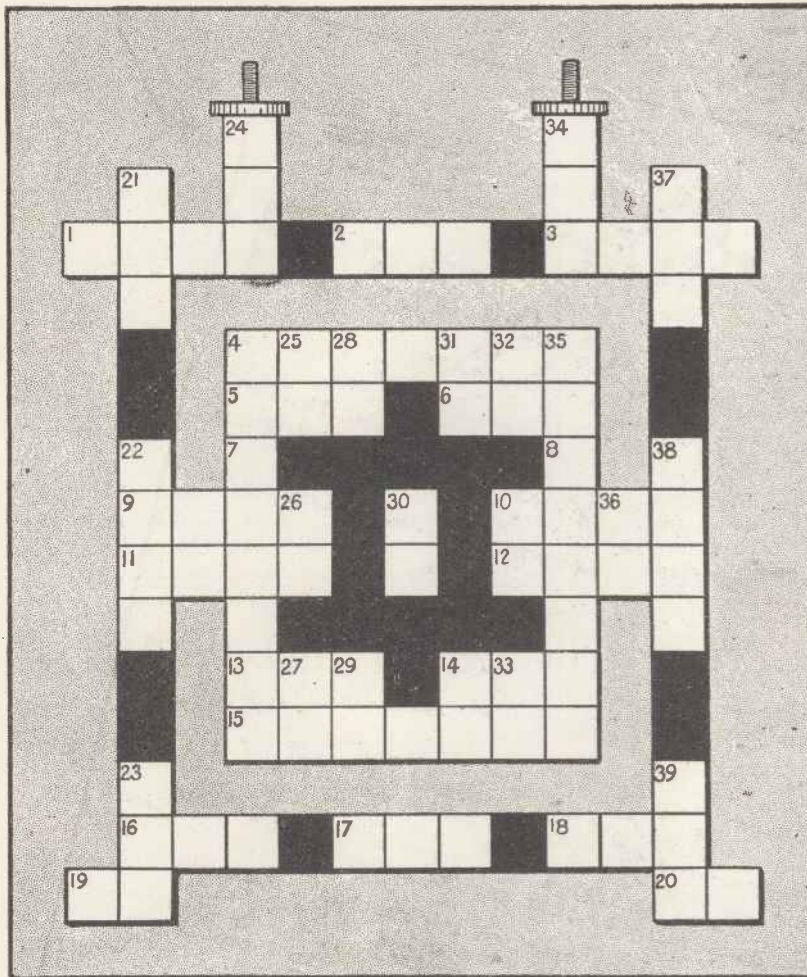
In writing to advertisers, please say you saw the advertisement in THE WIRELESS MAGAZINE.

All Communications to
Advertisement Manager,
La Belle Sauvage, E.C.4.
Phone: City 1120

Our Cross-Word Puzzles

THAT much interest still centres in our February issue. In view of this we have decided to give around cross-word puzzles is shown by the large number of entries received in connection with the cross-word puzzle which appeared in our February issue. In view of this we have decided to give this month a further puzzle which takes the form of an intervalve transformer. It must be distinctly

understood that no prizes are awarded for correct solutions, nor do we ask for such solutions to be sent to us. The puzzle is given solely to amuse and entertain those of our readers who have fallen victim to the craze. The correct solution of the puzzle will be given in our next issue.



RESULT OF FEBRUARY COMPETITION

In connection with our February cross-word competition, no competitor sent in a correct solution. In view of this we have decided to add the first and second prizes together and divide them between the three competitors whose solutions and accompanying puzzles were adjudged by us to be the best. Goods, chosen from the lists of the advertisers in this magazine, to the value of £2 10s. will, therefore, be awarded to:

Mr. W. W. DENNY,
76, Guildhall Street,
Folkestone.

Mr. H. A. FREEMAN,
School House,
Felstca.l,
Essex.

Mr. G. C. TURNER,
The School House,
Cranbrook,
Kent.

Puzzles sent in by these competitors will be reproduced in later issues of THE WIRELESS MAGAZINE.

The correct solution of the February puzzle is given below.

CLUES

ACROSS

1.—Negative element of dry battery. 2.—Affects reception. 3.—A type of lamp. 4.—Christian name of B.B.C. director. 5.—International language. 6.—Added to a nut makes a valve. 7.—Type of valve. 8.—Symbol to "carry on." 9.—Served by a broadcasting station. 10.—Trade association. 11.—Part of battery. 12.—Accumulator gassing (reversed). 13.—A good "earth." 14.—Some theatrical managers do it. 15.—Saved from the dump heap. 16.—Not found in good valves. 17.—System of transmission. 18.—Wireless (French). 19.—Used in photo-electric cells (abbreviation): 20.—Voltage.

DOWN

4.—Needs plenty of wire. 10.—Transmitters hope to "get" there. 14.—Gauge of threads. 21.—Capacity ratio. 22.—Top of a dial. 23.—Where experiments are made. 24.—Causes interference. 25.—"Iddy iddy, umpty iddy iddy." 26.—Used for condenser vanes (abbreviation). 27.—Aerial and earth connections reversed. 28.—Call sign without numeral. 29.—Under another name. 30.—Full of good things. 31.—Goes to + H.T. 32.—Essential connections. 33.—American wire gauge. 34.—Produced by atmospherics. 35.—For your appreciation. 36.—A carefully-built transformer. 37.—Price of a crystal. 38.—Electrical pressures. 39.—With many noughts.

G	R	I	D	C	A	T	L	E	A	D									
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Solution of February Puzzle.

Notings on the Month's Progress

Sir Oliver Lodge

IN his recent presidential address to the Radio Society of Great Britain, Sir Oliver Lodge pointed out that although we know how to generate both the long wavelength radiations used in wireless, and the extremely short wavelength disturbances known as X-rays, we are not yet able to produce by any analogous methods the short intermediate wavelengths which give rise to the sensation of light.

Wireless waves are created by setting-up in a suitable conductor, such as an aerial, oscillatory currents of extremely high frequency. The higher the frequency the more pronounced is the field or "fringe" effect of the current, that is, the energy located outside the actual conductor.

Finally the stage comes when a part of the energy leaves the conductor and travels outwards

through space as an ether wave. X-rays, on the other hand, are produced by the sudden impact of a cathode stream of electrons hurled at high speed against the metal anode of a Crooke's tube.

Neither of these methods, however, can be utilized to generate light waves, which are too small for one operation and also too big for the other.

All we can do at present is to throw the atoms of matter into the confused and irregular agitation that we call heat; or clash them together in some other way, as in chemical combination, and trust to the properties of the atoms themselves to emit waves capable of affecting the eye.

In short, the generation of light waves is a haphazard method, more or less outside our control. We make a body sufficiently hot and await the result.

The Shorter Wavelengths

From the wireless point of view the centre of interest is steadily shifting from the longer towards the shorter wavelengths. The success of the Marconi "beam," and the long-distance results of low-power amateur transmissions on 100 metres and under, are two notable instances in point.

Apparatus has now been developed capable of transmitting wireless waves ranging from a wavelength of a few centimetres upwards, so that before long we may have broadcasting limited to a wavelength range of from 50 to 100 metres, with receivers capable of selecting any one of a score of stations operating within these limits.

This may sound optimistic, but it is not generally appreciated how great is the percentage difference in frequency between two closely

(Continued on next page).

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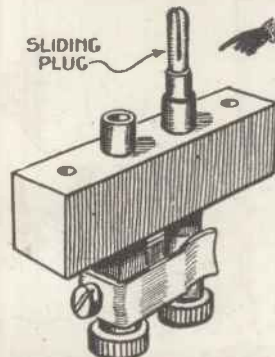
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Size	Approximately	150 to 300 metres	5d. each.	No. 1.	4d. each
2.	24 in.	250 to 400	6d.	2.	5d.
3.	24 in.	350 to 550	7d.	3.	6d.
4.	3 in.	450 to 650	8d.	4.	7d.
5.	24 in.	600 to 750	10d.	5.	8d.
6.	4 in.	700 to 1,000	1/2	6.	9d.
7.	4 in.	950 to 1,350	1/4	7.	10d.
8.	5 in.	1,300 to 1,750	1/8	8.	1/-
9.	5 1/2 in.	1,700 to 2,600	2/-	9.	1 1/2
				10.	1/4
				11.	1/6
				12.	1/8

EBONITE COIL HOLDERS 1/6 each



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JOTTINGS ON THE MONTH'S PROGRESS (Continued from preceding page)

associated numbers on the "short" end of the scale.

For example, there is a difference of nearly 340,000 cycles between a wavelength of 90 metres and one of 100 metres, whereas between wavelengths of 400 and 410 metres the difference is only 18,000 cycles.

Therefore, although the reception of the shorter wavelengths calls for extremely sharp tuning and careful design, to avoid high-frequency losses, the separation of two stations using closely-associated short wavelengths is not so difficult as would appear at first sight.

Photo-electric Effects

An interesting aspect of extremely high-frequency radiation, that is, within the light range, is its electrical effect on various substances, classed as photo-sensitive. The metals, sodium and potassium, amongst others, loose electrons when exposed to the action of light waves and become positively charged in consequence.

A similar effect has been held to play an important part in many of the vital processes. For instance, the emission of electrons under the stimulus of the received ray probably

lies at the root of the action of the optic nerve in conveying the sensation of light to the brain.

In other words vision is a photo-electric phenomenon. So in all probability is the ultimate action of chlorophyll in the mechanism of plant life.

Abrams Box

The discovery that electron emission is closely connected with many, if not all, of the physiological processes of the human body, has led to some interesting developments in the region of medical science.

Perhaps the most amazing is the so-called "Abrams box," at present the source of much controversy in the daily press. Dr. Abrams was a physician of San Francisco who, before his death some two years ago, accepted the theory that the cells of the human body are composed of electrons vibrating at certain definite frequencies.

He argued that the vitality of any individual depends upon the maintenance of his electronic vibrations, disease being the outward manifestation of any deficiency or irregularity in this respect.

His "magic box" on examination

proved to be a thermionic valve high-frequency generator, very similar to a low-power wireless transmitter, by means of which high-frequency electric oscillations were administered to the patient, partly for the purpose of diagnosing the locality of deficient "electronic vibration," and partly to supply "curative" impulses where required.

Some extraordinary results were undoubtedly secured by the apparatus, but the validity of the method is a matter that can only be determined by competent medical authorities. The facts are interesting, however, as an example of the increasing application of wireless methods and technique to extraneous purposes.

Wired Broadcasting

The announcement that the German Postal Authorities have decided to give a three-months' test to the wired-wireless broadcasting system invented by Prince Reuss is an indication of the progress that has been made in this direction.

Instead of radiating from a transmitting aerial through the ether, high-frequency currents are fed into the supply wires of an ordinary electric-light system, and are tapped off by a special receiving set installed in each subscriber's house.

The high-power lighting or heating currents are kept quite distinct from the low-power high-frequency currents carrying the broadcast programme.

The system is essentially limited to large towns already provided with a network of distributing wires, but within such areas it has certain decided advantages. In the first place it removes the problem of interference, so difficult to overcome with ordinary wireless.

At the same time, four or even five different programmes can be fed simultaneously into the same wire, and clearly separated at choice by means of filter circuits arranged at the receiving end.

Finally, using much less power at the transmitting end, stronger signals can be secured on a relatively cheap type of receiver, owing to the low current losses incurred in passing over a conducting wire as compared with the waste of energy involved when radiating through space in all directions.

B. A. R.

THE DISTANCE CRAZE!



Kindly Old Gentleman: "No, it's not clear. I wonder, now, if I go outside and adjust my aerial, should I get Chile?"

TELEPHONES RE-WOUND

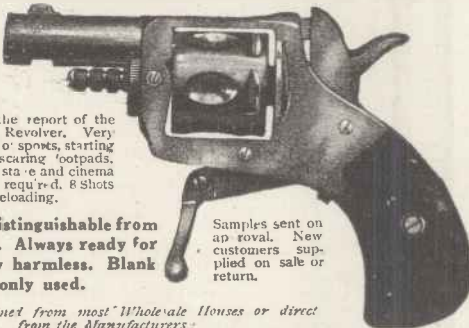
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1/6

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Understanding the Broadcast Symphony

"HIGHBROW" MUSIC EXPLAINED *for the* LISTENER

BROADCASTING has made the American word "highbrow" very well known in England. As applied to music the term may be used to denote classical as compared with popular work.

Few persons, outside the musical profession, really understand exactly what a symphony is and its place in "highbrow" music.

A symphony has been described as a sonata written for the orchestra—but one must first know, before grasping this explanation, the nature of a sonata.

Sonata

A sonata, then, is a composition (made up of parts or movements) written for a solo instrument like the pianoforte or organ, or for one like the violin or clarinet with accompaniment by the pianoforte.

A symphony is a composition for orchestra made up of four parts related to each other, not only by the keys chosen, but also by their emotional contents.

The first movement of a symphony is called the Allegro and is usually quick and energetic in its character. It has a division into three parts known as exposition, illustration and repetition.

First Movement

In this, the first, movement the composer displays the melodies he has chosen as the material of the movement, and then exploits his learning and fancy in their development, and finally repeats with a modification of the first division and the addition of a suitable close.

The second movement, or the Adagio, is generally slow and frequently sombre. It may, however, be consolatory, contemplative, restful or religiously uplifting.

The third, or Scherzo, movement, is of a playful or jocose character. This movement is a successor to the minuet and was first substituted by Beethoven. The Scherzo has a second part known as the trio. A second minuet at the entrance of

the trio is generally more sententious than the first part, and is sometimes in another key.

The finale, or fourth movement, is generally in rondo form. This species of composition illustrates the peculiarity of that form in the reiteration of a strophe ever and anon, after a new theme has been exploited. An illustration of the musical refrain characteristic of the rondo form is the following, by Mr. H. C. Brunner:

"A pitcher of mignonette
In a tenement's highest casement.
Queer sort of a flower-pot—yet

That pitcher of mignonette
Is a garden in heaven set
To the little sick child in the basement—

The pitcher of mignonette
In the tenement's highest casement."

If now the first two lines of this poem which compose its refrain be permitted to stand as the principal theme of a musical piece we have in Mr. Brunner's triolet a Rondo.

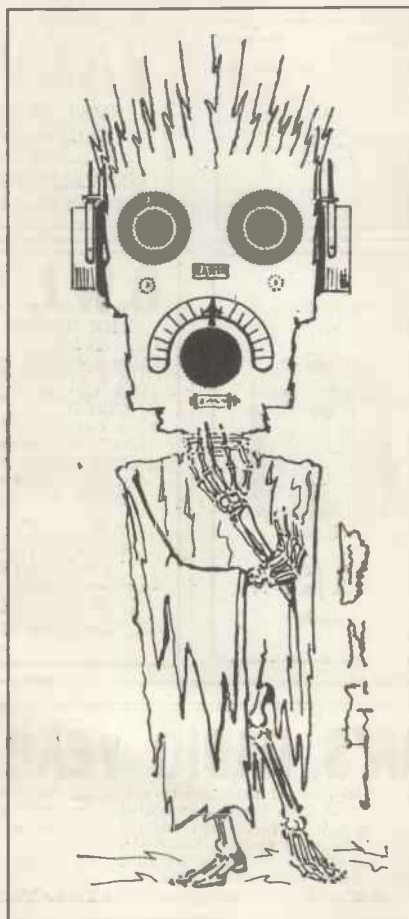
Another form of music is that of a repetition of the first movement. Still another consists of the theme and variations.

Increased Enjoyment

A little earnest attention given to the construction of symphonies will amply repay the listener-in by the additional enjoyment to be derived.

In this case, as the writer has found by experience, "a little knowledge" is *not* a dangerous thing.

THE OSCILLATOR'S NIGHTMARE!



"FIDDLE LOUD-SPEAKER"

IN connection with the article "A Loud-speaker—and a Fiddle, Too!" that appeared in No. 1 of THE WIRELESS MAGAZINE, it appears that the City Accumulator Co., of 10, Rangoon Street, E.C.3, filed as long ago as January 2nd, 1923, a patent in the specification of which the following claim is made:

"In an arrangement as claimed in Claim 1, the employment of the body of a musical instrument such as a violin, alto, violoncello, etc., as a sound box."

This certainly seems to be an anticipation of the arrangement described in our article.

WE read of a man who has a prejudice against loud-speakers. Married, of course.

WIRELESS is now transmitting messages at 200 words a minute. This should make some of our district visitors envious.



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Wireless Fascination that Never Wanes!

KNOBS, knobs and dials, terminals and switches, many of them, on the set, on the shelf and in the drawer. They represent a few years of wireless experience and many pounds of hard cash, but do I begrudge my dealer those coins or the paper? Not I.

A Sacred Art

Time was when I had only heard of wireless, in a vague unreal fashion. It was a wonder, a sacred Art which was carefully guarded by a chosen few. Occasionally I heard of a ship sending out an SOS and the crew being rescued, and those newspaper reports were glimpses of the unknown. Such is the perversity of human nature that the less one knows of a subject, the more one wants to know. And so it was with wireless.

The rumours of possibilities of wireless telephony between London and Chelmsford brought the matter nearer home. Here and there an odd aerial sprang up and still further whetted my curiosity. If these people could explore the mysteries of wireless, so might I. The first components for a crystal set were purchased, and an aerial made its appearance in my garden. For a time I was content, for I could now hear those ships in far-off waters sending out their messages, and the reception of time signals from Eiffel Tower was a ritual not to be missed.

The Fleming valve then made its appearance. By its aid I could get just a little further, but only slightly. Reaction and regeneration followed soon after, and my field was trebled.

Eventually amplifiers made their appearance on the set. H.F. and L.F. were both tried with indifferent results. Information was difficult to obtain, and I had only common

sense and a large amount of hope and experimenting to give me the results desired. Those were good old days—those in which the faintest possible sign of a spark signal was pounced upon and ensnared in the phones until it fluttered into nothingness as the ship moved away or the station closed down. The amplifiers became useful. Quality was not then thought of, for of telephony there was little or none. Power was the thing, power and range, and some truly weird looking intervalve transformers were used!

Gradually but surely fashions changed. Telephony and broadcasting came into actual everyday practice, and with them commercial concerns began to produce neat and efficient components. Those friends of learning, the printers and publishers, began to publish books and journals which spread knowledge, and wireless clubs came into existence, so that fellow enthusiasts met and exchanged experiences to their mutual advantage. Now I possess

Slip stations may be logged by the cartload, and American and New Zealand amateurs are equally easy to receive in their season. Is the fascination gone?

Certainty and Uncertainty

Not a bit of it. For one thing, as surely as the golfer plays his ball round the course time after time, in and out of the same holes, so, surely, can I twist those knobs, and with the same delightful uncertainty, or certainty, hear Paris, Rome, Madrid, Berlin, New York, London, or the like. Over and over again the golfer comes to the same tee, and over and over again he as surely tees up the ball on it, and drives it on its way. Even so do I just hear some foreign station and the fascination remains.

The golf, billiard, chess, and draught enthusiasts are fascinated by their games. There are certain rules to the games, and the players know full well that these must be obeyed or there is no game. With

my experiments there is a similar certainty. There are rules of the game that cannot be contravened simply because they will not be so treated. When I want to try out a pet theory or circuit, that is when the fun begins. The rules of Ohm, Ampere, and Voltaire, hold good, and are firm masters. I cannot cheat them, and a new circuit either of my own or some-

body else's always finds the rules untricked, and the game must be played to the end. The fascination is always there, and I suppose always will be.

With wireless, fascination begets enthusiasm, and none of the devotees of the Art will ever say that the fascination is gone.

THE ETHERWORM.



a really excellent receiver by the aid of which I can hear almost anything. The junk drawer contains the remnants of many of the experiments of those old days, and it seems that I am at the end of the interesting period. But am I? I can sit and twist the knobs and listen to any desired broadcasting station from Madrid to the now famous KD K A.



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MY TOPSY-LIKE AERIAL

THE "highbrows" would sneer at my aerial. Its farthest end is supported on a mast comprised of steel and wood. The wooden portion is the lower half and the steel the upper half. I originally possessed only the lower half and its height was then not above 20 feet, but with it transpired my first experiences with a crystal receiver.

Those were happy, fascinating days, for 2 L O had then one concert a week on its programme and that of only an hour's duration, broken up by several ten-minute intervals. The catwhisker always refused to find a sensitive spot and such little catastrophes as a sudden jerk often balked me of a good thing at the crucial moment.

Making Improvements

I yearned for bigger fields to conquer and the steel portion was added to the wooden mast with an appreciable and acceptable increase in the strength of my signals. The wire guy ropes were pegged firmly into the ground and remain there to this day. My "highbrow" friends tear their hair and gnash their teeth when they see it, and mutter horrible things about absorption and screening, but I heed them not.

The near or lead-in end is also suspended on steel and this is clamped firmly to the house, so firmly, in fact, that the ladder which we used fell against it with all its weight but the mast barely quivered. The lightning has free play with this piece of steel, for it is not earthed except through the brick wall; but during every storm we have had, the lightning has refused to use it as a landing stage. Perhaps the insurance company which has taken a risk on my premises would object if they knew of this "dangerous" piece of steel, but I shall not claim on them if the lightning does perchance take a fancy to this unauthorised track.

So much for the supports. They are, I admit, against all accepted practice, but nevertheless they serve this function. The aerial wires are of single-stranded copper and are insulated by the aid of two common egg insulators, these being originally

intended to be used as breakers for aerial mast stays. My highbrow friends are annoyed at my insulators and suggest all manner of alternatives, quaint, ugly, heavy impedimenta for which I have no use.

Another Bone of Contention

My lead-in wire is also an object of derision. It is an ordinary piece of glass tube, formerly used as a glass separator in an accumulator box. It passes directly through the woodwork of the window frame and my wire leads-in pass through the tube—rubber insulation included. Those kindly, technical, coldly critical friends scoff at the simplicity of the arrangement; they call it crude, bad, untidy, and suggest that it causes a high-resistance aerial. I remain mute. It is the soft answer which turneth away wrath. The earth is good, I will allow, and I boast about it, for am I not proud of that two guineas worth of copper netting which lays hidden, buried under the aerial? They give me no credit for this, however, but jeer at the long earth lead which I am compelled to use from the set to the ground and they hint at loops, hysteresis and leaks.

Revenge in Store

But later I shall have my revenge. After they have hurled their vituperation at my faithful aerial and have had an opportunity to air their superior knowledge and relieve themselves of an immense vocabulary of wonderful sounding words I will entice them into my little den and let them wear my phones! I will twist my condenser knobs and let them hear signals which they have never heard on their own sets, and I will take care that I give them everything that is going at the time. Their faces will, perhaps, become longer as I tune in the stations one after another—short and long waves come in equally well—and the crowning event will be when I give them K D K A on the loud speaker with three valves!

Perhaps they will then slink away subdued. They may say that they are surprised at the reception and go home and surreptitiously overhaul their sets and aerials whilst I

—well, I never intend to touch mine. It serves me well and I shall not erect any of those newfangled gadgets for all the highbrows in the country.
A. J. C.

TO A HOWLER

Howl! Howl! Thou coyote low!
'Djust tighter still reaction.
May all thy valves to ions blow!
Thou worse-than-horn-of-Klaxon!

"The night with music shall be filled,"

Was Mr. B. sarcastic?
He had not heard the programme killed

By aerial gymnastic!

Thy box of tricks I'd smash with bricks,

Thy tubes with insulators:
Thy life I'd fix; thou'dst live on
"Clix,"

And lie on detonators!

And if 'tis act of ignorance,
We will not weigh the pros/cons,
But hoist thee to thy aerial mast,
And throw thee to th' electrons!
C.T.

"AMERICA calling," says an announcement. For drinks, presumably.

ONE of the Spanish papers provides a wireless programme every week. A number of our papers go one better, by giving a loud-speaker demonstration every morning.

WE understand that Mr. Winston Churchill will not reduce the 2 L O wavelength in his budget. According to the newspapers, however, this is about the only thing he will not reduce.

It is authoritatively stated that wireless waves travel at the rate of 186,000 miles per second. This is even quicker than the speed at which some of our politicians change their opinions.

THE new Wireless Bill gives the police permission to search any foreign aircraft over the British Islands which they suspect to be fitted with wireless. We understand that Scotland Yard is busily recruiting cobats for the purpose.



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Simple Valve Receiving Sets and How to Make Them

This handbook, which is compiled from the writings of many contributors to "Amateur Wireless," seeks to show in close detail, and with the aid of 112 illustrations, how to make and operate about ten different types of valve sets.

Simple Crystal Receiving Sets and How to Make Them

Compiled from the pages of "Amateur Wireless," this handbook deals in a simple, straightforward manner with the making of a number of crystal sets. With 114 illustrations.

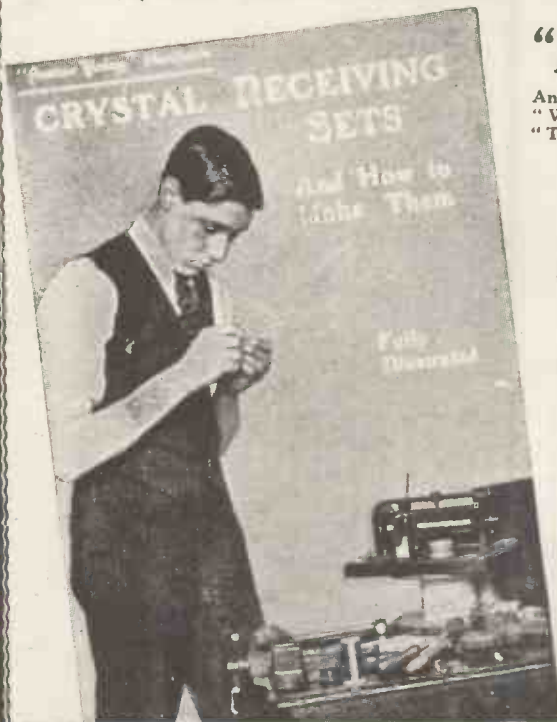
Wireless Component Parts and How to Make Them

Detailed instructions for making the various components forming parts of many kinds of wireless receiving sets. It does not describe the making of any one complete set, but just all the parts likely to be required. With over 200 illustrations.

Wireless Telegraphy and Telephony and How to Make the Apparatus

This revised edition is by Mr. E. Redpath, the well-known writer on wireless. The explanations of principles are up to date, and there are directions for making apparatus, including detectors, amplifiers, single-circuit and complete short-wave receiving sets, a valve panel, and a five-valve amplifier.

Cassell's, Publishers, London, E.C.4

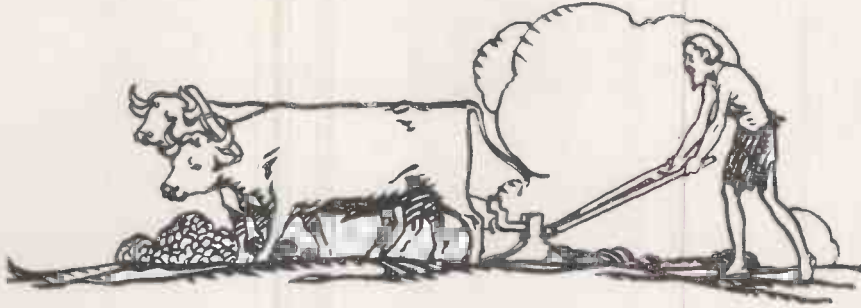


"The Wireless Magazine" Buyers' Guide

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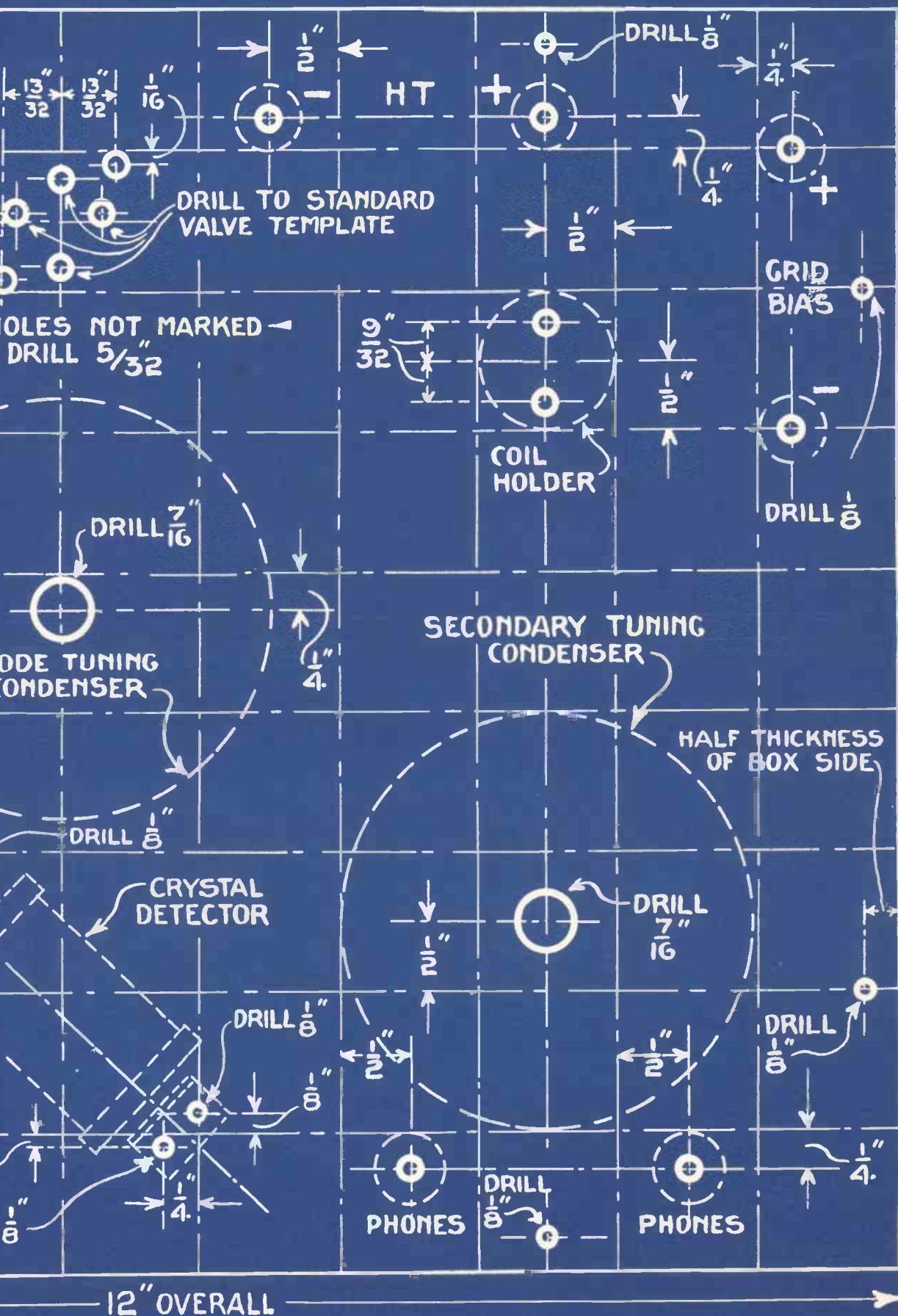
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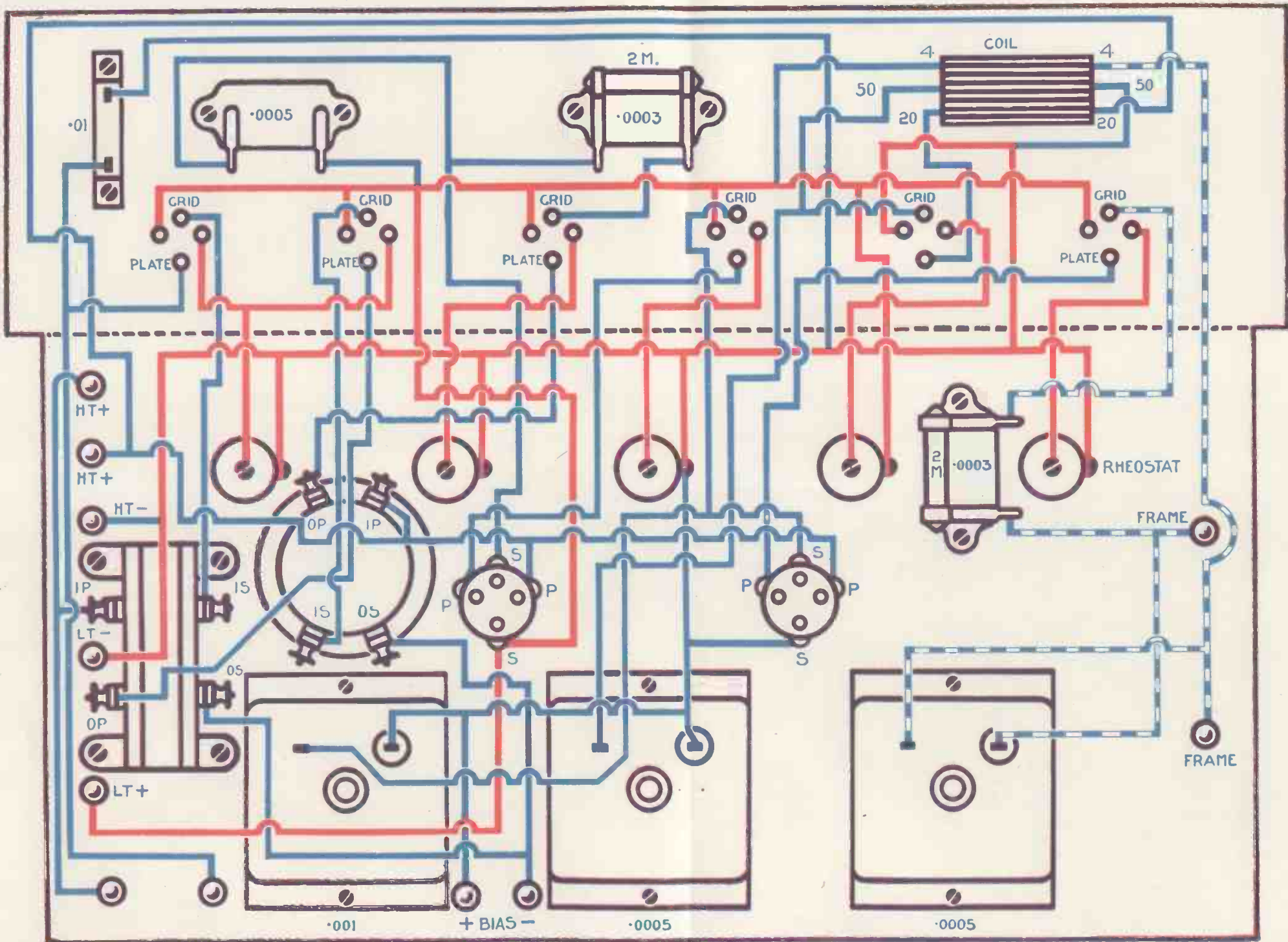
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Wiring diagrams



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TWO WIRING DIAGRAMS

Left: SIX-VALVE SUPERSONIC HETERODYNE SET

Below: HIGHLY-SELECTIVE VALVE-CRYSTAL REFLEX SET

Key to Colours: Red wiring, filament lighting circuit ; Blue-and-white wiring, aerial circuit ; Blue wiring, other circuits.

For Full Constructional Particulars, see special articles in "The Wireless Magazine," April, 1925.

