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ONE-VALVER :: AUTOMATIC



The Wireless Magazine

Edited by
Bernard E. Jones

VOL. 2, NO. 9.

October, 1925



OTIME
ORIES

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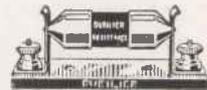
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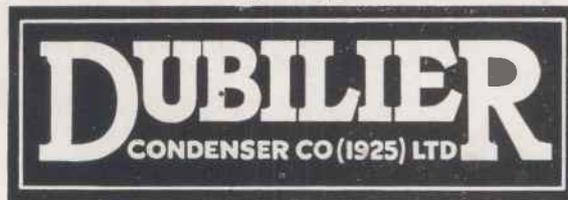
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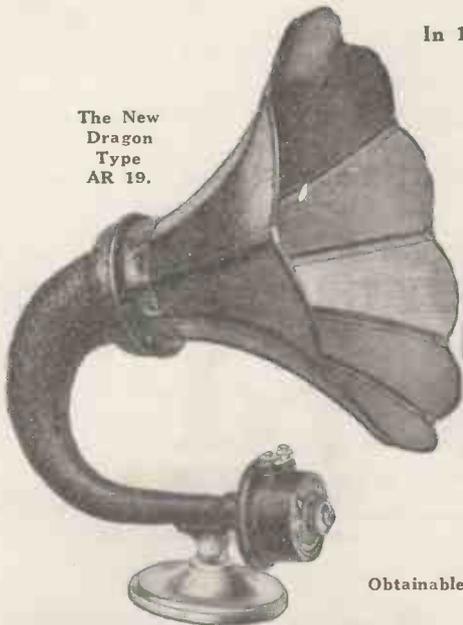
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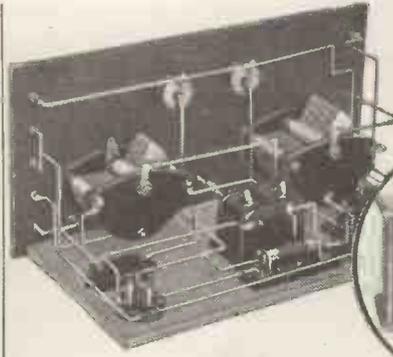
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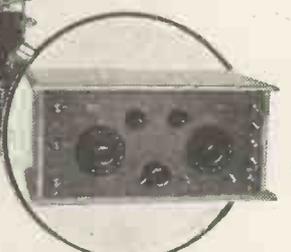
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The Wireless Magazine

OCTOBER, 1925

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John Henry with his dog

HOME CONSTRUCTOR SETS.

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A REINARTZ ONE-VALVER WITH REFLEX ACTION. A full-size "Structograph" Coloured Plate of this set is Given Free with this issue . . . 250

A CRYSTAL SET WITH POTENTIOMETER CONTROL. No Fidgeting Catwhisker Adjustment 260

A NEW FOUR-ELECTRODE VALVE CIRCUIT. The outcome of experiments with a circuit patented recently . . . 270

Announcements.—THE WIRELESS MAGAZINE, edited by Bernard E. Jones, is published about the 25th day of the month, and bears the date of the month following. One Shilling Net. Subscription rates are 15s. 6d. a year, post free; Canada, 13s. 6d. a year, post free. Contributions, accompanied by stamped and addressed envelopes, are invited. All editorial communications should be addressed to The Editor, THE WIRELESS MAGAZINE, La Belle Sauvage, London, E.C.4. Subscriptions should be addressed to The Publisher, THE WIRELESS MAGAZINE.

A Peep into American Conditions

*An article, specially
written for "THE
WIRELESS MAGAZINE"
by FRED SMITH, Studio
Director, Crosley
W.L.W. Station,
Cincinnati.*

YOU English get a lot of fun out of comparing American customs, mannerisms, methods and purposes with your own. But never mind, the Americans do the very same thing. One of my father's favourite stories was that of an American mother who was travelling through England with her ten-year-old son. Asked the boy: "Mother, do these people speak English?" And she: "Why certainly, my son." "Then," replied the boy decisively, "we don't!"

After all, a sense of humour is simply a sense of things out of proportion. With half an eye we can laugh at each other. With a fuller vision of seeing life from the other man's point of view we may not laugh so much, but we are sure to have a broader understanding of humanity at large.

I have been told by many persons prominent in the American wireless world that European countries were several years behind us. I know that such is not the case.

Strange as it may seem from the American point of view, the English and Germans, notably, seem to think that we in the States are far behind them! Imagine my surprise to hear from a German that American programmes consisted only of a little music and a great deal of advertising! Imagine my astonishment to find that English wireless engineers think that American broadcast operators do not monitor their sets! Some day wireless programmes will be heard clearly back and forth, and then the wireless public in both hemispheres will be able to form more intelligent judgments.

*Our Heading Photograph shows the Whitehall Building, New York City
(Copyright photograph by Ewing Galloway, N.Y.)*

THE IDEALS BEHIND AMERICAN BROADCASTING

The constant argument which European systems of broadcasting put forth, that is, the systems operating under monopolies granted by the government, is that they are keeping the broadcasting situation free from a chaos similar to that existing in America!

A Human Weakness

It is very shrewd of their leaders to make this comparison; for it is a human weakness to discover consolation in a condition from which there is no escape by imagining it to be at least more supportable than that of others.

You might just as well try to persuade a native of Berlin or Paris that New York, Chicago and all the other American cities are inefficient and chaotic because the top stories of their sky-scrapers measure varying distances from Mother Earth!

You might just as well tell the housewives of Europe that American homes, in spite of their modern equipment, are not comfortable because Middle Westerners erect Italian villas along the Lake shore and the Californians build Mission Inns by the Pacific!

We sometimes form our hardest opinions about the things of which we know least. One of the hopes for wireless is that it will help humanity to catch a universal point of view. For the present, however, owing to inherent differences between races of men, broadcasting manifests itself with great variability in different countries. If you are genuinely interested in American wireless, don't laugh at us, or criticise us—try to catch our point of view.

A Nation With Material Freedom

We are a nation of one hundred and twenty million people where practically all of our past has been consumed in conquering material forces and overcoming material obstacles. An untouched continent has been our enemy, with the last one hundred and twenty-five years of mechanical development as our weapon. The continent has been conquered. It has been conquered because the American people were given, at the very beginning, material freedom. The tremendous energy of this new blood race has developed to material perfection the art of living because it had material freedom. Upon this fundamental was our government built. If a man wanted to build a sky-scraper on a certain corner, he could do it. If a second business man desired to erect a three-story building next to the sky-scraper, he was free to do so.

This is the American freedom of which you hear so much, the freedom to do as you please materially.

In the development of so vast a territory no complete metropolitan centre grew up simultaneously as the Mecca of all good things in America. Our country has no Paris for its France, no London for its Britain. Washington is scarcely even the political centre. Most of our presidents have come from Virginia, New York State and Ohio, our writers from the Middle West, our athletes and millionaires from all over. New York would like to be considered the solar plexus of America, but San Francisco is three thousand miles away!

Besides, Chicago and Boston have excellent opera, and these cities, with Cincinnati, St. Louis and a dozen more have symphony orchestras comparable to the world's best.

It is very probable that the American Telephone and Telegraph Company would have enjoyed building up from New York a situation similar to that created by the B.B.C. It does, in fact, control the telephone system in America, and a most wonderful work it is doing at that; but there the situation was unique, and a coherent universal control was desirable.

From the Atlantic to the Pacific

When it came to broadcasting, every city wanted to lift up its voice. When a concert or event worthy of national reception is at hand, a splendid spirit of co-operation prevails, and the programme is relayed from the Atlantic to the Pacific and the Lakes to the Gulf, with a quality of transmission that is one hundred per cent. A parallel will prevail in Europe with Continental simultaneous tie-ups for broadcasting stations in ten or twenty countries by telephone line.

I have been told frequently by Europeans that the craze in America is one by which people listen either for distance or for jazz, and nothing more. Let me tell you about the "D.X. hound" first—the listener who wants distance.

The American thinks in terms of distances. His country is so big he must think in this manner. For example, the state of Texas is as big as the country of Spain. The state of California is nine hundred miles long—something like the distance from London to Rome. The American travels—in his car—for thousands of miles every time he has a vacation.

Distance is a part of the atmosphere of America. So when he, the American wireless fan, sits down to his set, he wants, at some time during the evening, to hear the music and the voice that comes through thousands of miles of space.

There is one more factor in the American make-up you should understand: the valuation of publicity.

No Trade Secrets

In America the old idea of trade secrets has passed into the regions of tranquil oblivion. Big business has discovered that a big heart and a warm hand clasp will get you more business than secret devices and stealthy spying. The thing the American manufacturer strives for to-day is good-will. He picnics his employees and he banquets his clients. He wants the good-will of everybody. He has already learned the significance of the Spanish proverb: "There is no small enemy," and has translated it into: "Every friend is valuable."

Immediately we discover in this the answer to "Why does America favour commercial broadcasting?" as well the answer to the similar question: "What does the American who pays for broadcasting get out of it?" The simple answer—good-will.

May I be permitted to dispel the fallacious idea that

A PEEP INTO AMERICAN CONDITIONS *(Continued)*



Corner of W E A F's reception room showing entrance to studios.

a commercial programme consists chiefly of a lengthy description of silk underwear or the superlative qualities of automobile tyres?

The gentle fact is that the advertiser who pays for broadcasting gets nothing more than a simple "The programme this evening is given through the courtesy of Hotel Gibson," some two or three times in the course of an hour. He has learned from his own judgment, and from the example of a few thoughtless broadcasters who ruined their reputation by over-advertising, that the main thing for the listener is a good programme, and that no one enjoys being told too frequently that he is being fêted.

I am giving you the picture of America through the eyes of an American who endeavours to see things impartially and without prejudice.

It is such a common fallacy to believe that countries other than our own have no ideals. It has been a very useful fallacy when we needed excuses of any nature to give us moral strength in time of actual controversies—wars. It gives one such a sense of superiority! May we not hope that wireless, with further rapid development, will make us all neighbours and so wipe out such narrow and short-sighted views?

Every nation has its ideals born of its history and its environment. And so has America. Perhaps we run ashore once in a while out of pure exuberance of enthusiasm. But certainly behind the blunder there lived the beauty of an ideal. And so it is with our broadcasting.

Behind all that mass of individualistic expression

there is a common ideal, the desire to give to the American public the very best of the world's culture.

I have had letters from the directors of the principal stations in the United States giving some particulars of their work. Their responses show that they are full of enthusiasm for their work, and that we in America are working earnestly and sincerely for the development of the broadcasting art.

Here is a paragraph from the letter written by the director of K S D, St. Louis *Post Dispatch*:

"There are two other achievements of which we feel proud—one is that for three entire seasons we have



Luxury is the keynote of all American broadcasting stations, as can be seen from this photograph of a reception room.

broadcast every symphony programme given in this city by the St. Louis Symphony Orchestra; and for two entire seasons we have broadcast each of the operas presented by the Municipal Opera Association in the Municipal Open Air Theatre at Forest Park, St. Louis. Of course, there are many other things we have done of which we feel proud, but these are, you might say, the high lights in our three years of broadcasting."

The 5 K W, Pacific Coast, station of Earle C. Anthony, Inc., writes:—

"We have numerous remote controls, having exclusive broadcasting rights at the Philharmonic Auditorium, Los Angeles *Evening Herald*, Coliseum, Aeolian Residence Pipe Organ, and Southern California Music Company. The classical and semi-classical is preferred in programme arrangement."

From K D K A, Pittsburg:—

"As consistent reception is possible over greater distances by use of the short wave than the long one, it is

What American Studio Directors Have to Say

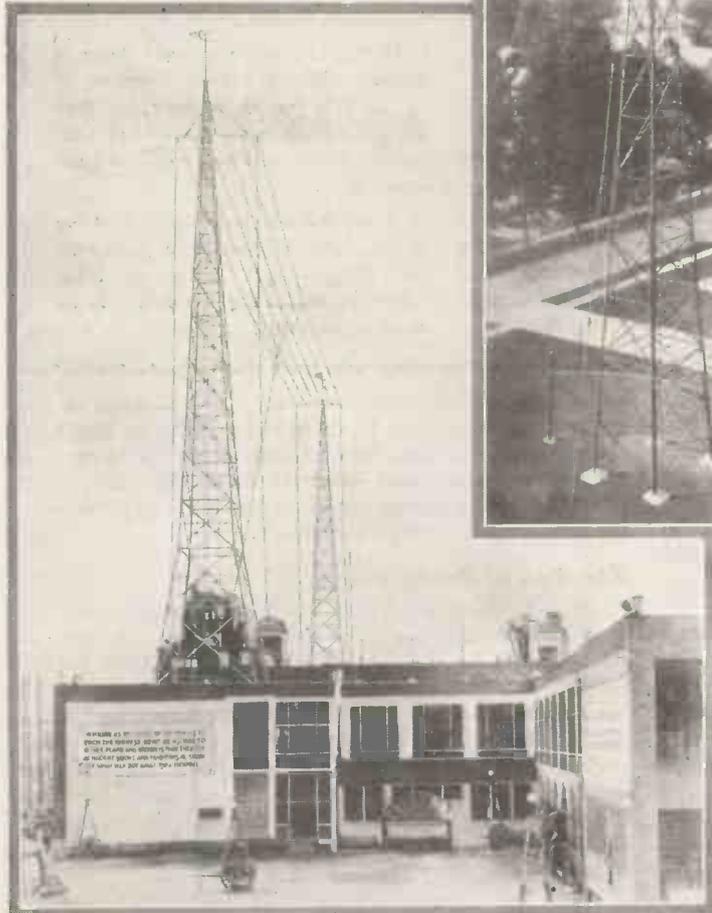
the short-wave set that has been used recently to transmit programmes half-way around the globe, the programmes having been relayed regularly for a week at a time by stations as far distant from Pittsburg as Australia, New Zealand and South America, as well as Europe and South Africa.

This is the first time that programmes have been regularly and consistently relayed half-way around the world, and establishes K D K A as the pioneer in world-wide broadcasting, as it was in the field of national broadcasting."

From W O A W of Omaha, Nebraska :—

"One of our most recent and pronounced wireless activities was our second anniversary celebration. We received approximately one hundred and eighty thousand responses, twenty-two thousand of which were telegrams.

"In connection with our programme for cementing the friendship of rural and urban communities, W O A W has given the great wheat and corn belt area of the Middlewest, including Iowa, Nebraska,

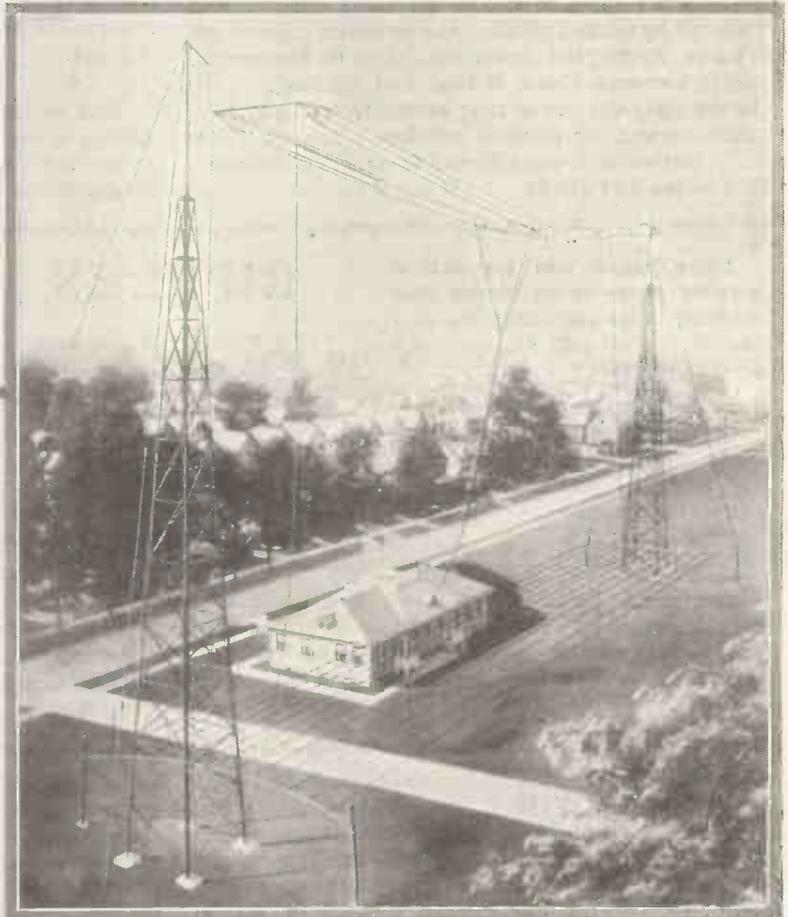


Aerial of WOC, Davenport, Iowa, owned and operated by the Palmer School of Chiropractic.

Minnesota, Missouri, Kansas and the Dakotas, an invaluable service in the scientific education of agriculturists in the proper methods of farming and horticulture by co-operating with the University of Nebraska."

From the manager of broadcasting, General Electric Company :—

"You will undoubtedly make many interesting observations on the effect of broadcasting as an agent for promoting mutual understanding. I am glad



Aerial of WTAM, Cleveland, Ohio, owned and operated by the Willard Storage Battery Co.

that it is being utilised by those who are interested in improving world conditions, and I hope that a high standard will always be maintained in broadcasting. Such standards are not only desirable but are necessary when broadcasting has the power to deliver messages to homes everywhere and to audiences including people of all ages."

* * * * *

Perhaps I may even speak of the Crosley W L W station, Cincinnati, where I have been studio director for the past three years :—

A PEEP INTO AMERICAN CONDITIONS (Continued)

More than two years ago I wrote the first play written expressly for wireless production, a poetic fantasy of springtime, under the title of "When Love Wakens." Subsequently I wrote several other "rad-arios," besides translating and adapting many more.

Twenty-minute Plays

Perhaps the most interesting of these latter were included in a group of programmes given weekly over a period of ten weeks, each one taken from the dramatic and musical literature of a particular country. The plays were cut down to twenty or thirty minutes, and surrounded by music typical of the countries from which they came. Among the former were plays by Benavente, Wilde, Sudermann, Ibsen, Molnar, and Tchekoff.

In the early autumn of 1923 we conducted at W L W the first contest for original wireless plays, or "rad-arios." Our contest was followed by others at Schenectady, London and Berlin.

It is a very healthy sign that the prominent stations of the past remain the principal stations of the present. Sometimes I am shown European figures indicating that a large percentage of the stations come and go. The stations that come and go are the little ones without capital or clear ideals. They are the type operating on one or two hundred watts. Sometimes the high-power stations change hands just as newspapers do, or restaurants.

But the privilege of operating, the control of a wavelength, is too rare and precious a possession at present to let go carelessly. The big stations are on the air with regular, dependable and first-class service day in and day out.

One of the marked tendencies in American broadcasting is the evolution towards wireless showmanship. It is now pretty generally recognised that the performance for wireless must evolve into a distinctive

Those people who say that a wireless censor is not needed have evidently never considered the possibilities if a golf championship were ever broadcast.

Should the new station be pronounced Daintree or Daventry? Some of the dispossessed Chelmsford listeners get over the difficulty by pronouncing it very unsatisfactory.

A man charged at one of the Metropolitan Police Courts had been to prison fifty times. It was not stated whether he was an oscillator or just an ordinary criminal.

RIPPLES

The new station at Rome will be able to transmit five programmes simultaneously. Just the thing for broadcasting the proceedings of some of our Town Councils.

Paris is said to have been relaying several of our British programmes lately. Evidently the French are better at relaying than repaying.

An invention makes it possible to "bottle" speeches by wireless. In many cases we fear that a special type of cork would be necessary to prevent the "gas" escaping.

It sounded like the voice of the loneliest spot in the world, said one writer with regard to the broadcast ocean waves. Like the teetotal bar at Wembley on the day of a Glasgow excursion, in fact.

We have had a request from a correspondent for back numbers of "The Wireless Magazine." But we don't quite know what he means, for the W.M. has never been a back number.

A request has been made that the B.B.C. should give more poetry in the programmes. This is what comes of installing wireless sets in lunatic asylums.

The wireless orchestra which plays some three concerts weekly at W L W is composed of first-stand members of the Cincinnati Symphony Orchestra, and is directed by the Assistant Symphony Director. Fritz Reiner himself, the famous conductor of the Cincinnati Symphony Orchestra, has directed concerts on special occasions at the studio, and the symphonic concerts from Emery Auditorium are frequently broadcast.

A beautiful feature given to the listeners of the Cincinnati station every summer is the season of grand opera at the charming open-air theatre in the Zoo Gardens. The season runs eight weeks, with splendid casts and chorus from New York, the orchestra of sixty men being composed of picked men from the Cincinnati Symphony Orchestra. Every Monday night for eight weeks W L W broadcasts a complete opera.

It would make a long history indeed to tell of all the splendid service being rendered by the leading American wireless stations; for there are many more who are just as active and just as sincere as those I have had time to mention.

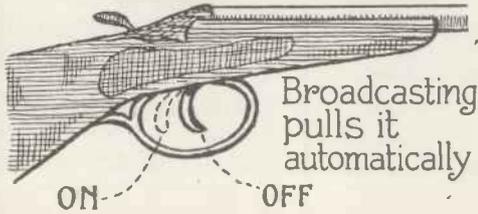
and characteristic show much after the manner of the motion picture. The thrill of mere distance has long since died—the fan now wants both distance and splendid entertainment—and the infant demand of the public for well planned performances is rapidly developing into an intelligent insistence.

Kingdom of Public Power

Broadcasting is the kingdom of public power, and the voice of its king is the opinion of the people. A successful broadcasting director is one who gives back to the people, who reflects back to the people, an expression of their own highest sentiments. And in American broadcasting the will of the American people is being obeyed. American ideals are being maintained: the will to material freedom, exemption from personal taxation, the stimulating effect of competition and the evolution toward artistic showmanship are the manifestations of the will of King Radio in America.

In a subsequent article I shall tell you of my impressions of European broadcasting.

THE "TRIGGER" SWITCH



Broadcasting "Pulls the Trigger" and Automatically Starts Your Valve Set.

This device has been specially designed, built and tested by the Technical Staff of "The Wireless Magazine"

ON a cold, damp autumn evening, when the family is comfortably seated round a roaring fire, someone is certain to remark how nice it would be "to have the wireless on." Nobody stirs, for they all know that in the next room, where the wireless set is kept, the temperature is hovering round zero. Each member of the circle waits for somebody else to brave the cold.

What the Trigger Is

By means of the small extra piece of apparatus, however, that we have called a "trigger," the loud-speaker automatically bursts into life as soon as the local broadcasting station starts to transmit. Not a control or a switch need be touched. The whole sequence of events from the beginning of the local transmission to the lighting up of the valve filaments of the receiver and the reception on the loud-speaker is entirely automatic.

Not only is the receiver brought into action automatically, but when the transmission ceases the sequence of events is reversed and the receiver is automatically switched off.

Moreover, in nearly every broadcast programme there are one or two items that do not suit the taste of those who are listening and on such occasions the set is usually switched off. When the set and the loud-speaker are placed in two different rooms of a house, however, it

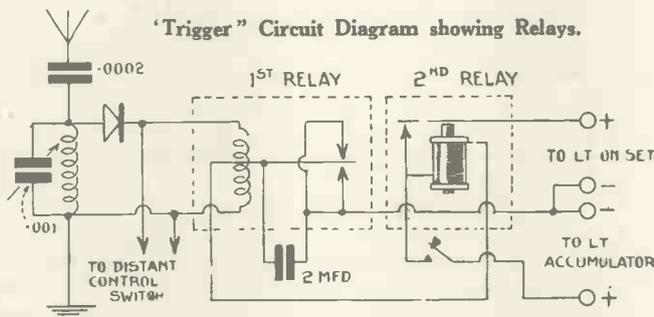
is very convenient to have close to the loud-speaker a switch that will break the filament-lighting circuit.

which is in no way connected to the filament-lighting circuit.

Before any detailed explanation is given we should like to emphasise the fact that *this system will not work outside the range of strong crystal reception.* Unless very strong signals can be received from the local station on a simple crystal set there will be insufficient energy in the "trigger" aerial to operate the first relay.

In the trigger itself there are two relays, one of which (the first) is a very sensitive Weston relay operated by the minute crystal set current. Thesecond relay is not so sensitive as the first, and is controlled by a much greater current.

'Trigger' Circuit Diagram showing Relays.



Owing to the resistance of the wires leading from one part of a house to another the valve filaments cannot be turned off by means of a switch directly connected in the L.T. battery circuit.

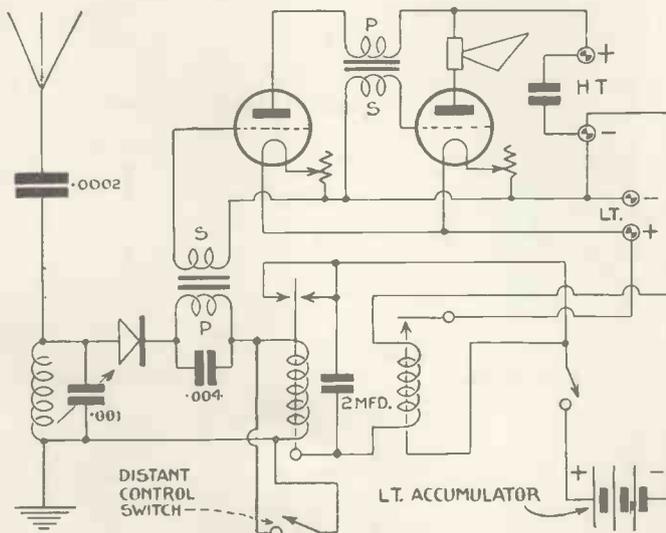
Separate Aerial

A separate aerial is required for the trigger on which the waves from the local broadcasting station are received and tuned-in by the usual tuning coil and condenser. The oscillations thus received and tuned-in are then rectified by the crystal detector transforming them into unidirectional impulses, after which they pass through the moving coil of the first sensitive relay. This coil takes the place of the phones in an ordinary crystal set.

The extremely minute current which passes through the crystal and

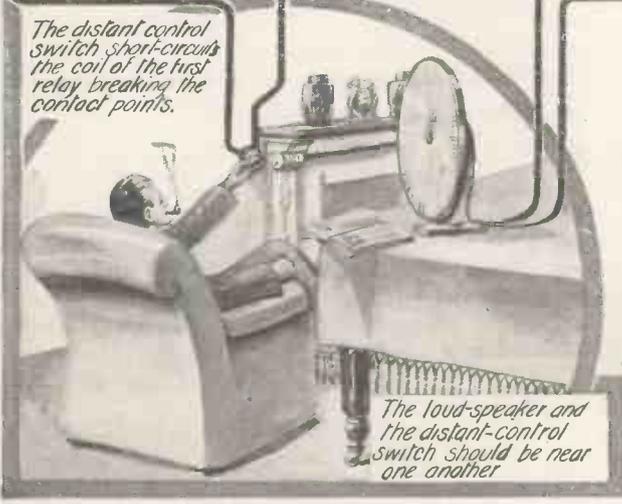
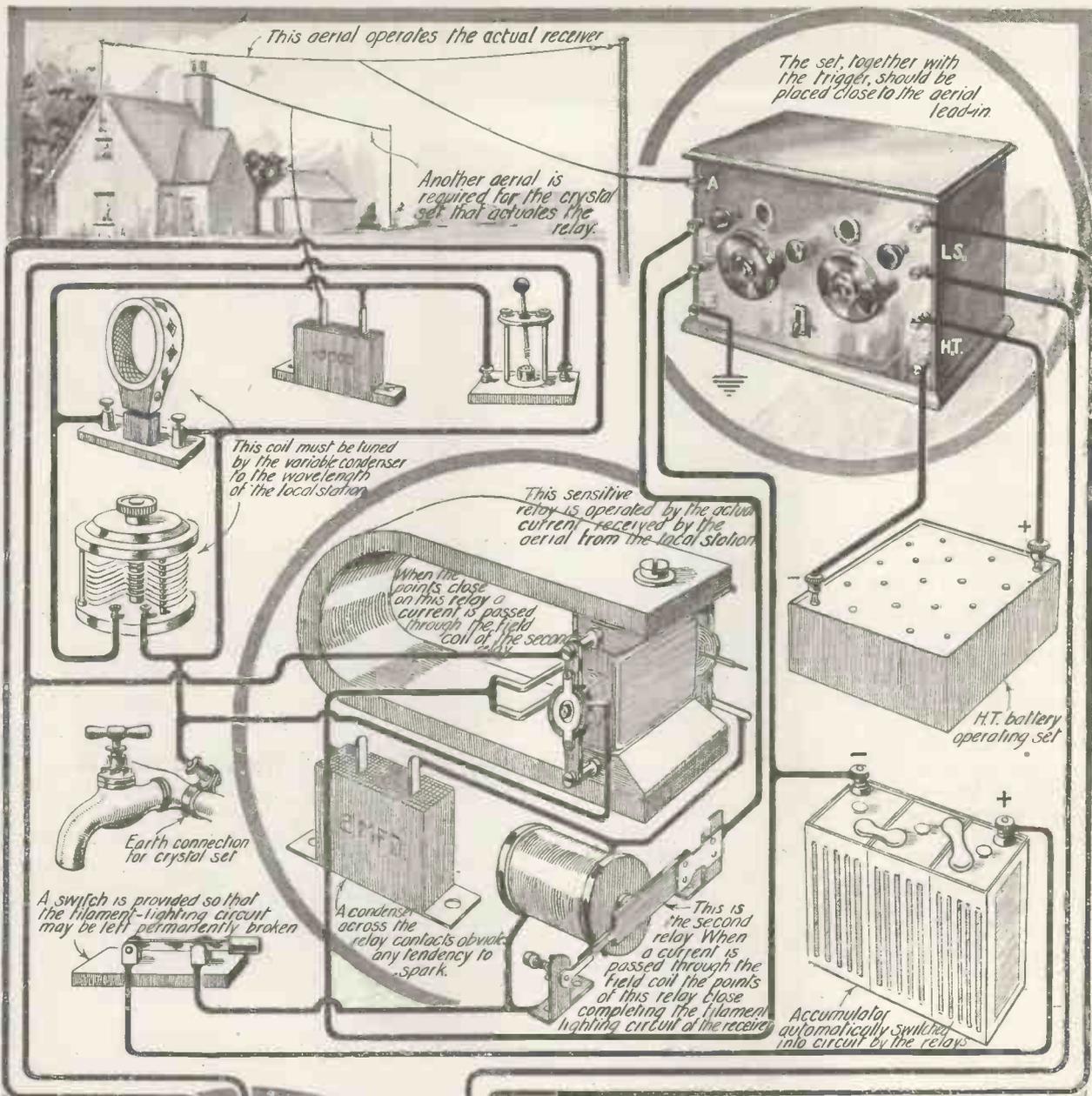
the relay coil is sufficient to give the relay a small magnetic field of its own.

Round the coil is a very strong



"Trigger" Circuit for Crystal and Two L.F. Amplifiers.

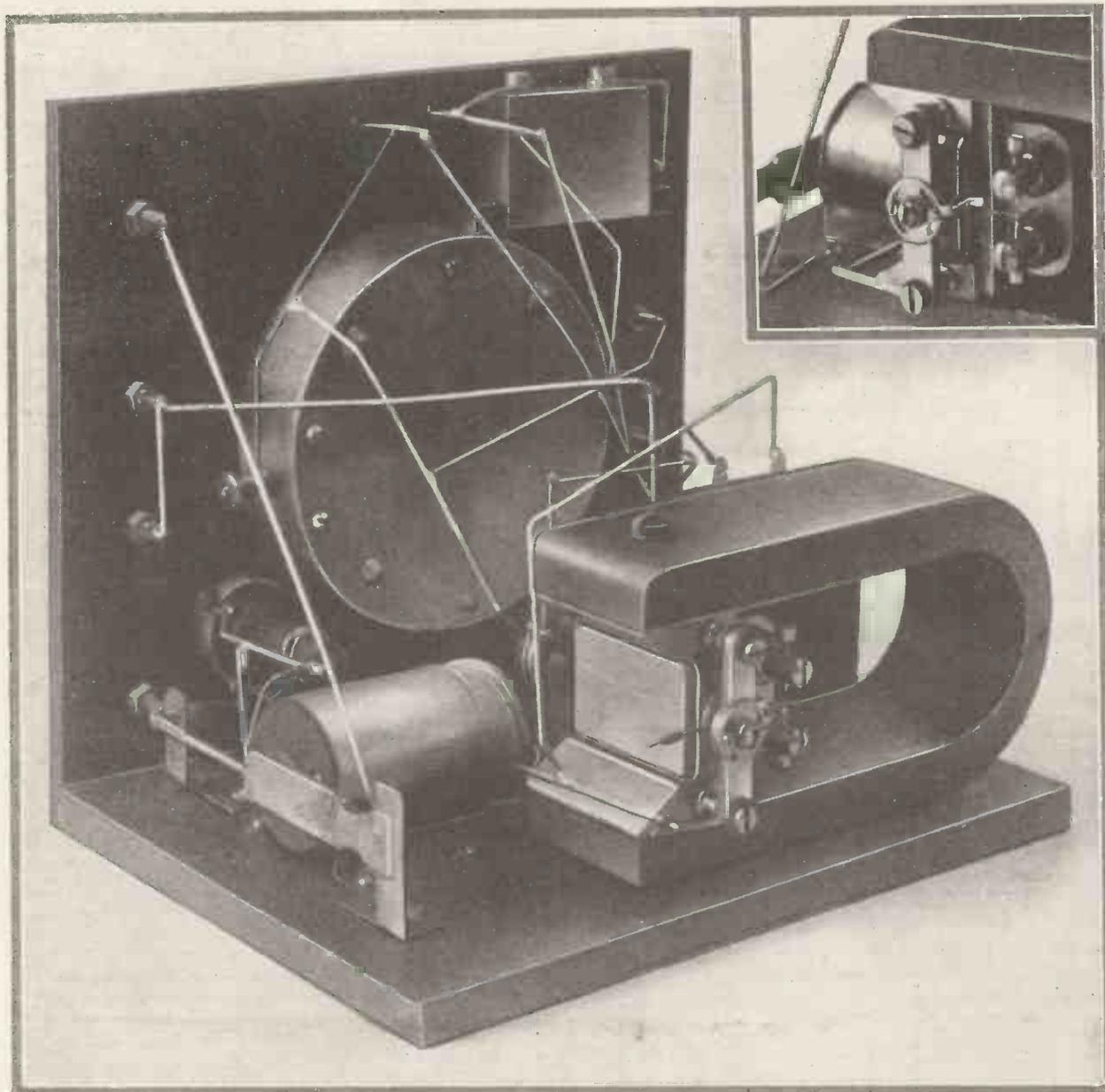
To get over this difficulty a distant-control switch is incorporated in the "trigger" circuit which cuts off the filament-current supply, but



THE "TRIGGER" IN PICTURES

A system and mechanism (developed by the Technical Staff of "The Wireless Magazine") by which your valve set, if within "crystal distance" of a broadcasting station, is switched on and off absolutely automatically, and is also controlled from a distant point where the loud-speaker is placed.

THE "TRIGGER" SWITCH (Continued)



Detailed Photograph showing Arrangement and Wiring of the "Trigger" Unit.

breaking the contacts of the first relay.

The actual receiver requires a separate aerial from the trigger. It is possible, however, to work an L.F. amplifier by the method indicated, no separate aerial being required.

A circuit diagram of this arrangement is given; it will be seen that the only difference is the insertion of the primary of a low-frequency transformer between the crystal and the coil of the first relay.

Components Required.

There are very few parts required for the making of the trigger. A complete list is given below:—

Radion ebonite panel, 7 in. by 6 in. by $\frac{3}{8}$ in. thick. (American Hard Rubber Co.)

.001-microfarad variable condenser. (Lissen.)

.0002-microfarad fixed condenser. (Dubilier.)

2-microfarad fixed condenser. (T.C.C.)

Crystal detector. (Radio Instruments.)

Weston moving-coil relay. (Economic Electric, Ltd.)

8 terminals. (Belling Lee.)

Fixed coil holder.

Push-pull "off and on" switch. (Lissen.)

Quantity of No. 36-gauge d.c.c. copper wire.

With the exception of the No. 36-gauge wire, the parts necessary for the construction of the second

relay must be home made.

Making the Relay

In the construction of the actual receiver the armature taken from an old electric bell was used. If this cannot be obtained, however, the reed, or armature, may be made up as shown in the sketches.

A large French nail, about $\frac{1}{4}$ in. in diameter, is used as the iron core of the second relay. Two ebonite end cheeks, $1\frac{1}{4}$ in. in diameter, and about $\frac{1}{16}$ in. thick, have a hole drilled through the centres large enough for the nail to pass through with a very tight fit.

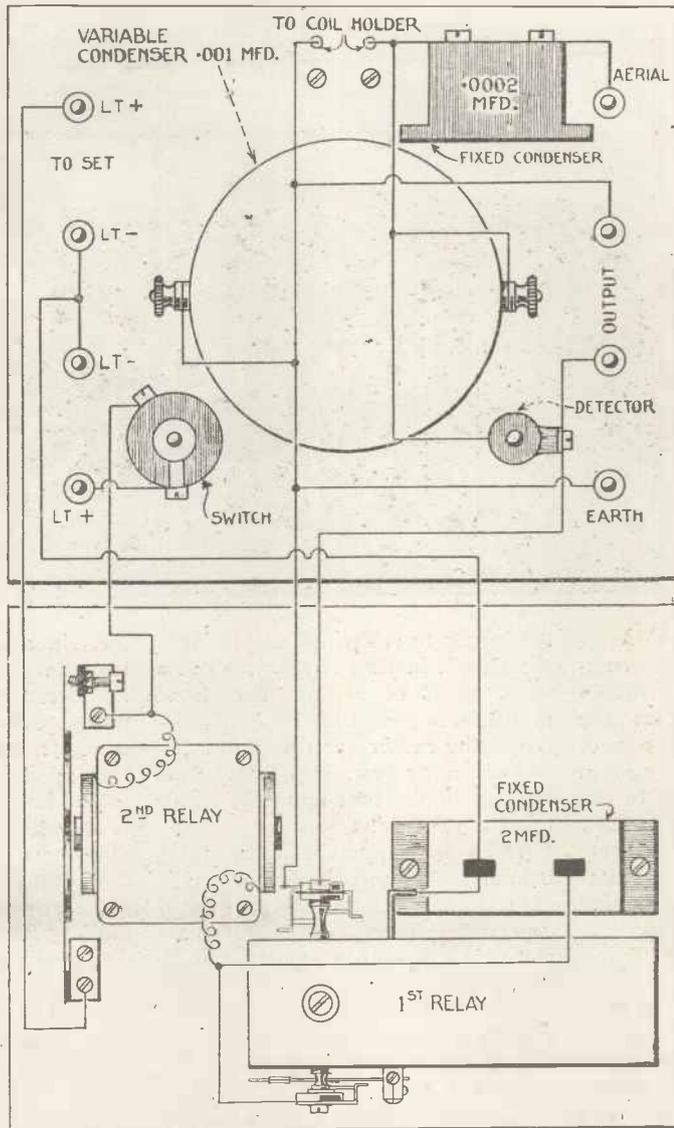
The winding space between the two cheeks is 2 in. long. This space is wound full of No. 36 gauge wire, the two ends being pushed through small holes drilled in the cheeks.

Preparing the Panel

The 7 in. by 6 in. panel is a standard size, and may be bought with the edges ready squared up. A drilling diagram is given showing the centres and sizes of the holes required for mounting the com-

ponents. The tuning condenser is mounted in the centre with the fixed coil holder directly above. In the left-hand bottom corner is seen the semi-permanent crystal detector, and in the opposite bottom corner is mounted a push-pull switch that breaks the accumulator circuit when it is essential that the trigger should not work for long periods. This is *not* the distant control switch already mentioned.

On the left of the panel are mounted the



Wiring Diagram of the "Trigger" Unit.

aerial and earth terminals, together with the two terminals to which the distant control switch wires

are connected. The top two terminals on the right-hand side of the panel are connected direct to the L.T. terminals on the receiver, while the bottom two terminals are joined to the filament-lighting battery.

A wooden baseboard, 7 in. by 5 in., is attached to the foot of the panel at the back. On it are mounted the two relays and the 2-microfarad fixed condenser. An idea of the disposition of these components may be gained from the wiring diagram.

Contact Points

This diagram also shows how the armature of the second relay is mounted and how the contact points may be made adjustable. In operation it will be found that these contact points need to be carefully adjusted.

Wiring should present no difficulty if reference is made to the wiring diagram and the full-page pictorial diagram.

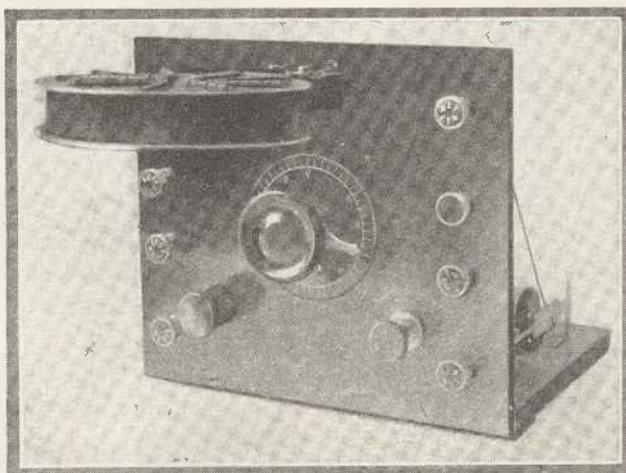
Soldering tags are already provided on the first relay.

Operation

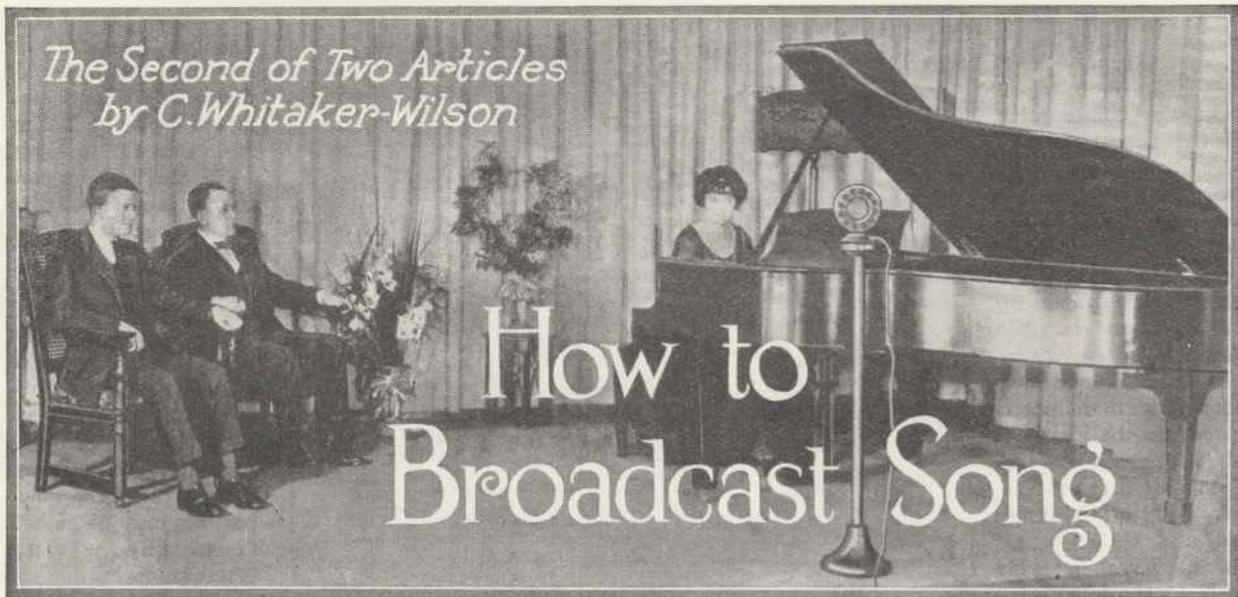
Attach the trigger to its own aerial and earth (both of which should be efficient) and plug in a coil in the fixed coil holder suitable for the local station. This station should be carefully tuned-in until the maximum current passes through the moving coil of the first relay.

It should be noted that when the local station is tuned-in, the blade attached to the moving coil moves up or down and makes contact with one of the two metal stops. It will probably be neces-

(Continued on page 235)



Front of "Trigger" Unit.



IN a previous article (How to Broadcast Speech) I began by recommending that all speakers should realise from the outset that the microphone, being entirely out of their own personal control, can in no way be regarded as being of the slightest assistance to them in their work of broadcasting. It merely does its work of collecting the vibrations of their voices and of passing them on elsewhere.

Cold and Dead "Mike"

I contrasted the microphone with a car, and pointed out that whereas a car is almost human in the hands of its sympathetic owner by reason of its being directly under his own operation, a microphone is cold and dead (so far as any help as a vehicle for effect is concerned) because the control is in the keeping of someone else. And if this be true for the speaker it is also true for the singer; for song is only an elongated and more tonal form of speech.

Therefore it follows that the successful singer is he who, while respecting the microphone as a means of conveyance only, and most certainly realising its limitations, can (otherwise) forget its existence. And from this thought arises another—one which bears directly upon the basic principles which govern all broadcast song: *The very act of successfully forgetting the presence of the microphone should constitute the very soundest reasons why a singer should never sing better than when broadcasting.*

For surely he has everything in

his favour to assist him in his interpretations, in that it requires but a small effort of his imagination to persuade himself that he is alone—rehearsing rather than performing—and no singer ever sings better than he does in the best moments of his private practice.

There is a great thought lying behind this, and one which can be of real use to the young singer especially. There is no question of the visible audience. So that if he can, in his private practice at home, concentrate sufficiently to become oblivious to his surroundings, he stands a very good chance of doing much the same sort of thing with only a lifeless machine placed fifteen feet in front of him.

That is a very different proposition from a crowded hall. At the worst the singer should only be dimly conscious that he has an audience—somewhere—a fact which should be more than a little instrumental towards steeling his nerves for the more intimate ordeal of singing in public in the ordinary sense of the word. In fact, I am of opinion that the British Broadcasting Company may be indirectly responsible for many a young singer finding his feet from the nerve point of view, because broadcasting is so much easier than concert giving from the æsthetic side.

I do not want to labour this point, but as a voice-trainer with some experience behind me, I unhesitatingly say that nearly every vocal or interpretive fault can be traced to bad actions of the nervous system.

The singer may not realise it, but it is a fact, nevertheless, that most faults emanate more or less from a misusage of the diaphragm. In other words, if anything goes wrong with the wind supply an impurity of some kind is bound to result. *This is because the diaphragm is under the direct control of the eye.*

In case this statement is likely to cause any confusion or doubt in the mind of any young singer who reads it, I will proceed to prove it. You cross a road, and narrowly escape being knocked down by a passing car. Where do you feel the unpleasant sensation of being thoroughly startled? In your eyes? No, your diaphragmatic regions! But your eyes saw the danger: why do they not ache, or something? Because the knowledge of your danger, and the fear immediately resultant from it, is telegraphed—on a main trunk line, be it noted—to your diaphragm, with the net result that your respiratory system is immediately disturbed and your pulse heightened.

Bad Breath Regulation

To translate this thought to the art of singing—which, after all, is the use of a wind instrument—is but to point to the fact that any disturbing element is likely to cause bad breath regulation, from which almost any class of fault may arise.

I fear that I have taken a long time to say all this, but I am anxious to insist that as the nervous system rules all things in song interpretation, the sooner the fact is realised

the better for the singer. And I repeat that broadcasting under the present studio conditions is an excellent beginning from this point of view.

Practical Hints

But it must not be concluded from all this that everything in the studio garden is bound to be lovely. Were it so, broadcast song would be by far the best type of transmission by wireless, which it certainly is not. There are many pitfalls to avoid, unfortunately.

First—as in speech so in song—tone is of the utmost importance. And it is in this respect that one of the greatest difficulties in broadcasting song arises. For the sake of those who have yet to make the acquaintance of a broadcasting studio it may be as well here to observe that everything in the room is heavily upholstered or covered in some way. The ceilings are draped—in some cases padded; the walls are hung with curtains; the floor thickly carpeted. This is, of course, to prevent undue echo.

And this unexpected lack of resonance in the singing-room has been the direct cause of many failures of those who have sung. It is useless for singers to complain that their voices sound like nothing else on earth in a broadcasting studio. It is so, but there it is, and there it will be! The only way to deal with the matter is to realise it at the outset and to remain unaffected by it.

Out of Tune!

A large percentage of those who have sung out of tune (and their name is legion) have done so simply because they have been taken unawares and thoroughly demoralised at the sound of their own voices. The result, particularly in the case of sopranos and tenors, has been a certain amount of over-pressure from the diaphragm in the high notes. And this is just where microphone and singer have parted company so far as artistry is concerned. A microphone is no flatterer, even when the best tone flows forth; but if there is any tendency to over-press

it will see that the effect is far worse, even, than the singer imagines.

So when you go to broadcast go prepared to hear your voice rather dull and toneless. But do not be distressed at what it sounds like so long as it feels perfectly right. It is for you to know when this is.

If you have been properly trained you should know by the "feel" of a note or phrase whether or not it is correctly produced. I have had the opportunity of being present at more than one audition, and I have always noticed that the singer who is accepted is he who sings with ease and restraint. The others are refused. Were it not so, there would be more bad broadcasting of song than there is.

I think it is true to say that a singer who cannot make his words travel as far as his tone is better silent for ever. For surely the very essence of song might be defined as

to listen, but audiences are able to—and do—absorb a certain amount of diction by watching the singer. Is it necessary for me to point out that in the case of broadcasting all this is denied to him who broadcasts?

"Intense" Diction

Diction through a microphone must, therefore, be intense. And to this end all practice at home should be with this thought in mind. Let the singer persuade some friend who writes shorthand to "take him down" in a song whose lyric is unfamiliar to him, and this without being within his vision.

This, and any modification of it which the ingenuity of the vocalist can devise, should be experimented with to the utmost. Moreover, I offer it as a suggestion that, before ever the song be rendered musically, or even read, that the words should be committed to memory and recited aloud. I argue that every singer who broadcasts, knowing the difficulties of musical reception by means of the ear only, should go to the most extravagant limits in this matter if he wishes for success.

And, finally, all sudden effects must be studiously avoided. One has only to watch the meter in the control-room during the broadcasting of a song to realise that sudden *fortissimi* and *pianissimi* are ineffective. The former may blast; the latter miss altogether.

Volume and Tone

All loud passages must be guarded most carefully; all soft ones must carry good vocal tone. The microphone is entirely mathematical and scientific; it is neither artistic nor æsthetic.

You are concerned with appealing sounds; it prefers to think of them as vibrations only.

But, like all accurate thinkers, the microphone is the first to say that there is nothing the matter with the best. And therein lies the art—and the pleasure also.

MR. R. M. FORD seems to be as troublesome to the P.M.G. as his namesake Henry is to the motorist.

DE MORTUIS OSCILLATORIS

QUIETLY he sits and he fingers the knobs
Of his D.F. research set and sadly he sobs,
As he turns his frame round to the East and the West
And seeks the location of each howling pest.

He weeps through the microphone now and again
In accents of gently remonstrative pain:
"Please do not do it. Oh, don't oscillate,
DO take a few volts off your overworked plate."

Slowly he ages and slowly he greys,
But still against howling his voice he will raise.
And Ham-handed Henry he bitterly hates,
And Oswald also as he still oscillates.

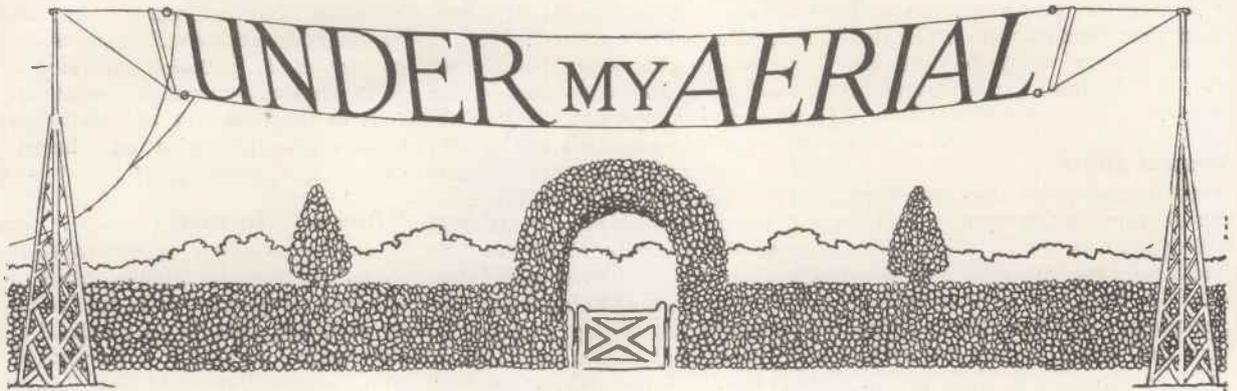
When Chirruping Clarence shall chirrup his last
And howling shall be but a thing of the past,
There'll be a white tombstone beneath the tall pines,
And on it the stranger shall read these sad lines:—

Much howling sore long time he bore,
Remonstrance was in vain.
But golden harps don't oscillate,
And now he's out of pain.

J. L.

the presentation of a musically set poem before the listener so vividly that the words are visualised without the slightest effort upon the part of the listener. Anything else desirable in the matter of expression and depth of interpretation can be added to this but not given in place of it.

It is no good relying upon the listener making an effort for the singer's sake: *people make no effort*



Daventry

IF there was one thing which pleased me above all others about the opening ceremony of the new high-power station it was the statement that, as far as broadcasting was concerned, Daventry would be pronounced as spelt and not as Daintree, the pronunciation known to the natives of the district and to a few wise historians.

We have enough fancy pronunciations amongst the names of our towns already. So far the B.B.C. folk have avoided places with catchy pronunciations and it would have been a pity if they had fallen over their most important station.

Imagine what confusion and quarrels "Daintree" would have caused amongst our peaceful and law-abiding listeners-in. Imagine the number of free fights "Daintree" would have brought about in our wireless clubs. Tricky pronunciations have been known to be the cause of the breakdown of lifelong friendships, even amongst wireless men.

I have never forgiven the man who corrected me when I said some-



Correcting the native pronunciation.

body or other had gone to Bicester.

"You mean Bister, do you not?" he said in tones of ice.

A strange thing with regard to these tricky pronunciations of the names of towns is that pronunciations with which we are perfectly familiar here at home do not always obtain in other parts of the empire.

For example, one of the things I remember so well about Ottawa,

the Canadian capital, was that the tram conductors all called out "Glos-cestre Avenue," instead of Gloster Avenue as we should have called it.



Difficulties

Possibly the greatest difficulty with regard to the new straight-line frequency variable condenser is that, were this condenser to be brought



The room required to rotate a plate.

into general use, wireless experimenters and broadcast listeners would everywhere be compelled to think in frequencies as measured in kilocycles instead of in wavelengths as measured in metres.

The transition from metres of wavelength to kilocycles of frequency is not a difficult one (there is a simple relationship between the two) but nobody ever takes kindly to a new system of measurement and wireless folk are no exception to the general rule. Besides what would happen to all our wave-meters?

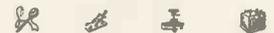
The plates of the new condensers are, in shape, like an elongated D. Because of the large degree of elongation, the plates of the rotor of such a condenser require considerable room in which to move. Moreover, the area of a plate is quite small compared with the amount of room it requires for rotation.

This elongation of the rotary plates makes it necessary to have a much larger number of plates than in a circular or straight-line

wavelength (square-law) condenser of the same maximum capacity.

For example, to get a maximum capacity of .0005 microfarad in one of the new straight-line frequency condensers, it is necessary to have *twenty-three* rotary plates.

I wonder how soon these new condensers will be on the English market and I wonder what their reception will be like.



Wireless and Geography

A schoolmaster friend of mine put the "Grand Good Night" as broadcast on Sunday, July 19th, to a most ingenious use. He gave each member of his class a blank map of the British Isles and instructed them to indicate the position of any place mentioned in the speech which he was going to read to them.

He then read the "Grand Good Night" to them slowly pausing a little when a particular place or country was mentioned. I asked him what the results were like when he corrected the maps.



Gussed it was Wales by the spelling.

"Very good indeed," was his reply. "The majority of the places were well known to the children. Tintagel and Marazion set them fast. Very few of them were able to place the Rhondda Valley correctly although most of them gussed by the spelling it was in Wales."

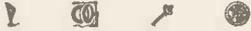
"Did they get the Fens and the Broads?"

"Most of them did. We have made a special study of the holiday

districts recently. The little isles proved too much for many of them."

"Did anybody get the whole lot right?"

"One little fellow did, but his father is a great wireless enthusiast and he had actually drawn up a correct map with the boy before I set the exercise."



Whitewashing Aerials

A little while ago we were being asked to make our outdoor aerials as conspicuous as possible so that flying birds would be able to see and avoid the aerial wires. Now we are being asked to make our indoor aerials as inconspicuous as possible since wires inside a house are an offence to the artistic eye. Moreover, we are told that an indoor aerial is apt to spoil the effect of the decorative work of the house painter.

Have you an indoor aerial? Does your indoor aerial consist of a number of unsightly wires, black or copper,



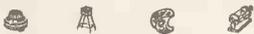
An offence to the artistic eye.

running under the spotlessly white ceiling of the pink and magenta drawing room?

What are you going to do about it? Luckily for you, there is a remedy for such wireless wickedness. Those horrid black or copper wires must be whitewashed. More than that, they must be whitewashed in such a fashion that they cannot be told apart from the spotlessly white ceiling.

"Have you whitewashed your indoor aerial, Mr. Halyard?" you ask and quite rightly.

"Well, no," I am bound to reply, "I always use D.C.C. wire for my indoor aerials, so there is no need for me to whitewash my wires."



Aerial Risks

A would-be wireless enthusiast asked me yesterday what risks he would run in erecting an outdoor aerial.

"None whatever," I replied; "provided, of course, that you

exercise a moderate amount of common sense."

"But I know absolutely nothing about electricity," he said in rather an aggrieved voice, "and there are telephone wires running across my garden very near the place where I would like to fix my aerial."

I suppose you have often met people with this same curious dread



A curious dread of electricity.

of what they call electricity. Most wireless enthusiasts are aware that there is little to fear from land telephone lines as such. There may be induction effects from such wires, but the results of such effects are more likely to be amusing than dangerous.

The other day I saw an aerial wire which, at its middle point, passed under a set of twenty land telephone wires. I remember the feeling of apprehension I had as I looked at that aerial wire. I wondered what would happen if one of the telephone wires fell over a power line somewhere and that same wire fell across the aerial.



Holiday Personalities

"Had a good holiday, George?" I asked one of my wireless friends a day or two after his return from the seaside.

"Pretty fair, jolly good weather," he replied.

"Done any wireless on your holiday?"



"I knew he was a Russian."

"Not a bit, but I've had a rare good wireless holiday all the same."

"How do you make that out if you have done no wireless reception at all?"

"Easy—I've talked wireless morning, noon and night to every wireless Tom, Dick and Harry I came across."

"I don't see much of interest in that."

"Oh! Don't you?"

"No."

"Very well then, there is no need to discuss it further."

"But that would be a most unsatisfactory way to leave it. Explain yourself, if you can, George."

"Well! Through talking to everybody I could about wireless, I got into contact with some of the most interesting American personalities in the whole wide world."

"Some of the big pots?"

"Rather."

"Tell me their names. I know most of the big pots—by name."

"Never got to know their names."

"George, you're leg-pulling, as usual."

"Well! You're asking the questions."

"Who were your wireless big pots, George?"

"The first day I was at the seaside, I ran across the inventor of the oscillating crystal."



Interesting American Personalities.

"How did you know it was he?"

"Why, he told me, of course. Not only that, but I knew he was a Russian because of the snow on his boots, and because he had had to have his beard cut from round his ears in order to get a pair of earphones on."

"George, you old rascal. What other big pots did you meet?"

"I met the man who has been doing wireless for three years and has never burnt a valve out the whole of that time."

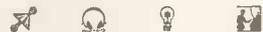
"What a big pot! How did you run across him?"

"Oh! I got talking to him in a wireless shop."

"What was he buying, a valve?"

"Dear me, no. He was buying a new piece of crystal. His old piece had lasted him three years."

"George,——"



England's Worst Aerial

I have been spending a part of my holidays at a well-known seaside resort on our western coast. As

is always the case with me when I visit a new place, one of the first things I did was to have a walk round to see what kind of aerials there were in use.

I did not see anything exceptional in the way of good aerials, but I think that I saw an aerial which would take a deal of beating in an



A Wireless Lunatic.

all-England worst-aerial competition.

This extraordinarily bad aerial was a twin-wire aerial fixed over the roof of a small bungalow. There were two chimneys to the bungalow, one at each gable end. To the outside of each chimney a short vertical mast was secured and the aerial was slung between these two masts. The "horizontal top" of the aerial could only have been about twenty-five feet in length.

The horizontal wires had not been pulled tight between the masts. They hung quite loosely in the most slovenly fashion. The two down-leads were taken from the horizontal wires, not at the centre points nor at the ends, but somewhere about a third of the way along the horizontal span. Moreover, they were not even opposite each other. One must have been a good yard further along its horizontal wire than the other.

The two down-leads were fastened to a piece of thick, insulated cable and this thick cable was actually lying on the sloping roof. There was a fair-sized twisted loop of this cable hanging over the edge of the roof.

Probably this loop was an alternative to shortening the cable.

The lower end of the insulated cable was fastened to an aerial lead-in in the usual way.

I have not the least hesitation in saying that this aerial was the worst aerial I have ever seen. My fingers itched to get at it and so would yours have done. I did not make the acquaintance of the owner of this bad aerial, but I formed the idea that he was either a wireless lunatic possessed of many valves or a wonderful genius with a wonderful crystal set. Most probably the former.

Which Set Shall I Buy?

Of all the constantly recurring wireless questions which are being put before you, I wonder which you find the most consistently difficult. I know which constantly recurring question bothers me the most. It is the one asked by the novice who has decided to install a wireless set and is puzzled to know what kind of a set to buy.

I always feel like running away when I am asked that familiar question: "What kind of a set would you recommend I should buy?"

It is really most terribly difficult to give a definite answer to that apparently simple question. What I feel I should like to say is something like this:

"Well, I should not buy such and such a set because it is so difficult to tune, and I should not buy that and that set because it does not get the distant stations, and I should never buy a set which employs a



That Bothering Question.

movable reaction coil, and so on and so on."

Not very helpful is it when you talk like that to a wireless beginner?

There is one point, however, about which I feel most emphatic when it comes to recommending a type of set for the novice, and that is that it is most unkind to recommend a valve set which employs high-frequency amplification.

The more I see of high-frequency amplification in the hands of the unskilled listener-in, the less I like it. I am convinced that the majority of those who possess valve sets would do infinitely better with low-frequency amplification than with high-frequency amplification.

Another point about which I feel decidedly emphatic is that it is frequently not in the best interests of wireless to advise the addition of a valve amplifier to a crystal set.

Two valves following a crystal detector will give about as much volume as a single-valve with reaction. It always seems to me much better to advise the making of a two-valve set, detector valve and

low-frequency amplifier, and to leave the crystal set alone just for use as an emergency set when the valve set cannot be used for some reason or other.



Valve Holders

I have a wireless friend who is in the Post Office. Rather a useful place to have a wireless friend, isn't it? The friend I refer to though, is only in a very subordinate position. In fact, he sells stamps, postal orders and, I believe, wireless licences over the counter.

Now this Post Office friend of mine, let us call him Dot for short, came into my house the other evening to have a look at a three-valve set of mine. Dot and I went over the set very carefully and we had a most interesting talk about the different component parts.

Practically everything came in for discussion, fine adjustment, variable condensers, coils, grid leak, terminals, transformers, switch and wiring. I noticed though, that my P.O. friend made no remark with regard to my valve holders.

The valve holders I am using in that particular three-valve set are of a type which I consider to be amongst the very best of present-day anti-capacity valve holders, and I was rather disappointed that Dot took no notice of them.

A few evenings later I had a call from another Post Office friend (same Post Office). On seeing my three-valve set he at once exclaimed:

"So that is where Dot got his new valve holders from, is it? He's been talking of nothing else for a couple of days."



A Valve Holder.

Funny that Dot should have adopted the one component he had never said a word about, wasn't it?



A Hill Shadow

During a recent visit to one of England's beauty spots, a picturesque village in the Pennine mountains, I came across a peculiar example of a "wireless shadow." The village

I refer to consists of a number of scattered houses, some on one side and some on the other side of a deep valley.

In a talk I had with a local wireless enthusiast, I learnt that reception on the eastern slope of the valley was always excellent, whereas reception on the western slope was invariably poor.

"What is the reason?" I asked, greatly interested.

"I suppose that the western mountain throws a wireless shadow," was the reply.

"But would a hill shadow cause reception to be bad from all directions or only from one particular direction," I asked.

"Here, at any rate, the hill shadow causes reception to be bad from every direction. No matter in what direction a transmitting station lies, you can get that station twice as loud on the eastern slope of the village as on the western slope."

"What is the geological formation of the eastern hill?"

"Chiefly clay and gritstone."

"Is the western hill different?"

"Yes. It is all limestone."

"Don't you think it might be the earth which is at fault on the western slope?"

"It might be. Would you like to see a set working on the western hillside?"

"Very much indeed."

"Come along then."



The Shadow Dispersed

We climbed the hill and entered a cottage where a three-valve set was working on 5 XX and giving



A Hill Shadow.

ing rather faint loud-speaker results.

"There you are," said my new friend, "pretty poor, isn't it?"

I admitted that it was.

A few questions elicited the fact that the "earth" consisted of a soldered connection to a main water supply pipe. My first glance at the cottage as I approached it had satisfied me that the aerial was an exceptionally good one.

"Do you mind if we try a counterpoise?" I asked the owner of the set.

"Not at all. I have plenty of spare wire," he replied.

We rigged up a temporary counterpoise of No. 18 bell-wire, the counterpoise running immediately under the aerial at a height of six feet above the ground.

Reception was no better with the counterpoise than it was with the earth. I began to nose round. The aerial was all right, but the aerial lead-in! I never saw such a mess-up. The wing nut on the outside of the aerial lead-in was absolutely black and so was the end of the aerial down-lead.

I took the wing nut off and rubbed its inside surface on a stone. Then I separated the seven strands of the down-lead and cleaned each one carefully with a blunt pocket knife.

After screwing the down-lead to the lead-in tube again, we tried



Could hear the Loud-speaker outside the House.

the set once more. Signal strength was infinitely better; in fact, you could hear the loud-speaker outside the house whereas before you could only just hear it in the room.

The owner of the set had put down the deterioration in the signal strength he was obtaining to the "hill shadow" and had not even given a thought as to there being some other reason for the poor results.

I found out afterwards that reception on the eastern slope of the village was certainly better than on the western slope but my experience with the three-valve set on the western hillside shows that it does not do to pay too much attention to the bad reputation a place may get for wireless reception.



Accumulator Terminals

My oldest accumulator has been showing a tendency to come home from the charging station with corroded terminals. I often lend this old accumulator to wireless friends who need an accumulator

in an emergency, so perhaps it has suffered at the hands of those who have borrowed it.

The other day I lent this old accumulator to one of my oldest wireless friends. After trying the accumulator, my friend brought it back to me and told me with a rueful countenance that he could



The Changing Station.

get nothing at all out of it. I was rather puzzled at this, for the accumulator had only come back from the charging station fully charged the day before my old friend borrowed it.

However, on examining the terminals on the accumulator, I found that the circular bases of those terminals had been covered with a thick layer of pitch. In order to allow connection to be made with the terminals, a loop of thick copper wire had been placed in the pitch on each terminal base. The idea was that the bare copper wire loop would protrude above the pitch and so make contact with the wire attached in the usual way to the accumulator terminal.

Unfortunately, however, the wire of the loop was too thin or the layer of pitch was too thick, whichever way you like to look at it, and no contact could be made with the accumulator terminals.

It was very kind of the man in charge of the charging station to "pitch into" my old accumulator in this fashion and I was sorry to have to take the pitch off.

A little vaseline smeared on the terminals would have been much better and would no doubt have prevented corrosion just as much as the pitch would have done.

HALYARD.



FINGERPRINTS are now being transmitted by wireless. Perhaps that accounted for the presence of so many on our soup plates at the Brighton boarding-house last week.

WIRELESS will increase security, says a diplomat. But not the security that our moneylenders demand—it would be impossible to increase that.

Using Your House Telephone As An Aerial

It is obvious to anyone who gives a thought to the matter that the immense network of wires carrying the telephone traffic of London and other large towns must absorb an appreciable amount of energy from broadcast ether waves.

Induced Currents

Whenever an electromagnetic wave cuts across a conductor it induces an electromotive force, which, if there is an available circuit, spends itself as an electric current. In the case of the ordinary aerial, the current circuit is the path to earth, and pains are taken to tune this path to the frequency of the wave, so that the currents not only flow through to earth, but are also built up to a large value by the cumulative action of sympathy.

If there is no such circuit available then the electromotive forces induced in a conductor by the impact of ether waves are dissipated as eddy currents. Any large mass of conducting material, such as the iron latticework used in reinforced-concrete buildings, a leaded roof, a metal bridge, or the like, absorbs a large proportion of any wave energy that passes by, incidentally robbing or screening any wireless receiver in the immediate neighbourhood.

Lowering Aerial Efficiency

In the ordinary way a network of telephone wires may be regarded as acting in much the same manner. It is well known that a mass of telephone wires lowers the efficiency of an adjacent wireless aerial, especially one lying more or less parallel to their course.

From this aspect the telephone system may be regarded as inimical to wireless. At the same time, under certain circumstances, it can be made to serve a distinctly useful purpose.

At first sight the telephone lines feeding a subscriber's instrument would appear to offer an excellent ready-made aerial. There is an elevated wire well insulated and supported, and an excellent lead-in taken directly to the sitting-room or hall or wherever the instrument is located. The only drawback is that

the whole system is too carefully insulated. There is no circuit to earth, and it would be fatal to the telephone service to make one in the ordinary way.

But it is possible in a very simple way to open up a circuit which will be able to tap off from the overhead

of which is formed by the parts of the telephone instrument that are associated or connected with the lead-in wire from outside. This condenser, it will be observed, is actually in series between the overhead wires and the lead to your set and thence to earth.

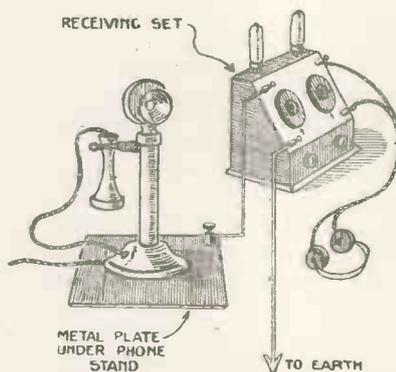


Fig. 1.—Method of Using Telephone as Aerial.

wires the radio-frequency currents induced by ether waves, whilst leaving the ordinary telephone currents absolutely unaffected.

This can be done by merely standing the telephone instrument upon a metal disc or plate, as shown in Fig. 1, taking a lead from the

What the Condenser Does

So far as the low-frequency currents used in ordinary telephony are concerned the condenser forms an absolute bar to their passage, so that none of the telephone-service energy is lost. On the other hand the radio-frequency currents induced as previously explained in the overhead wires readily jump across the condenser and enter the new circuit opened out to earth via your receiving set.

It will be found that the ordinary size of coil used with a standard 100-ft. aerial will tune-in to the local broadcast station on the new aerial so formed. The signal strength is about the same as that given by a frame aerial of eighteen-inch sides. Ten miles from London good head-phone strength can be secured with two valves.

An Actual Experiment

In the actual experiment the telephone instrument was merely placed upon a tin pie-dish, a wire being roughly clipped to the pie-dish and taken to the aerial terminal of the set. A good outside earth was used. Tuning, though broad, was fairly well defined. With greater refinements better results than those mentioned could no doubt be obtained.

In practice the telephone aerial is not one to be recommended for its efficiency. It does, however, offer a convenient alternative to any telephone subscriber whose aerial is for some reason or other temporarily out of action. Also it affords a means of using a portable set in any hotel or boarding house fitted with a telephone but otherwise unprovided with facilities for the wireless enthusiast.

The actual receiving circuit is illustrated diagrammatically in Fig. 2.

B. A. R.

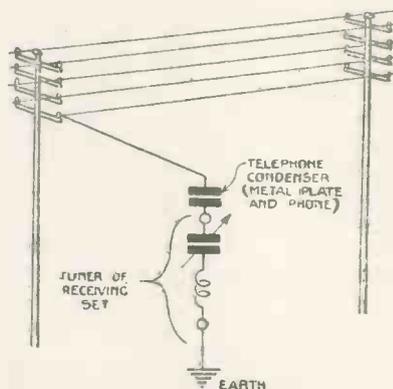


Fig. 2.—Theoretical Diagram of above Arrangement.

plate to the aerial terminal of your receiving set, and joining the earth terminal of the latter to an ordinary outside earth plate, or to the nearest water pipe.

The explanation lies in the fact that the metal disc constitutes one plate of a condenser, the other plate

A Wireless Adventure

As W.W. Jacobs Might Have Written It

(Slightly mixed and with deep apologies)

"WIRELESS telergraphy," said the night-watchman, as he gazed with an expression of intense longing on his face and a curious



"As I was a-saying, wireless telergraphy is a wunnerful thing."

unceasing moistening of the lips, alternately at an empty tankard at his feet and at the darkness studded with pin-pricks of light which veiled the beauty and charm that made Wapping such a haven of hope to lightermen; "Wireless telergraphy is a sort of a—a kind of a— . . ."

His arms and hands suddenly began to cleave the air to illustrate to his companion what wireless telergraphy really was, and a boy scout taking the air on the wharfside stopped dead and tried to read the signals.

Young Joe Green followed the fascinating movements of the night-watchman's arms and hands and then shook his head in self-pitying modesty—wireless was beyond the likes of him.

"As I was a-saying, wireless telergraphy is a wunnerful thing."

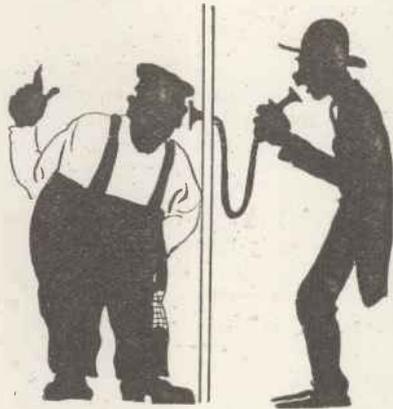
He paused impressively, and young Joe could hardly contain his admiration. The night-watchman looked at the tankard, moistened his weather-beaten unknissed lips, heaved a reminiscent sigh and spoke again.

"But this 'ere wireless tele—tele—you know, wot you speak through, fair beats me." Again he paused. His head sank lower and he sat as if in deep meditation. Joe began to

fidget; then he looked at the deck where the night-watchman's eyes were fixed, saw the tankard, seized it and disappeared into the night.

When he returned, the night-watchman, asking no questions, quickly reduced the tankard to its former desolate condition, and, infused with fresh life, proceeded with his tale.

"There was Bob Pretty's demerstration at Little Mugglesford. I stayed there last Christmas, and on Christmas Eve we was a-sitting in the 'Blue Lion'—just to smoke a pipe or two, that's all—when Bob says, suddint like: 'Let's 'ave a wireless tele-er—tele-phone demerstration'—you know as 'ow Bob talks big like; 'fer the benefit of



"Arter poor Bob 'ad gone, we 'eard the wireless voice as plain as plain could be."

retired wireless men.' Bob had just a-won the Christmas raffle, and George Cadger was a-growling in the corner at Bob's luck in winning the raffle year arter year. 'Somebody else ought ter 'ave a turn at writing the slips of paper and taking round the 'at,' he says, annoyed like.

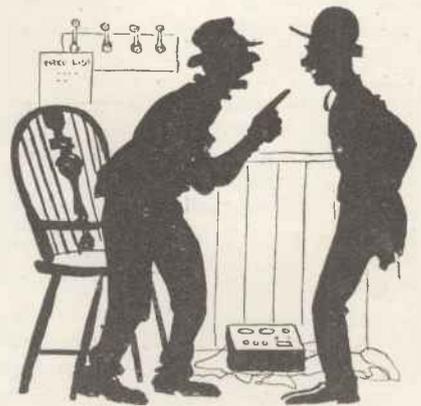
"Well, we all, 'cept George, thinks the demerstration would be great fun, so Bob goes home for his wireless thingamegibs. 'E was mighty quick, was Bob, and George ses as 'ow 'e 'adn't bin 'ome. Well, 'e comes back with 'is wires and stuff and looks round the room fer a proper place ter put it. Then he notices the speaking-toob above

George's 'ead and, perlite like, asks George ter move. George gits up and, moody like, glares at Bob, but Bob 'ad a face as kind as an angel's, and he fixes 'is wireless to the toob.

"That will catch the woscell-bashuns,' says Bob, big like, and we all gives 'im a clap, 'cept George. 'Now,' ses Bob, looking at his big gold watch, the one he won at the 'arvest raffle, 'the signals will arrive in ten minutes' time. While we're waiting, I'll take the kerlection fer our brave wireless heroes.' Of course, we all gives liberal like, 'cept George, and then waits fer the signals.

"Poor Bob, he missed the signals. Just at the moment they was due, he 'ad a bad attack of the coughs—fair broke 'im in two, they did, and 'e 'ad ter leave the room. Arter poor Bob 'ad gone, we 'eard the wireless voice as plain as plain could be by putting our earn against the speaking toob. It was wunnerful. I wish poor Bob could a-'eerd it—it was uncommon like 'is voice. Soon after the wireless signals stopped, arter saying, perlite like, 'Best wishes ter Little Mugglesford,' Bob returned, looking much better.

"Then up gits George and accuses Bob of perveriferkashun, and Bob

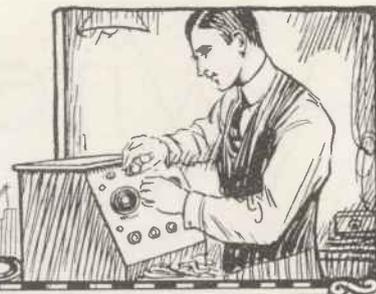


"Then up gits George and accuses Bob of perveriferkashun."

turning the other cheek like, ses gentle: 'Orl right, we'll call up Paris by wireless and see.' 'Exkuse

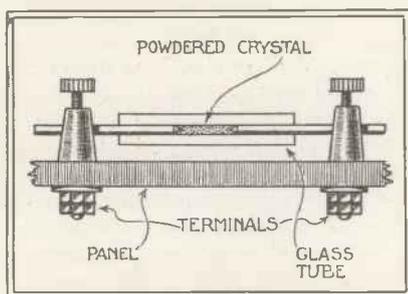
(Continued on page 246)

Gadgets, Hints and Tips



Permanent Detector

A SIMPLE permanent crystal detector can be made as follows: It is made up of a piece of glass tube and two pieces of copper wire, which are bent to shape and, after



Simple Permanent Detector.

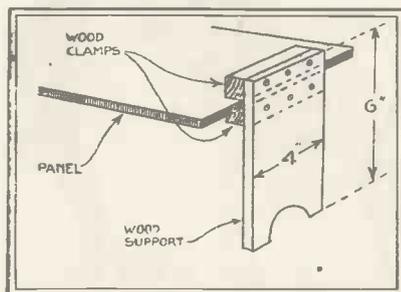
being pointed with a file at one end, inserted in the tube.

A small quantity of powdered hertzite crystal is placed in the tube, between the wires, which are connected to two terminals.

If bent to the shape shown in the sketch, the wire can be bent inwards should it not make proper contact with the crystal powder.
E. P. F.

Holding the Panel

THE operation of testing a set is greatly facilitated by using panel



Device for Holding Panel.

supports of the type shown in the illustration.

The distance between the clamp pieces (which are fixed by means of wood screws to the leg of the device)

is determined by the thickness of the ebonite used in the set.

The gap should be adjusted so that the clamps just grip the edge of the panel when the latter is in position.

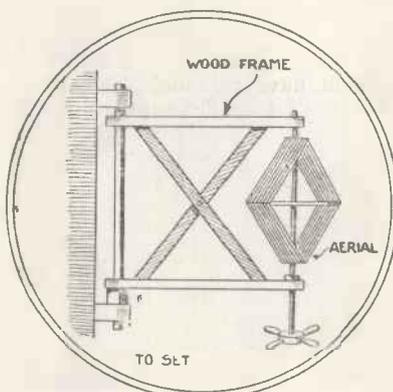
D. R. B.

Loop Aerial

WHEN a wireless set is confined to a small space it is often a matter of considerable difficulty to dispose of the loop aerial when it is not in use.

This problem can be solved by adopting the method illustrated.

Two wooden arms are fastened to the wall in a manner that will permit them to turn easily. In addition to this, the aerial is pivoted so that



Loop Aerial.

it can be revolved. When the loop is not in use it may be placed flat against the wall.
F. C. L.

Anti-capacity Hint

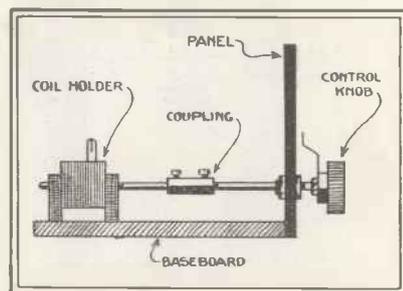
MOST experimenters have, at some time or other, experienced the annoying phenomenon of capacity effect, more especially when attempting to tune-in distant signals.

Extension handles are not only ugly, but are very apt to foul other controls.

A sure and not at all clumsy method of avoiding this is to fit all tuning condensers with a metal scale and connecting them all to a common earth.
H. S. F.

Coil-holder Extension

THERE is sometimes a difficulty in mounting an ordinary two-way coil-holder behind a panel owing to the fact that the control arm may not be sufficiently long.



Coil-holder Extension.

The difficulty can be overcome in the following way: Get a piece of 2 B. A. rod and fix it to the coil-holder control (as shown in the diagram) with a Meccano coupling.

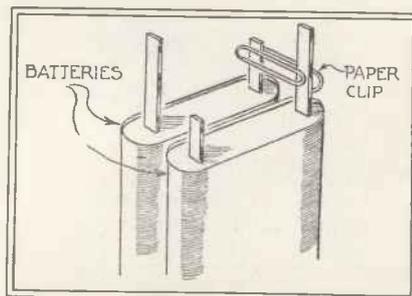
In this way the coil-holder can be mounted sufficiently far back to clear panel mounted components, such as variable condensers, etc.

A. A. W.

Connecting-up Batteries

IT is often necessary, when experimenting, to join up a number of pocket-lamp batteries in order to get the right amount of H. T. voltage.

A simple means of connecting-up



Method of Connecting Batteries.

batteries, which saves both time and trouble, is by making use of the ordinary wire paper clip, as shown in the sketch. The clips are good conductors.
B. R. S.

Everybody's Doin' It

THE wireless enthusiast laid down his phones with a sigh. "Coming, my dear!" he called wearily. "Botheration!" he muttered to himself as he followed his wife upstairs to dress for dinner.

It was not until he was advancing towards the lady with arms outstretched, a black tie dangling from one of his fingers, that in responding to his mute appeal she broke the silence.

"The Jacksons want us to go in and play bridge after dinner," she ventured timidly.

"Well, I don't want to go," he replied petulantly. "There is an extra good concert being broadcast from Newcastle to-night, and I want to try out some new dull-emitter valves I've bought; my old ones use up the accumulators amazingly quickly."

"You've spent every night for the last five weeks on your wireless," complained his wife. "I don't think it is quite fair to me; you know I cannot stand sitting all the evening with phones over my ears like you do."

"Well, I bought a loud-speaker," snapped the man, "and you didn't like that either!"

"Nor could you expect me to enjoy it when you kept on switching on and off in an endeavour to listen to the North Pole—or Timbuctoo—or something."

"You don't understand," cried the man in exasperation, "the fascination of long-distance reception, the stirring of the pulse as the carrier wave gradually becomes audible, the intoxication of hearing a foreign language——" his breath gave out.

"Even if you can't understand it—of course not, dear," his wife finished the sentence for him.

Tactfully the enthusiast decided to let the subject drop. He hurried through his dinner in silence, and, seating himself at his wireless set again, he switched on his valves, adjusted the inductance, played about with the resistance, juggled with his coils—and swore a mighty oath.

"Anything wrong, dear?" queried his wife blandly.

"I cannot get a blessed sound out

of the thing," he grunted. "I can't think what is wrong."

"Can I help you?" asked the lady mildly.

From the direction of the set came vague spluttering sounds, but though they resembled and were in fact the result of local atmospheric, they did not proceed from the wireless instrument.

As the man grew calmer they gradually died down and then they faded completely.

"You," said the man in withering tones, "you couldn't even help me erect an aerial," and once more he turned to the set. Feverishly he rotated several handles and knobs.

"Perhaps you have lost the knack of it," ventured his wife.

"Ridiculous!" retorted the man. "To think after all this time I couldn't tune-in if there was anything to tune-in."

"Exactly!" his wife replied. "But I knew that if I suggested that nobody was broadcasting to-night you would have ridiculed the suggestion, but if your tuning-in is

not at fault it must be the transmitting which is."

"I suppose it must be," assented the man somewhat mollified.

"Then perhaps we had better go into the Jacksons for bridge," suggested his wife—and moodily he consented.

* * * * *

Several hours later, whilst the enthusiast was somewhere upstairs snoring, the darkness of the room was broken by the flash of an electric torch. Stealthily the bearer moved across the floor until the silence was broken by a muffled shriek, which could have but emerged from the throat of a female.

Presently a light was switched on, and after hastily rubbing a damaged shin the enthusiast's wife made her way across the room to where the wireless set stood.

With deft fingers she reconnected the aerial wire, which she had four hours previously disconnected, to the wireless instrument, and a few moments later she was listening in rapt attention to K D K A.

The "Trigger" Switch (Continued from page 225)

sary to adjust these stops. By disconnecting the aerial wire it will be seen whether the contact is broken.

Connecting-up

Next connect up the trigger to the set in the manner indicated, attaching each to the proper aerials. As before (presuming that the local station is transmitting) the contacts of the first relay will close. It will now be necessary to adjust the contacts of the second relay so that the points are just closed. When the first relay contacts are broken the second relay contacts should be just open.

Leads from the set and from the distant-control terminals on the trigger are taken to that part of the house in which the loud-speaker is situated. These leads are attached to the loud-speaker and the distant control switch respectively.

The set is then tuned-in to the

local station and switched off. The distant-control switch should be left in the "off" position (that is, with the circuit broken). As soon as broadcasting begins, of course, the set will be brought into operation. If desired it may be switched off by the distant-control switch.

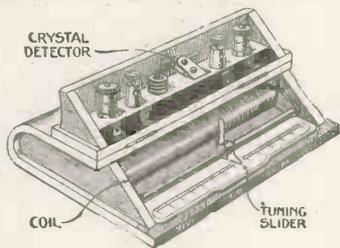
It is important to see that the contact points of the first relay do not stick. Any tendency to stick may be remedied by adjusting the stops.

Results

On an aerial 5 miles west of London the whole system works perfectly without a hitch.

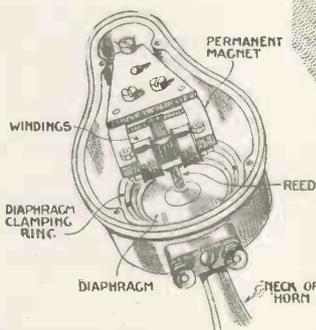
It is possible to receive 5 X X on the set with the trigger tuned to London, as both stations usually transmit at the same times. This, of course, applies to any other station that transmits simultaneously with 2 L O.

Novelties and New Apparatus of the Month

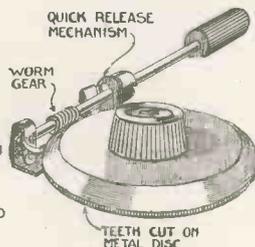


This neat and novel crystal set in the form of a book is made by Kenmac Radio Ltd., of London.

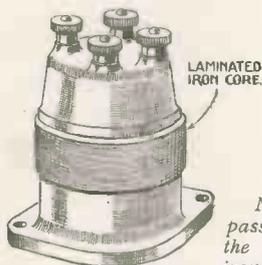
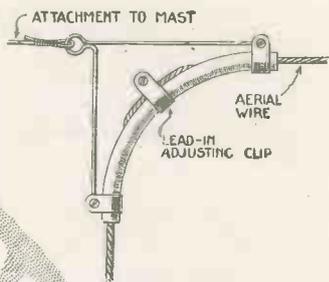
While the fundamental principles remain the same, the new H4 Model loud-speaker made by S. G. Brown, Ltd., possesses some distinctive features.



The Silver-town Verniometer is a slow motion device for use where critical adjustments are necessary. Back-lash is entirely eliminated and the gear ratio is 240 to 1.

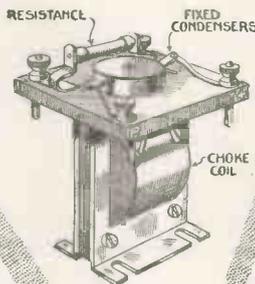


Sudden bends are avoided in the down-lead from an aerial by using this Economic Electric fitting.

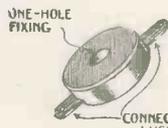
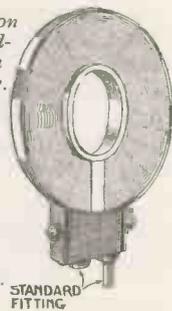


No bolts pass through the laminated iron core of the M-L low-frequency transformer. The yoke is constructed of thin annular rings.

In the iron-core choke coupling unit made by A. J. Stevens the fixed resistance and condensers are permanently mounted on the ebonite terminal platform.

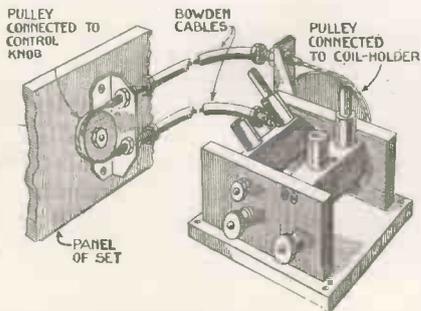


For the reception of Daventry a loading coil is in most cases necessary. This one is made by the Edison Swan Electric Co., Ltd., and is both neat and efficient.

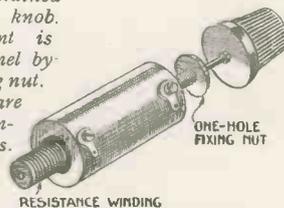


A Watmel fixed condenser that is easy to mount and neat in appearance. The condenser is supplied having different electrical values.

It is not always easy to mount a moving coil holder so that it may be operated from the panel. Here is a solution by the Economic Electric Co. The coupling between the two coils is controlled by a Bowden cable soldered to two pulleys.



The Bretwood filament rheostat works on the "push-pull" principle, while fine adjustment is obtained by rotating the knob. The instrument is fixed to the panel by a one-hole fixing nut. Soldering tags are provided for connecting purposes.

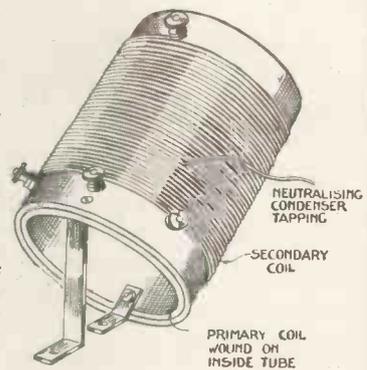


New Components Illustrated and Described

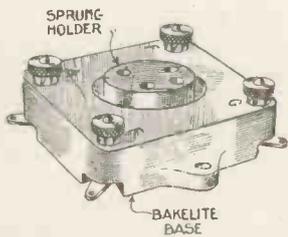


A new accumulator H.T. battery made by C. A. Vandervell & Co., Ltd. The actual capacity is one ampere-hour, and the total voltage 60. The miniature plates are sturdy and well finished. Each cell is firmly embedded in wax poured into the base of the hardwood carrying crate. Either liquid or jelly electrolyte may be used.

This efficient H.F. neutrodyne transformer is manufactured by Peto-Scott Co., Ltd. The axis of the instrument is so inclined that minimum interaction takes place between it and others. A tapping is provided on the secondary for connection to the neutralising condenser.

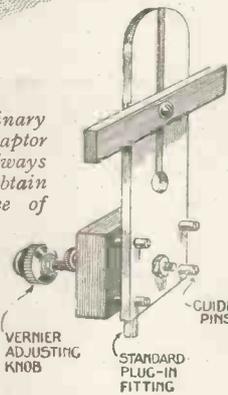


This neat and exceptionally well-made anti-phonic valve holder is manufactured by The Benjamin Electric Co., Ltd.



With the ordinary basket-coil adaptor it is not always possible to obtain the fine degree of coupling necessary if maximum results are to be obtained.

An ingenious device for obtaining a vernier movement when fitted to a standard coil holder may be obtained from Harding, Holland & Fry, Ltd., of London.



Panel engraving is saved by fitting Belling-Lee indicators. A range of these is manufactured, each indicator bearing a different name.



A very well finished anti-capacity valve holder is marketed by Burwood Concessionaires, Ltd. This component is specially suitable for baseboard mounting.

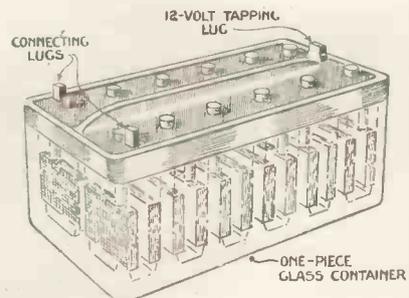


By placing this component in the centre of an ordinary plug-in coil an aperiodic aerial coupling may be obtained. It is called the Atlas Aperiodic Coupler. By means of this coupler the local station can be cut out and other stations close in wavelength can be received.

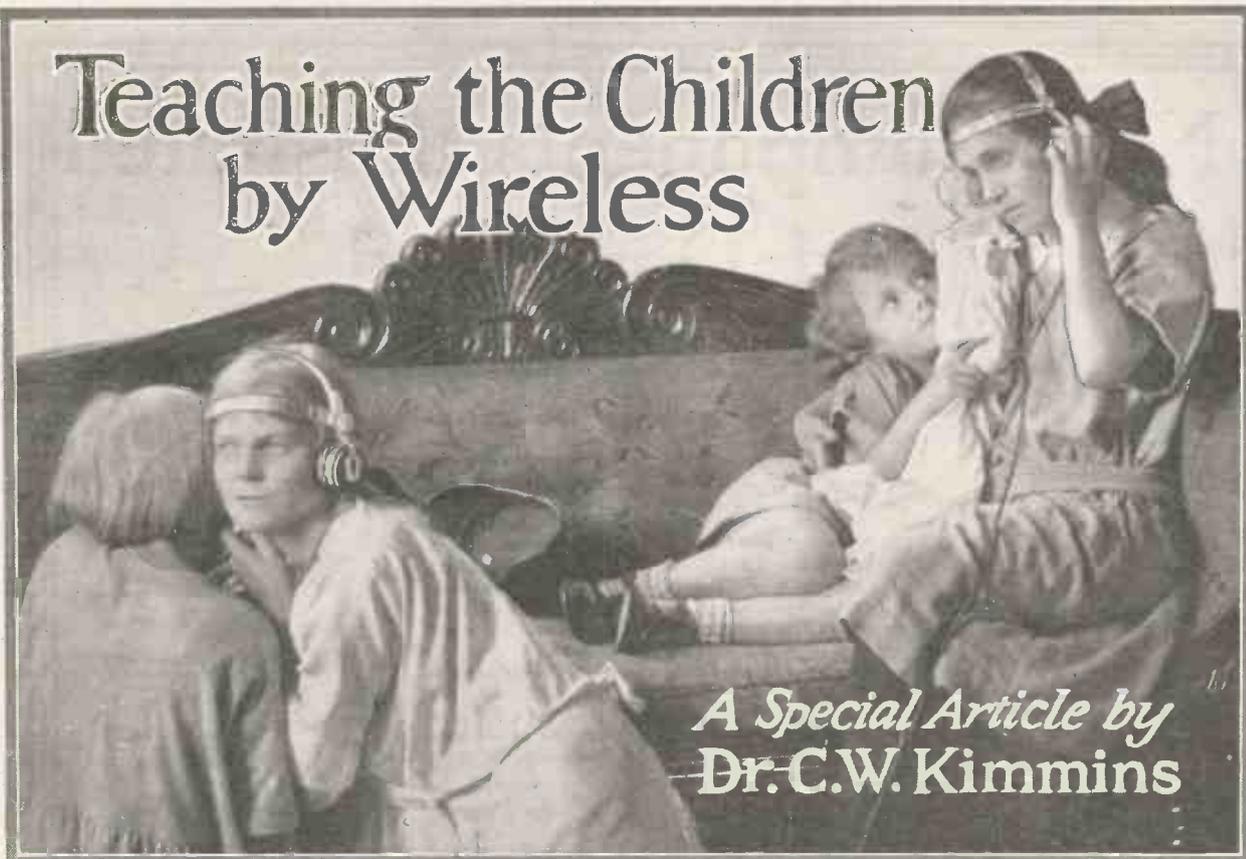


This Exide 24-volt H.T. unit possesses many original and distinctive features. The glass compartments for each cell are cast in one piece.

There is one positive and one negative plate in each cell which resemble the D.T.G. type made by the same firm.



Teaching the Children by Wireless



A Special Article by
Dr. C.W. Kimmins

Photograph by Miss Janet Allan and Miss Agnes Martin

THERE can be no doubt that eventually wireless will play a very important part in the education of children. It has many qualifications for this purpose, and experience in its use will rapidly remove obstacles which naturally confront any departure from normal methods of instruction.

Experimenters on Learning

During the past year a very important investigation has been carried out by competent observers in order to compare visual and auditory methods of presentation of material among university students. As regards the time spent in learning there appeared to be little to choose between the two; some did better by visual, others by auditory methods, but, on the whole, no claim for superiority could be maintained for either group.

As to the retention of the material by the memory, however, the auditory method appeared to have a distinct advantage. If a similar investigation with children resulted in the same conclusions the argument for the use of wireless methods would be greatly strengthened.

To obtain the best results, how-

ever, a combination of visual and auditory methods is desirable for children, and in the near future, when the loud-speaker is carefully synchronised with the cinema film, an advance may be made in educational procedure, the importance of which could not be over-estimated.

The wireless method as at present used can be utilised in an effective manner by taking advantage of the great interest it has already aroused in our children. The novelty and air of mystery which stimulate this, however, may soon pass away, and a more securely based interest will be necessary to retain the hold it has now secured.

Attractive and Educational

No effort should be spared to make the Children's Hour as attractive and educationally valuable as possible. In this connection there must be adequate variety in the items of the programme; there should not be too great claims on the attention of the children, and the musical part of the hour should be of good quality and of such a character as to relieve any strain that might have been caused by careful attention to, say, a story.

There is no reason why, if the programme is properly arranged, there should be anything in the nature of fatigue felt at the end of the Children's Hour; the boys and girls should have a feeling of longing for the next performance.

Range of Age

At present the great difficulty with the Children's Hour is the very considerable range of age and of mental development of the children, as it is obviously impossible to arrange a series of programmes to suit groups of children of about the same age as is done in the class-room.

The difficulty may, however, be overcome if certain safeguards are taken; the problem is to select material for the Children's Hour which makes an appeal to children of varying ages, and in its method of presentation to have regard primarily to the younger members of the listening group.

In this connection the greatest possible care should, of course, be taken to secure as broadcasters people who have a natural aptitude for the work and who have had practical experience in dealing with children. Naturally the broadcaster

TEACHING THE CHILDREN BY WIRELESS *(Continued)*

must have a sound knowledge of the subject about which he is talking, but a pleasing manner of approach, a musical carrying voice and an appropriate type of humour are of far greater importance than profound scholarship.

Nature Talks

There are many subjects which make a constant appeal to children of all ages. Stories about animals, if told properly, are not only immensely popular but are of real educational value. A visit to the Zoo is for the normal child a sheer delight.

In an investigation by the writer of the stories which give most pleasure to children, the number of records which had reference to animals was astounding, and though the percentage fell somewhat after ten years of age there was a considerable proportion for every age of school life. The habits of birds, accounts of migration and variety of types of nest-building are, even to the town child, of absorbing interest.

Recent accounts of territory in bird life, and the methods adopted by birds in pegging out claims for areas suitable for nesting and the bringing up of a family, have given this branch of nature study a greater scientific interest which is fully shared by the children.

A well-informed naturalist who has a gift for imparting knowledge in a vivid, simple manner cannot fail to make his nature talks to children attractive, and he should have a prominent place in the broadcasting programme.

Fairy and Other Stories

In this department the popularity of the story items—and every good programme for children should contain at least one—will largely depend on the special qualifications of the story-teller. There is no difficulty

in finding any number of people who have an excellent working knowledge of good literature suitable for children, including fairy stories and folk lore, but there are very few really good story-tellers.

In this particular sphere of educational activity there are so many who possess knowledge but so few who can impart it in that pleasant,

imaginative tale of adventure with fairy elements, such as "Peter Pan," "A Kiss for Cinderella," or "Alice in Wonderland," appeals to both groups and rarely fails to interest them. The child-world is so very different from the adult-world that a knowledge of child psychology is a valuable asset for the 'story-teller.



Photograph by Miss Janet Allan and Miss Agnes Martin.

How they just love to listen-in!

vivid manner which alone appeals to children. The very successful lecturer to a class of university students may prove an absolute failure in addressing children, though he may have a great wealth of knowledge of the subject of his discourse.

For broadcasting purposes, where such a long range of age is inevitable in the invisible audience, stories specially written for young children are as a rule unsuitable for the Children's Hour. Older children very much resent the type of story which has a limited outlook with a definite objective of pointing a too obvious moral, however suitable it may be for very young children.

A good fairy story or a modern

Travel Tales

In many ways visual methods have a distinct advantage over auditory methods in giving the necessary atmosphere for travel tales, but much can be done by wireless.

Young people delight in stories about children of other lands, their customs, animals, food, clothes, houses, schools and methods of travelling.

The description of striking differences between the habits of people in cold and hot climates, for example, appeal to children, who appreciate anything that marks a departure from normal experiences; it introduces elements which find their fullest expression in the fairy story, which is universal in its appeal.

Health Talks

In popular accounts of the main principles which should be observed in leading a healthy life, there is a fertile but practically unexplored field of the greatest possible interest to children without the slightest danger of having any evil effect in making them unduly introspective. There is undoubtedly a large body of interesting material about health which, if placed before children in an intelligently attractive manner, would prove a priceless possession.

Another field which might with advantage be more fully explored is the news of the day, from the child's point of view, which should include various sports items that

(Continued on next page)

What Are "Stunt" Transmissions?

TOO much publicity has been given to what are incorrectly described in some quarters as our "stunts." Exception is taken to this label being attached to the efforts which are made to broadcast events that are nothing more than normal happenings.

Part of Everyday Life

If the occasion that warrants the broadcast is to be regarded as part of our everyday life, the broadcast, while it may have about it an element of novelty in so far as it is the first attempt to transmit to millions of listeners what would otherwise be heard and seen merely by a few hundred people on the spot, is in reality a scientific fact.

If science through the human element fails, and fake or illusion is resorted to in order to convey a false impression of broadcast accomplishment, the term "stunt" may have some appositeness.

Realism by Natural Effects

But we incline more and more to realism secured by natural effects, particularly in the case of outside broadcasts. If, for example, the intention is to broadcast the noises at Epsom on Derby Day, then let the noises be those actually heard at Epsom.

If the public is told that the song of the nightingale will be broadcast, let it be the nightingale and no imitation that is heard. If the programmes advertise a "sea" broadcast, it must be the sound of the rolling breakers that forms a kind of background.

Imitated Noises

In the pursuit of this policy, failure is sometimes bound to occur; indeed, a good deal of courage is needed to adhere to such a policy. Practically any noise can be imitated with remarkable exactitude by mechanical devices, and failure can thus be eliminated; but in the long run this method of illusion would not be acceptable to the majority of listeners.

Birds will not, of course, sing, nor will the sea roar at any moment that will suit us or listeners themselves.

The B.B.C. answer the question

Some disappointment is sure to be felt in the event of failures; but listeners will know that fake noises have not been substituted for the real noises which they were led to expect. In short, if listeners are told that any particular programme is backed by natural noises, they may be certain that such is the case, and that the sounds are not being manufactured in the broadcasting studio.

This is not to say that well-intentioned efforts are not made to help us in our difficulties. It means rather that many administrative and executive problems which are so obvious to those who are closely

identified with our work are overlooked by outside individuals.

Great Responsibility

The responsibility of introducing variety into even three performances a week is very great. Repetition is a danger that must be guarded against.

Further, we can only carry out certain tests and adjustments after closing down each evening, as the land-lines are not available during the day.

AMERICAN farmers get reports of the markets for butter and eggs broadcast to them. We should have thought that the latter were able to speak for themselves.

AUSTRIA is broadcasting lessons in English. Judging from the jargon we hear from American visitors, this must be how they pick up their knowledge of the language.

Teaching the Children by Wireless

(Continued from preceding page)

would prove attractive to both boys and girls.

Loud-speaker or Phone?

For children, wireless by the medium of the loud-speaker is unquestionably better than by the individual phone from every point of view. The headphone for the young child produces a far more artificial atmosphere than the loud-speaker, to which the child has become accustomed by his experience of the gramophone.

The restricted movement involved in the use of the phone diverts the interest and increases any strain there may be felt in going through a programme. It would be a great advantage where possible for a group of children to be present. The common laughter at the recital of a comic story, co-operation when necessary in the explanation of points misunderstood by the younger members of the group, and the discussion of others, would increase the interest in many items and add to their value; it would also appreciably reduce the range of age difficulty.

The atmosphere, moreover, would be far more natural and approximate to the conditions of the class-room. If dance music appeared in the programme a short interval of dancing would give the opportunity of movement and the removal of any abnormal effects of concentrated attention necessitated by other elements in the series of items. In crowded districts the provision of a suitable room for listening-in for the Children's Hour would be a very obvious advantage.

Wider Outlook

Wireless is very democratic in its tendencies. The possibilities of taking advantage of it are rapidly increasing so that eventually the poorest child, by co-operative movement, may come under the influence of the Children's Hour.

The wider outlook which it gives on many matters of extraordinary interest will become public property and do something to bridge the gulf of opportunity which separates the child in the cultured home from the child in mean surroundings.

How Wireless Helps the
Cross-Channel Air Pilot:
by THEODORE S. SPRIGG



"HULLO, Croydon! Imperial Beer Uncle calling. I am now above Paris Plage, over." This is a sample of the conversation that by now is familiar to many listeners on the 900-metre wavelength, used exclusively for work with commercial aircraft.

Every day, from about 10 a.m. to dusk, conversations between pilots and the Croydon aerodrome can be heard, for the air liners which daily leave London's air port for the Continent are all fitted with wireless and regularly report their positions on the way across.

Strange Language

The language used may at first seem strange to the uninitiated, for it is based on the phonetic alphabet, like the "pip and ack emma" of army days.

Thus the words Beer, Uncle, Orange, Sugar, Pip, Ink and George, which are frequently heard, refer to the aeroplane's registration number, the first letter representing the plane's nationality, with G meaning British, H Dutch, and F French.

Then follows the name of the company owning the machine, and the last two letters of identification. Thus "Imperial Beer Uncle" would refer to a British plane belonging to Imperial Airways, Ltd., whose last two letters of registration are B and U. The Dutch machines are owned by the K. L. M. and cover the

London-Rotterdam route; the French pilots of the Air Union are recognised by their call sign of "Farman."

With the aid of wireless the course of every plane is followed throughout its journey. High up in the control-tower on the Croydon aerodrome an operator is continually in touch with every machine in the air, and at any moment a pilot may speak to him direct. The message is received on the high aerial on the Croydon aerodrome, from where it passes through the ground station, and so on to the control-tower.

Here, too, is kept a record of all machines leaving the 'drome and their position is marked on a map with a small flag that is moved forward from time to time, according to the reports of position sent out by the various pilots.

Every machine leaving Croydon must report when passing Biggin Hill, Lympne, and Paris Plage, but once safely over the Channel Croydon loses all interest in the plane, which then comes under the care of the French stations who see him safely to his destination.

Should a pilot fail to report on reaching the French coast, after crossing the Channel, Croydon at once calls him up. If no reply is received, and if no French station has heard of him, warnings are at once broadcast to ships in the Channel to keep a lookout in case he has

been forced to come down in the sea, and, if necessary, the Admiralty are also informed.

This is a very rare occurrence, however, for apart from the great reliability of present-day aeroplanes, a pilot, when in difficulty, sends out an SOS call, giving his position and informing the 'drome where he intends to land.

To avoid confusion with ships' signals, the words "May Day," derived from the French *m'aidez*, are used instead of SOS.

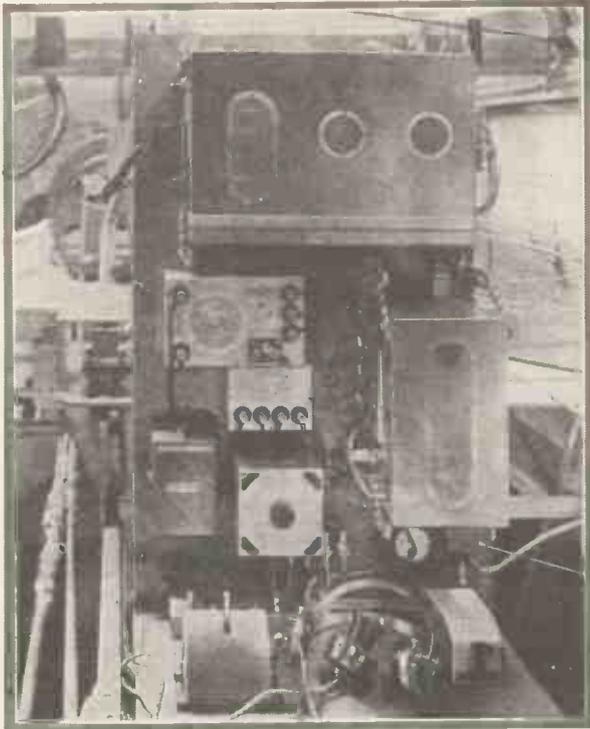
On hearing this call the aerodrome informs the pilot of the nearest landing ground, reports particulars to the headquarters of the machine, and sends out the necessary assistance and mechanics.

Weather Reports

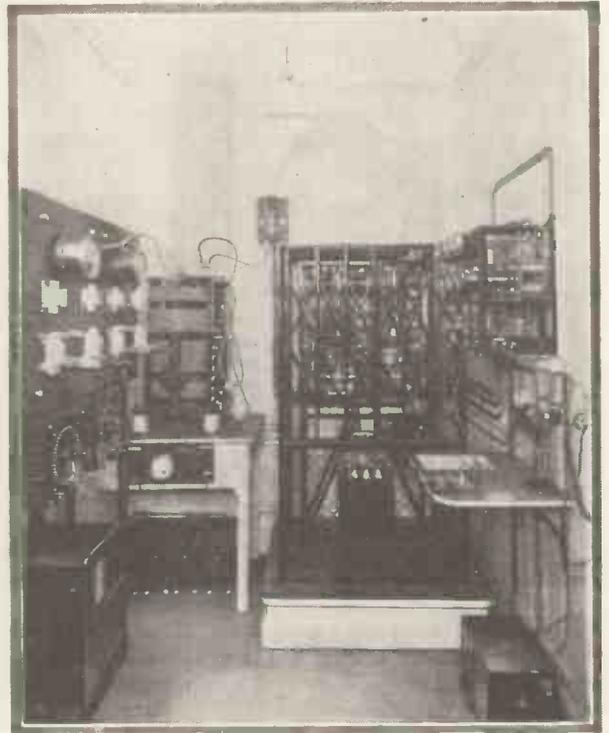
In addition to these reports of position, wireless is also used for the exchange of regular weather reports between the various aerodromes. By this means a pilot leaving the Croydon aerodrome for Paris can ascertain before starting the weather he is to expect on the way across, and he can also call the French stations *en route* for later information as to the weather ahead of him and the strength of the ground winds.

As all communication in the air is by telephony, there is no necessity for the pilot to be a trained operator or to understand the morse code.

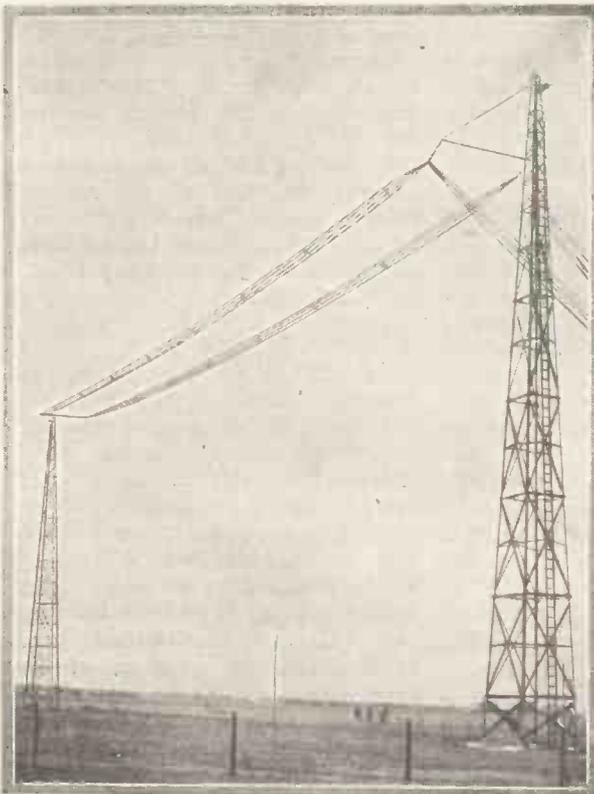
WIRELESS APPARATUS FOR AIRCRAFT



Marconi Type AD D.F. Set.



Marconi Transmitting Equipment for Ground Station.



Aerial at Croydon Aerodrome.



Marconi Type AD Transmitter and Receiver.

Also, very little tuning or adjustment is required to manage the set, as the wavelength is fixed at about 900 metres, and the only controls are four levers, similar to those on a motor-cycle, mounted beside the dashboard and connected to the set by means of Bowden cables.

One lever switches over to the receiving or transmitting valves as required, another connects with the aerial-tuning condenser, while the remaining two regulate the filament resistance and the reaction coupling respectively.

The pilot carries a microphone slung from a cord round his neck and wears a pair of low-resistance (120 ohms) phones. Both can be plugged directly into the set or connected up by a length of flex to the cockpit. The set itself is exceedingly compact, and is usually stowed in the passenger cabin behind the pilot's seat or in some other convenient place.

All the machines used by the British line and most of the Dutch 'planes are fitted with a special Marconi aeroplane set, known as the AD 6, which is the result of considerable experiment as to aerial requirements. It has an effective range of from 100-200 miles for C.W. telegraphy and telephony.

The transmitting system consists of an aerial-tuning inductance withappings for varying the wavelength and a variometer for obtaining intermediate values of wavelength.

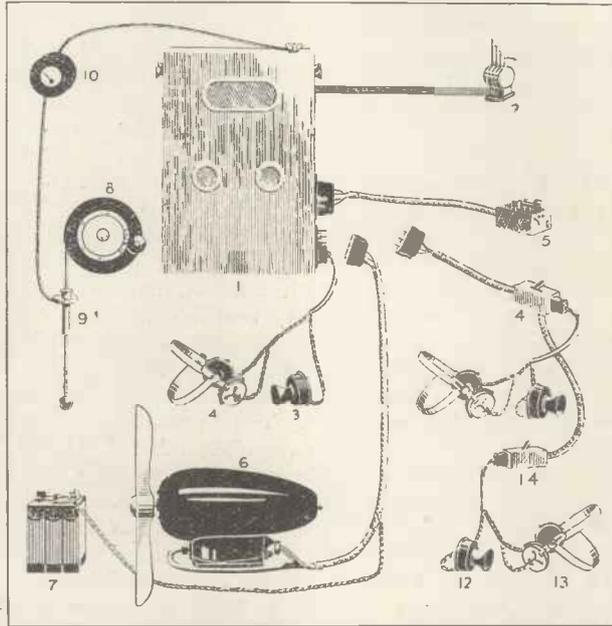
and are connected in cascade across the generator and speech choke. A side-tone circuit is also provided by which the operator is able to overhear his own speech and make sure that the message is being correctly transmitted.

A five-valve amplifier is used for reception. One valve is used for reaction, two for H.F. amplification, using resistance-capacity intervalve couplings, one for rectification and the remaining one for low-frequency amplification.

The anode circuits of the receiving valves are supplied with current from the generator, which is fitted with a propeller and mounted on an exposed part of the machine.

By means of this wind propeller the dynamo derives its power from the slip stream made by the aeroplane in flight. In the case of the more powerful sets, the dynamo is driven by one of the main engines through suitable gearing or by a separate petrol control motor.

The H.T. voltage of the generator is reduced to about 80 volts by the insertion of a high-resistance in the H.T. field of the generator. A 6-volt 25-ampere-hour accumulator maintains the filaments of the transmitter and

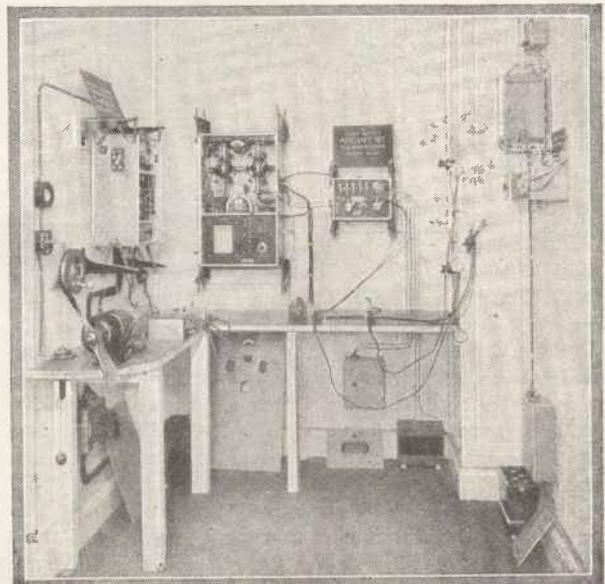


Key Plan of Type AD 6 Marconi Aircraft Set:—1, Instrument Box. 2, Remote-control Unit. 3, Microphone. 4, Phones. 5, Telegraph Unit. 6, Generator. 7, Accumulator. 8, Aerial Winch with Wire and Weight. 9, Fairlead. 10, Aerial Ammeter. The following additional equipment is for dual control: 12, Extra Microphone. 13, Extra Phones. 14, Two Keyboards.

An oscillator valve is coupled to the aerial by means of a variable grid reaction coil and an anode-tap connection on the aerial-tuning inductance. A control and sub-control valve provide the modulating system



Marconi Air-driven Generator on Aeroplane.



Marconi Aircraft Set.

HOW WIRELESS HELPS THE AIR PILOT *(continued)*

receiver valves at a constant potential.

The aerial employed on aircraft is of the single-wire trailing type, and is wound round an automatic winch, the end being led out through a tube, or "fairlead," and weighted with an iron ball.

When in the air, the brake on the winch is released and the 200 ft. of wire runs out in about three minutes, the rate being controlled by an escapement mechanism.

An "Earth"

The provision of an "earth" at first appears rather a difficult proposition when applied to a machine several thousand feet up in the air. A balanced "aerial" is used, however, and every piece of metal on the 'plane is connected together, or "bonded," as it is termed.

The set is then "earthed" to this mass of metal, the only disadvantage being that the breaking of any one of the connections immediately throws out the wavelength and alters the tuning.

An emergency set for use on land in conjunction with the existing apparatus is also carried by many 'planes. This consists of a light portable telescopic mast for supporting a land aerial and a heavy-current 12-volt accumulator battery with a switchboard. The switching arrangements enable the L.T. windings of the generator to be connected to the accumulator battery, and the set can then be operated in the ordinary way for both transmission and reception except that the dynamo acts as a motor-generator.

Dual Control

On 'planes carrying both a pilot and an observer a dual-control extension is fitted, enabling either or both to participate in the wireless conversation or to communicate with each other without affecting the wireless circuit.

This extension only entails the addition of a microphone-coupling transformer, a duplicate pair of telephones and microphone and two small keyboards, but its advantages, particularly on naval or military machines, are very great.

In addition to the exchange of

messages between the pilot and the aerodrome and the transmission of weather reports, there is another very important service which wireless renders to aircraft. This is direction finding, by means of which a pilot can ascertain his exact position when lost or in a fog. At present there are two separate methods of obtaining this information, either by the installation of a special apparatus on the machine or by communication with land stations.

In the former case, bearings may be taken by the pilot of any ground station which happens to be transmitting at the moment, and whose position is known. The apparatus used consists of an amplifier, a direction finder, a filament resistance, a tuning circuit, calibrating chokes and L.T. and H.T. batteries. The aerials are fastened rigidly in position in the form of two loops, and the receiver is designed to cover wavelengths between 600 and 1,000 metres, the limit usually required in aircraft workings.

Wireless Compass

By means of a form of wireless compass, the plane of the received signals and also the actual bearing of the station is found. These signals are then tuned-in and the final reading is taken when the signals are at their *weakest*.

This type of set is particularly useful in time of war, as the method is secret and the pilot is not obliged to give away his position by asking for a position.

In commercial flying, however, bearings from ground stations are almost exclusively used, as, apart from the saving of the weight of the apparatus, a greater degree of accuracy is obtained owing to the absence of noise and magneto disturbances.

The ordinary type of transmitting aerial is not suitable for direction finding, and a separate aerial must be installed. At Croydon, the D.F. aerial is a considerable distance away from the transmitting aerial, but is controlled by the same station.

Should the pilot of one of the air liners have missed a landmark and be uncertain of his position, he has only to call up Croydon, give the

number of his machine and ask for a "fix."

The Croydon operator then acknowledges the request, tells the Pulham station (in Norfolk) to stand by, and asks the pilot to speak for about half a minute, so that the two stations can tune him in on their D.F. aerials. Then, by means of their direction-finding apparatus, each is able to determine from which of the 360 degrees of the compass the sound is coming.

Distance Off

The distance off, however, cannot be found exactly until Croydon is given the bearing found by Pulham, when the two are laid off on a chart, where they eventually meet at a point. The intersection of these two bearings is the position of the aeroplane at the time of the message.

The rest of the procedure will have been heard by many listeners: "Hullo, Imperial Beer Ink, Croydon calling! Your position is 10 miles north-west of Dover, over."

On hearing the "over," the pilot knows that the operator has switched over to receive, and he then sends out his acknowledgment of the message.

To ensure that the position is accurately received the Croydon operator usually counts up to the required number. In this case it would be, "two, four, six, eight, ten miles north-west of Dover."

In practice, this method of direction finding is surprisingly quick and accurate. It is seldom more than two minutes from the time the pilot first calls to the reception of his O.K., while the bearings have been proved to be accurate within half a mile.

Interesting Communications

Communications of this character and many other conversations of equal interest are to be heard every day by all who possess wireless sets in the London area, and they afford a novel change from the regular broadcasting programmes.

Any crystal set which can be adjusted to receive on a 900-metre wavelength can hear Croydon working, but, unless the machine is very close, it will not usually be possible to hear the pilot's replies.

Getting the Best from Your Receiver

Notes on General Efficiency

WHEN one sees so many inefficient home-constructed sets about one wonders that so many people are keenly interested in wireless. They seem to be perfectly satisfied to listen to a terrible sound coming out of the loud-speaker. It is the intention of the writer to point out the rights and wrongs of the usual circuits met with, and to show how to get the best results out of a straightforward four-valve circuit.

Aerials—

Before dealing with the interior part, perhaps a few words on aerial and earth design would not be out of place. Remember that the better your aerial, the smaller the set can be and the less reaction will be necessary to produce the same results. This, of course, means that much better quality can be produced.

Needless to say, the aerial should be as high and unscreened as possible. For the reception of broadcast wavelengths the writer suggests the use of a single wire, 7/22 enamelled, of which the total length does not exceed 100 ft., including the lead-in.

Arrange the ends of the wire in such a manner that the lead-in is kept well away from the wall of the house, and the flat top, that is the aerial itself, suspended midway between the two supports. The lead-in may be taken off the end nearest the house and, if possible, should be the same piece of wire; or, in other words, do away with joints.

For really efficient reception, the lead-in should come in at a window, through one of the panes. If you are interested in short-wave work, this is well worth doing as it will save you a great deal of trouble. A small hole can be drilled in one window pane and a brass terminal,

with small rubber washers put through. The aerial lead-in and lead to the set are then attached to their respective ends of this terminal.

—and Earths

Turning to the earth lead, many people do not consider this very necessary. But they are mistaken. A good earth is essential. Use thick stranded copper wire; the longer the earth lead, the thicker the wire should be. Clip and solder it to the main water-pipe. Intermediary pipes and gas pipes will *not* do. If possible, insulate this lead where it touches the outside walls of the house.

If you must use a lightning protector, get a two-pole 20-ampere capacity copper switch, mounted on a porcelain base, and put it in a dry place underneath the top of the window outside. Then there will not be much leakage or loss due to capacity or dampness.

Finally, great care must be taken with insulation. Do not use a single cotton-reel insulator at each

set. It is proposed to describe refinements for use on waves at present used by British broadcasting stations, between, say, 300 and 500 metres. It is assumed that the operator is not content to listen to his local station but wishes to get farther afield—with a reasonable amount of success.

For this purpose high-frequency amplification is advisable. We shall therefore use one high-frequency valve, with tuned-anode coupling, which is the best for all-round reception. Next comes the rectifier. For various reasons the valve is better than the crystal, so we shall use a valve rectifier.

Note Magnifiers

In order to get strong headphone signals (or loud-speaker strength from near-by stations) a note magnifier is indicated. Transformer coupling gives the greatest strength per stage. For really loud signals a power amplifying valve is necessary. Transformers again come into use here, and it is advisable to have a

switching device to cut out the last valve when it is not required.

Having thus briefly sketched out the circuit it is advisable to refer to Fig. 1 and note the following points:—The aerial series tuning condenser should be of about .0005 microfarad and, if possible, fitted with a vernier. The aerial and plate

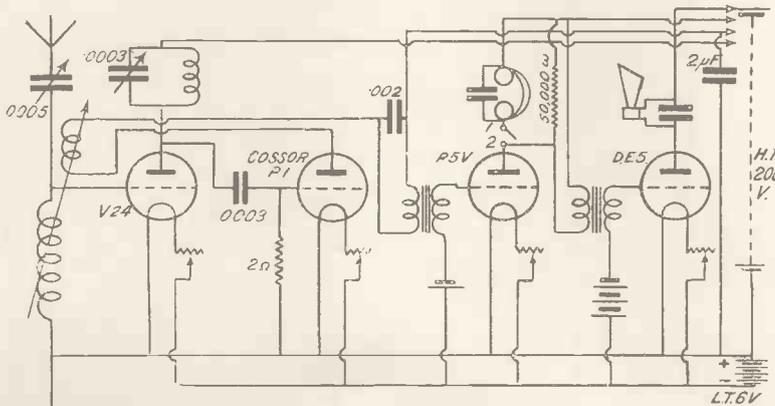


Fig. 1.—Typical Four-valve Circuit.

end of the aerial. Use the "shell" type, two at least in series with a rod of ebonite about 6 in. long. This remark applies to each end of the aerial. Leakage loss is not the only trouble with aerial insulators—capacity losses should be considered as well.

Now, having settled the question of aerial design, we may turn to the

coils should be wound single-layer fashion on well-waxed cardboard or ebonite tubes, with No. 20 gauge wire. About 35 turns in the case of the aerial circuit and 50 turns for the plate coil will be sufficient for our needs. Make sure that everything is *dry*. Warm the formers in an oven, and give them a coating of shellac. It is not necessary to

space the windings when working on broadcast wavelengths.

Reaction

The reaction coil will require approximately 50 turns of smaller gauge wire, say No. 26 gauge, and can be arranged to be coupled on to one end of the aerial coil. Reaction can be obtained by coupling on to the plate coil, and, in fact, this is strongly recommended by several experimenters to prevent re-radiation in the event of the set oscillating. As this does not prevent radiation and gives slightly poorer results, it can be neglected, provided due care is taken that the set is not oscillating.

The condenser across the plate coil should be of .0003-microfarad capacity, also fitted with a vernier attachment. The plate-grid condenser should be of .0003-microfarad (fixed) capacity, and must be of good quality. If this condenser is at all leaky, bad noises will be heard owing to the H.T. leaking on to the rectifier grid. Its capacity is not critical. The grid leak is of the usual 2-megohm resistance, but a variable leak is advised for final adjustments.

Good low-frequency transformers must be used. A small condenser is shunted across the primary of the first. This can be of about .002-microfarad capacity.

Switching

Note should be made of the single-pole double-throw switch attached to the plate of the first note magnifier. One side goes via the phones to the positive high tension, the other via the primary of the second low-frequency transformer to the extreme positive end of the H.T. battery. A high resistance is shunted across the primary of this transformer to stop resonance—that sudden blatant noise which will come from the best sets when a note played corresponds with the resonant frequency of a particular transformer.

With loud-speakers these noises can generally be got over by putting a fairly large condenser, of .025- or .05-microfarad capacity, across the terminals. Sometimes resistances are employed as in the case of the transformer.

Another very important item is grid bias. Glancing at Fig. 2, which shows the plate-current grid-volts characteristic of a valve, one

can see that if the valve is not worked on the straight portion of the curve, that is, between A and B, uneven amplification will result, with corresponding distortion in the output. By applying negative grid potential as shown in Fig. 1, the mean grid voltage can be arranged to fall in the middle of the straight portion, allowing equal variation on either side. Thus true amplification with little or no distortion results.

As the variations on the last valve are correspondingly greater, a valve

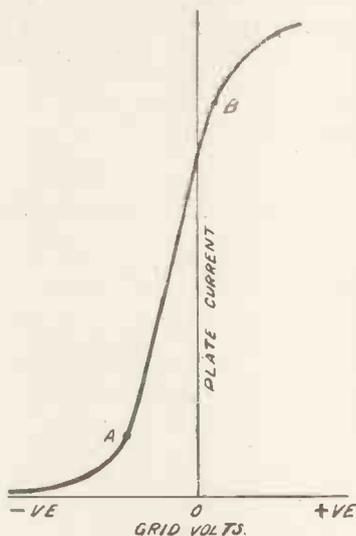


Fig. 2.—Plate-current Grid-volts Curve.

with a longer straight portion than that used on the first stage must be employed. Hence a power amplifier valve should be used. In other words it is no use using small valves on the last stage as amplification will only result in a very distorted form. Full particulars as regards plate potential and grid bias are always given by manufacturers, and as these vary with different valves it is not proposed to go into the matter here. On the last valve the high tension is generally required to be between 150 and 200 volts.

H.F. Valve

For the H.F. valve the writer suggests the use of the Marconi V24, which is specially adapted for this work because of its low internal capacity and small capacity between the electrode supports. Any good make of rectifier valve can be used in the second stage.

In conclusion, pay particular attention to the following points: Solder all leads. Use resin flux,

not acid. Use stiff copper wire, No. 18 gauge is suggested as being sufficiently self-supporting. Space all wires, and where they have to cross, make them do so at right angles. Use ebonite valve sockets.

Reaction Overlap

Finally, get rid of reaction overlap, if present, by varying the high-tension supply to the rectifier, altering the filament brilliancy or altering the value of the grid leak. (Overlap, it may be explained, is the tendency of the set to go in and out of oscillation with a "plop." It is therefore wellnigh impossible to tune-in a faint station, because as soon as the signal becomes audible as reaction is increased, there is a sudden click and the set is oscillating hard. By loosening coupling again, the set will suddenly stop oscillating, on a different setting from that where it started.)

If the above remarks are adhered to, the writer is sure that the enthusiast will be more than satisfied with the improved results he obtains.

A. G. W.

A Wireless Adventure

(Continued from page 233)

me all,' ses Peter Jones, at this moment; 'it's purty late, I must go.' 'Oh! wait till the signals come through,' ses Bob, disappointed like, but Peter 'as 'is old ooman to think on, so he goes. Then Bob speaks to his wires and stuff and asks for Paris—Lemonade Tower he called it—and we listens to the toob and we 'ears, plain as plain could be, the wireless a-saying: 'Thank Mr. Robert Pretty for priceless services on behalf of wireless heroes. Silver cigarette case picked up by Mr. George Cadger belongs to one of our wireless men. Please 'and to Mr. Pretty as a reward for his services.' So, of course, we makes George apologise to Bob and 'and over the cigarette case."

The night-watchman paused.

"Yus, Joe," he said, with a pathetic look at the tankard, "and Bob and his pal, Peter Jones, just arter came into some money from a forgotten friend in Borneo, and bought themselves new clothes and 'ad a month's holiday."

Again he looked at the tankard, but Young Joe Green was fast asleep.

H. J. SLATER.

THE stock joke—oh yes, no issue of THE WIRELESS MAGAZINE is complete without it—is that the first thing one needs in wireless is wire. What is the first thing a person who wishes to install or make a set does? He goes to a shop and buys wire. What is the last thing he does before listening in? He connects batteries and telephones to his set with wire.

We all use wire, immense quantities of wire. Yet

how often do we think whether the wire we have selected is the best kind for the particular job in hand? How often do we consider the wire we use in relation to the duty it has to perform? There is no doubt that if we did so our sets would be better in every way.

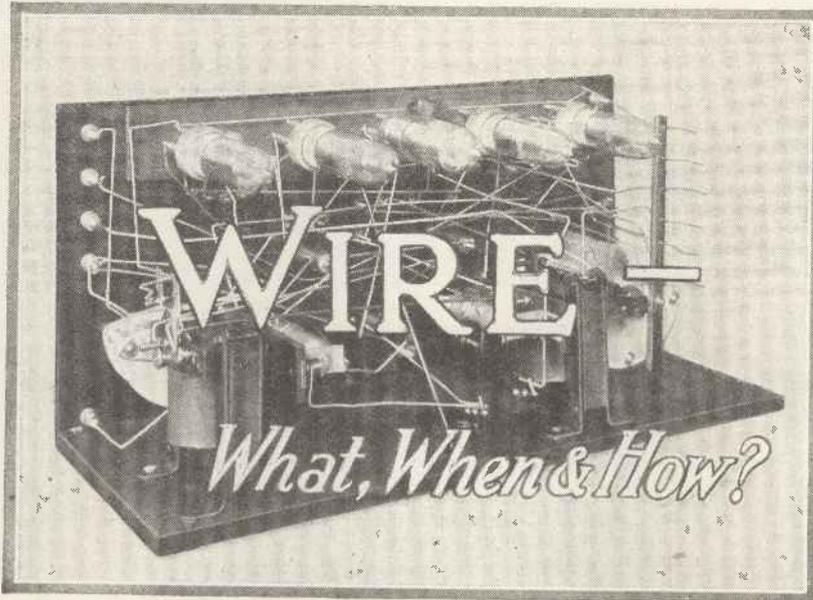
One Use Only

Wire has one use in electrical work, and one only, and that is to conduct electricity. This conduction of electricity may be divided into two classes; firstly, conduction in which loss is to be avoided, and secondly, where a definite resistance has to be placed in the circuit in order to achieve a certain object.

To take the first case therefore, let us primarily see to it that the wire we get is of the very highest conductivity. That aim must come before all others.

In wireless work, where high-frequency currents play such a prominent part, we have to consider other points in addition to the ordinary resistance which would oppose a direct current. Primarily, the phenomenon known as "skin effect" must be regarded.

Skin effect is the name given to the peculiarity of high-frequency currents for travelling on the surface rather than in the middle of a wire. Nearly all amateurs have read of this somewhere, but practically the only time they remember it is when erecting an aerial; and here convention seems to have decreed that everyone shall erect an aerial having



seven strands of No. 22 gauge copper wire.

So far so good. But it does seem a little illogical to connect a relatively enormous conductor such as 7/22 aerial wire straight on to an inductance coil of, say, No. 28 gauge. The same current must travel through both—why, therefore, take so much trouble over one part of a circuit and so little over another?

No one wishes to suggest that inductances should be made of 7/22, and all will admit that it is better to have efficiency in one part only of a circuit than none at all; but surely it would pay constructors to give a little more logical thought in deciding upon the choice of "the first thing in wireless."

In oscillatory circuits, which for the purpose of this article may be said to be all the tuning circuits, high-frequency transformers, and the like, it is necessary to fix a compromise between efficient conductivity as represented by low direct-current resistance and high insulation, and the losses directly due to such direct-current efficiency such as high self-capacity.

In other words, our search for efficiency in one direction may itself cause losses in another, and, therefore, we have to balance gain against loss, loss against gain, until we finally arrive at the point where we get the biggest gain for the smallest loss.

With regard to the size of wire for inductances, there can be no doubt that most amateurs and many manufacturers use wire of too small a

gauge. The reasons for this undoubtedly lie in the constructor's efforts to cut down cost and reduce size and weight, but electrically it is poor economy.

Apart from the fact that large-sized wire must cost more for a given length, it is much more difficult to wind on account of its stiffness.

Short-wave working, say, on any wavelength below 500 metres, demands highly-efficient, sharply-

tuned coils, chiefly owing to the necessity for obtaining selectivity due to the congestion of the broadcast wave-band.

I would ask any amateur who is at present using basket coils wound with, say, No. 26 gauge wire, to make a set of similar wavelength out of No. 18 gauge, to substitute them in his set, and note the difference in selectivity and sharp tuning. As a rule, the difference is positively amazing.

On the higher wavelengths there is no need for such efficiency, and the finer wire coils may be used with success.

The question of the insulation of the wire we use is of vast importance. We have a selection of four media—namely, cotton, silk, enamel and air.

Air as an Insulator

Wherever possible use air, that is, wind the coils with bare tinned wire, and support it on the very smallest and thinnest of ebonite supports. Space the turns well—such is the only method of reducing self-capacity in short-wave coils. Never mind the bulk which results from the use of such wire and constructional methods—the efficiency obtained will be worth it.

Unfortunately, in the case of plug-in and other forms of interchangeable coils, we are in rather a quandary. Such coils must needs be fairly small and possess a high degree of mechanical strength in order to stand the constant pulling

and pushing which they are bound to receive.

Enclosed Windings

Compactness of the windings is therefore essential unless they are to be completely enclosed in ebonite casings, or surrounded by tape or some other form of protective covering.

Enamelled wire should never be used, except for very large coils, owing to the thinness of the covering and the subsequent closeness of the windings. Double-cotton covering is probably the best, for it is fairly thick. Shellac varnish should never be put on wire used for coil winding, owing to the big increase in self-capacity that results.

Litzendraht wire has certain claims as the best wire for winding inductances. It consists of a number of strands, each separately insulated, contained in one outer sheath, usually of cotton or silk. Theoretically it may be claimed to be the perfect high-frequency conductor, but practically it has many disadvantages.

In the first place it is very expensive, and secondly, it is most difficult to work with, for a well-soldered joint to each strand is essential, and in so doing, the inter-strand insulation must be absolutely unimpaired. It is really doubtful therefore whether, on the whole, the use of Litzendraht is to be recommended.

To sum up therefore, in tuning circuits use bare wire if possible, or failing that, double-cotton covered, and employ as large a gauge as space will allow.

The correct wire to use for high-frequency transformers will depend largely on the precise functions for

which they are designed. Transformers to be sharply tuned may be made from the same wire as for inductances.

On the other hand, those designed to have a fair amount of wavelength latitude may be wound with finer wire, say No. 28 or 30 gauge. Such wire, for example, would be suitable for a transformer to tune over the whole broadcast range. The windings of transformers of this type need not be openly spaced, and therefore enamelled wire may be used with success.

Aperiodic high-frequency transformers should be wound with re-

temperature changes, be chosen. Such wires as Eureka, Constantin, Manganin and the like are suitable. Ordinary resistance wires, unalloyed, invariably increase in resistance value as their temperature rises, with the result that any current passing through them will be reduced in strength. Rheostats and potentiometers, therefore, demand the use of a wire whose resistance may be relied upon to remain constant.

Internal Connections

Finally we come to the wire used for the internal connections of the various components in the set. There

is much to be said for the three general methods in use today, which are (a) bare wire, (b) self-covered wire, and (c) wire covered in sleeving.

The bare-wire system, properly carried out, is undoubtedly the most efficient. The wire used should not be so thick, however, that in congested places a considerable capacity is formed between one or more adjacent conductors. For this reason it is doubtful if the use of bus-bar in high-frequency circuits is good practice. It is not necessary to use 1/16 in. thick wire for it to be self-supporting. Wire of Nos. 18 to 20 gauge, tinned, will be found quite satisfactory.

Self-covered wire, either flexible or stiff, may be used successfully, but it has a greater self-capacity than bare wire. Providing the insulation is sufficiently good there is no objection to two wires touching where

they cross; but they should cross at right-angles. An excellent example of a well-insulated wire of this type is Glazite.

Similar remarks as for self-covered wire apply also to conductors covered with loose sleeving. R. B. H.

BROADCAST BERT.

(Acknowledgments to Bret Hart.)

I RESIDE on Wandsworth Common and my name is Broadcast Bert.

*I do not oscillate nor practise other vicious hurt;
But I'll tell in simple language all I know about the row
That broke up our Society. 'Twas all about a brow!*

*Now, none there could be keener nor in greater harmony
Than the members, chairman, and hon. sec. of our Society,
Till Micro Mick of Mitcham struck the mortifying blow,
Saying London will transmit of music high brow more than low!*

*Forthwith, Push-pull Perce of Peckham up and stood his legs upon,
And said he saw no reason to condemn these men of Lon
If we want to elevate the nation you cannot deny
We must feed and over-feed them with brow-music very high.*

*And then Two-ohm Tom of Tooting rose and spat upon the floor,
And said in all his savvy he had never heard before
Such a bare-faced brazen insult 'pon his class intelligence;
He would wipe the floor wiv all of them and wiv the chair commence.*

*Then Anode Art of Angel raised a pint of porter, when
A portable loud-speaker took him in the diaphragm.
And he smiled; he swayed; he dropped. The game was quite beyond
his ken;
So we shot his bulk, not tenderly, on to the wireless pram.*

*But you could not say transformer, 'fore each member did indulge
In an argument whose fierceness made th' accumulators bulge;
And the way they heaved component parts—it made the hon. sec. choke,
Till a 5-lb. insulator fell, the head of Thompson broke.*

*But I reside on Wandsworth Common and my name is Broadcast Bert.
I do not oscillate nor otherwise the ether hurt.
And in language quite non-technical I've told the history
Of the high/low-brow explosion that killed our Society.*

C. T.

istance wire of small gauge—either silk- or cotton-covered wire of No. 30–36 gauge is suitable.

While on the subject of resistance wires, it is important that a well-known brand, whose resistance is known to remain constant despite

The Bewitched Aerial

"LONDON calling the British Isles!" Mr. MacPherson adjusted his headphones. He had often heard the announcement. It was a pleasant voice—nicely articulated, well-nigh perfect. It was, of course, an English voice, that is to say a voice with an English accent. Even so, Mr. MacPherson had no quarrel with it. He was Scotch himself, but let that go.

A very good programme was Mr. Mac's verdict—an extremely good programme—varied and, well, all that sort of thing. To suit all tastes. That was it. The unseen audience—the great vast unseen audience. Tastes might differ. But surely no one could find fault with that pleasant announcer. Specially selected for his enunciation. Must be some job, thought careful Mr. MacPherson to himself. It was very soothing.

Observe, Mr. MacPherson was listening after a good dinner—a very good dinner. He was feeling mellifluous. He had that balmy feeling. His digestion was working magnificently. He was smoking a big cigar. It was a good cigar. Within easy reach stood a decanter containing a quantum suff. of Mr. MacPherson's favourite medicine. Mr. Mac beamed serenely as he listened.

He did not know at what precise moment broadcasting from London ceased. It did cease. Something went wrong, as something sometimes will go wrong—no matter how seldom—even with the best conducted wireless. As a matter of fact, Mr. MacPherson had closed his eyes. One might almost have thought he was fast asleep.

"Bump! Rump! Thump! Dump!" "Ship's morse," murmured Mr. MacPherson to himself. He had nobody else to murmur to. All the rest of the family were out—at the pictures or somewhere. Mr. MacPherson was alone. He was content. He was quite comfortable. He wasn't looking for trouble. It was peace he wanted. He didn't often get it. Hence he appreciated it. He felt somnolent. He looked it. He might have been somnolent.

Now Mr. Mac knew as much about ship's morse as he did about the

morse code, which was the same thing as saying that he knew nothing at all. But it was pretty safe. He knew as much as the next. If anything disturbing occurred on the wireless Mr. Mac always put it down to "ship's morse." It sounded well. It was good enough. It was as good as anything else.

Then a strange thing happened. A voice, the like of which for general h.p. Mr. Mac had never heard the equal—loud and resonant and booming—sounded in his ear—in both his ears to be exact.

It was a mighty voice. It was an

DO YOU WANT TO BUY A SET?

We shall be glad to advise you as to which types of sets are the best for your personal use.

Tell us how much, roughly, you wish to spend; where you are situated; what stations you wish to receive; whether you intend to use phones or a loud-speaker, and we will advise you as to the general lines of sets that will answer your purpose.

Send your enquiry with coupon (p. iii, cover) and stamped addressed envelope to—

"Buyer's Advice Bureau,"

THE WIRELESS MAGAZINE,
La Belle Sauvage, E.C.4.

unearthly voice. And in fact it was. Its tones were stentorian. It was an immense, a tremendous voice. And yet Mr. Mac smiled as he sat. His cigar had dropped from his mouth. Luckily it had gone out. But he was beyond thinking of such trifles.

He was engaged with mightier issues. In his youth Mr. Mac had read Jules Verne. But more wonderful than all Jules Verne's imaginings was this—this voice—that was calling—calling—the Earth! "Mars calling Terra! Hel-lo! Hell-o!"

"Yes," replied Mr. MacPherson (for the Earth), forgetful of the fact, of course, that he was only a listener, not a broadcaster.

"Mars calling the planet Earth!"

"Yes," roared Mr. MacPherson "What on earth do you want?"

Of course, Mr. Mac might as well have been inarticulate. Nobody heard him—at least Mars certainly did not—there could be nothing more positive than that. Mars calling US (no, not U.S. please). Well, well. This was terrific. My word! Fancy! And a lot of other things Mr. Mac thought to himself.

"Dut! Dut! Dut! Dut!" etc. There it was again. Would nobody answer Mars? Where were they, these broadcasting people? What fools! Would nobody take notice? Where were the scientists? The addled asses!

He thought they were always on duty—Mr. Mac liked that idea—somebody else always on duty. He liked relaxation himself. But then they were scientists. It was their job. It was their business to be on the look out for Mars and Jupiter and Pluvius and Saturn and a lot of other distinguished aerial bodies.

That was it. Aeria! Could there be anything particular about his, Mr. Mac's, aerial? Perhaps he was the only recipient! And he was lockjawed—that is to say he could not answer back, much as he would have liked to. He must investigate this matter—he would write to the aerial people—that is to say to the wireless authorities—to the people responsible—to the—to the—

But what was this? Ye gods! This was something. "Hello, Saturn! Mars calling; What under the Sun is the Earth doing? I can't get him. He must be stupid."

"Boom! bang! fizz! squelch!" A noise like a thousand thunders was in Mac's ears. Yet to one watching him—if such a one there had been—he was to all intents and purposes fast asleep. His eyes were still closed. A smile was on his features. It was a cherubic smile. And yet strange things were happening. It was as if Mac heard nothing—was beyond it.

The contents of the decanter had appreciably decreased. In fact they had almost disappeared. Where once

(Continued on page 259)



A Reinartz One-valver with Reflex Action

This one-valver has been specially designed, built & tested in "THE WIRELESS MAGAZINE" workshop for volume & selectivity.

THE famous Reinartz tuner, which takes its name from a most prolific American wireless inventor, John L. Reinartz, has enjoyed a tremendous vogue in America. For some inexplicable reason, however; the British amateur has been slow to realise its advantages.

Reinartz Tuner

A glance at the circuit diagram will show that the Reinartz tuner consists of two separate coils magnetically and statically coupled together. One of these coils includes a semi-periodic aerial inductance of eight turns which is magnetically coupled and auto-coupled to a secondary coil tuned by a variable condenser.

The other coil is connected to the plate of the H.F. valve and is rigidly coupled to the aerial coil.

Reaction is controlled by a variable condenser connected between the free end of this coil and the aerial.

Tuning

The H.F. oscillations induced in the aerial by the electromagnetic waves passing through the ether from the transmitting station are tuned-

in by the suitable adjustment of the grid-coil variable condenser.

These H.F. oscillations are then passed on to the grid of the valve where they appear magnified in amplitude in the tuned-plate circuit of the valve. The magnified oscillations are next detected by the crystal and pass through the primary of the L.F. transformer, in the secondary of which they reappear at a higher voltage.

turers' names are given in brackets at the sides of each item:—

Crystal detector (Belling-Lee).

L.F. transformer (C.A.V.).

2 .0003-microfarad variable condensers (Portable Utilities Dial-condensers).

.0005-microfarad variable condenser (Portable Utilities Dial-condenser).

Filament rheostat (Ericsson).

Radion ebonite panel, 12 in. by 7 in. by $\frac{3}{8}$ in. thick (American Hard Rubber Co.).

8 terminals (Belling-Lee).

Valve holder (Burndept).

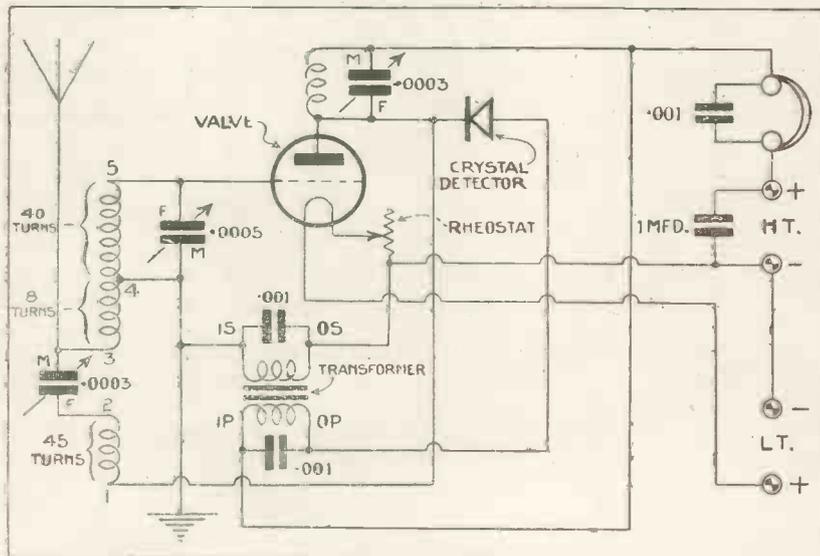
Fixed condenser, 1-microfarad (I.C.C.).

3 fixed condensers, .001-microfarad each (Atlas).

Fixed coil holder.

$\frac{1}{4}$ lb. of No. 24-gauge wire for winding the coil.

Mahogany cabinet with base-board (see sketch).



Circuit Diagram of Reinartz One-valver with Reflex Action.

The valve now functions as a low-frequency amplifier, the rectified impulses being amplified by the valve and passed through the phones.

The following is a complete list of all the components required to make this receiver. The manufac-

turer's names are given in brackets at the sides of each item:—

Crystal detector (Belling-Lee).

L.F. transformer (C.A.V.).

2 .0003-microfarad variable condensers (Portable Utilities Dial-condensers).

.0005-microfarad variable condenser (Portable Utilities Dial-condenser).

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Radion ebonite panel, 12 in. by 7 in. by $\frac{3}{8}$ in. thick (American Hard Rubber Co.).

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Fixed condenser, 1-microfarad (I.C.C.).

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Fixed coil holder.

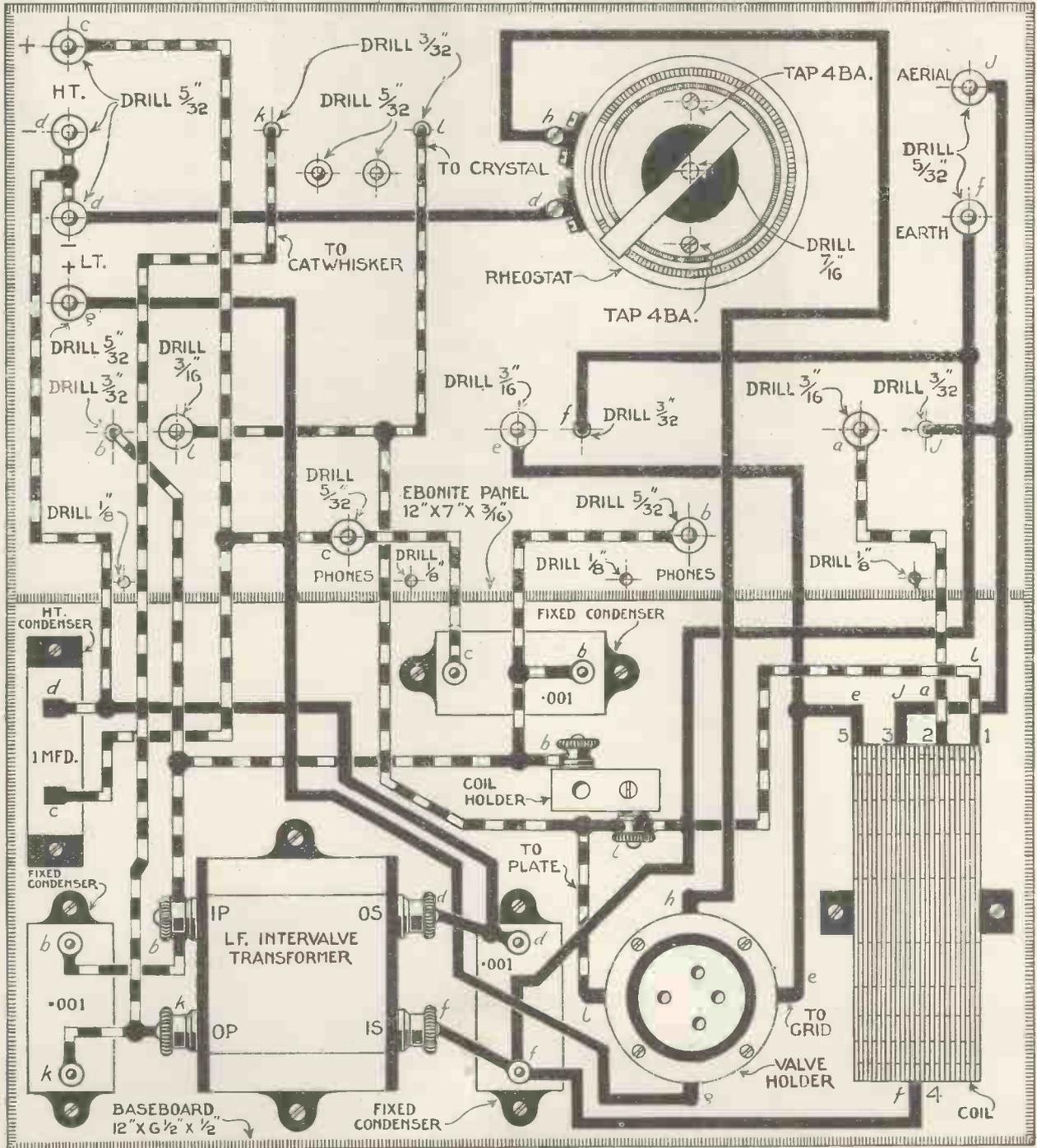
$\frac{1}{4}$ lb. of No. 24-gauge wire for winding the coil.

Mahogany cabinet with base-board (see sketch).

Making the Coils

The Reinartz

REDUCED REPRODUCTION OF "STRUCTOGRAPH" COLOURED PLATE GIVEN FREE WITH THIS ISSUE

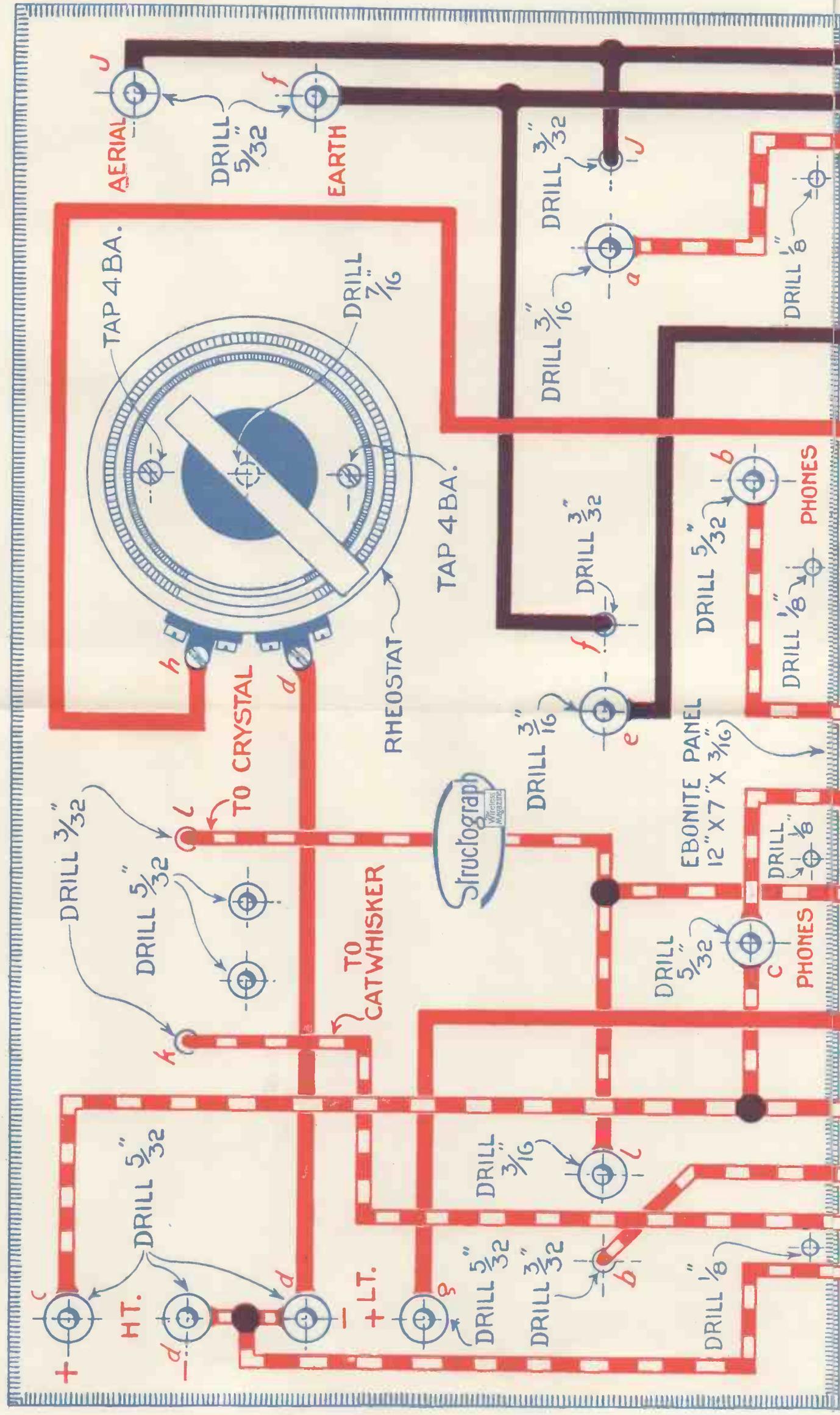


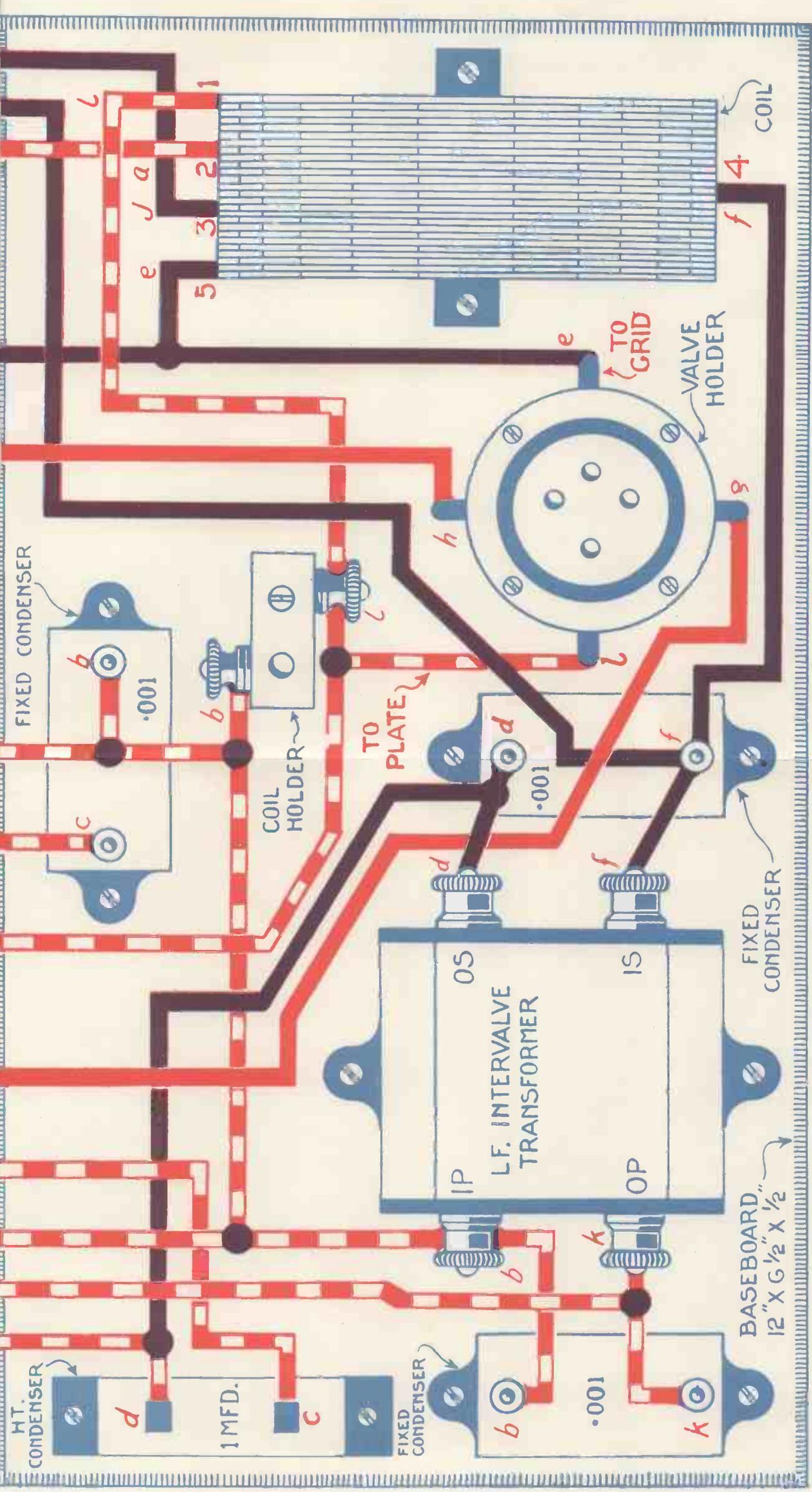
The full-size "Structograph" Coloured Plate of the Reinartz One-valver with Reflex Action that is given Free with this issue (and reproduced on a reduced scale above) is a special combined layout, drilling and wiring diagram developed by the Technical Staff of "The Wireless Magazine."

A REINARTZ ONE-VALVER WITH REFLEX ACTION

Combined Drilling Template and Full-size Layout and Wiring Diagram

For full particulars, see article in "The Wireless Magazine" for October, 1925.

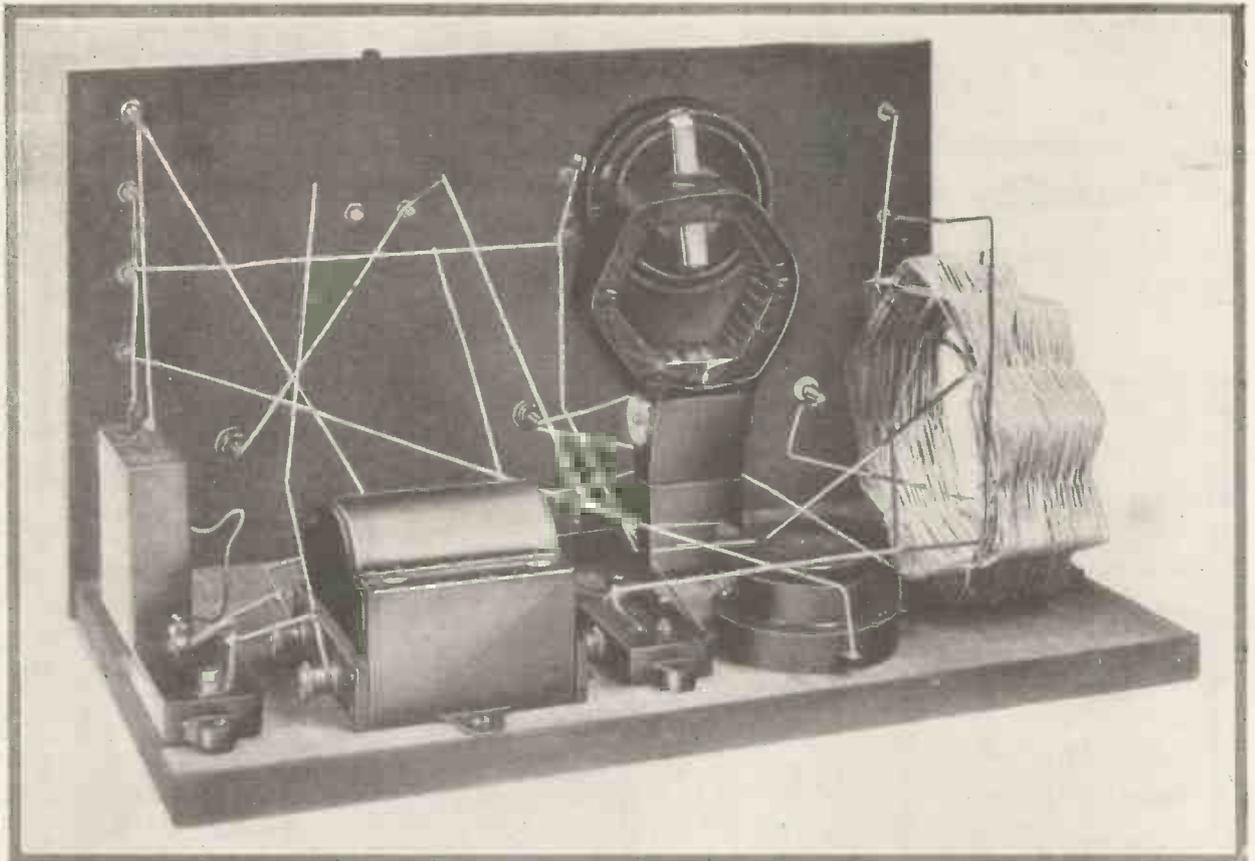




HOW TO USE THIS DIAGRAM AS A TEMPLATE:—The blue shaded outline indicates underside of panel and upper side of baseboard: all blue lines relate to either panel or components. This template should be laid on the panel and the drilling centres *pricked* through, the template thus serving many times if so required, and the whole plate being retained for use as a layout and wiring diagram.

SPECIAL INSTRUCTIONS FOR WIRING:—There is a choice of three methods. (1) Follow the wiring lines, *red* lines indicating the filament-lighting circuit; *red-and-white* lines, the H.T. or plate circuit; and *black* lines the grid circuit. A *black circle* at the intersection of two wires indicates that the two are soldered together. At all other intersections there is no connection between the two wires. (2) You can ignore the lines of the wiring, if you like, and work entirely by means of the red letters shown at the various terminals. You *just connect all like letters together* with one wire or with as few wires as possible, thus all the *a*'s together, all the *b*'s together, and so on, and you should do so in *alphabetical order*, the *a*'s first. By this method you cannot go wrong if you are careful, it having been carefully worked out to save the home-constructor both time and worry. (3) The ideal method is to combine (1) and (2).

A Reinartz One-valver with Reflex Action (Continued)



There is nothing complicated about this Reinartz One-valver with Reflex Action, as can be seen from this photograph of the wiring.

required, together with nine 4 B.A. screwed brass rods, each 4 in. long. A circle of 4 in. diameter is drawn on the square of ebonite and nine marks made round the circumference at equal intervals. At these marks holes are drilled to clear the 4 B.A. rods, which are then inserted and clamped each side of the ebonite by 4 B.A. nuts. No. 24-gauge wire is used for winding the coils.

Winding the Coils

Start winding the coils by going outside one rod, inside the next one, outside the next, and so on. The plate coil of 45 complete turns is wound first and the wire is cut at the 45th turn.

Next comes the aerial coil, having eight turns of the same gauge wire wound in the same direction and in a similar manner. The wire is *not* cut at the 8th turn, but a loop is made and the grid coil of 40 turns is wound straight on without breaking

the wire. Thus we have wound two distinct coils, one of 45 turns and the other of 48 turns, tapped at the 8th turn.

This completes the winding of the tuner. Before the coils are removed from the former they must be secured in some way in order to prevent the wire from coming adrift. The best method of doing this is to tie up the coils between the rods where the wires intersect with stout cotton or string, after which the coils may be removed.

A sketch of the cabinet showing the dimensions and the method of construction is given on p. 254. Made of mahogany $\frac{3}{8}$ in. thick, the cabinet has its two sides, back and bottom, fixed, while the top is made in the form of a lid hinged at the back in order that easy access to the wiring and instruments is possible.

Provided that the constructor possesses the tools and the ability there is no reason why he should not

make the cabinet himself. Nothing looks worse, however, than a badly made cabinet, and therefore, in the majority of cases, it will be better to place this part of the construction in the hands of a reputable firm of cabinet makers.

Cabinet Construction

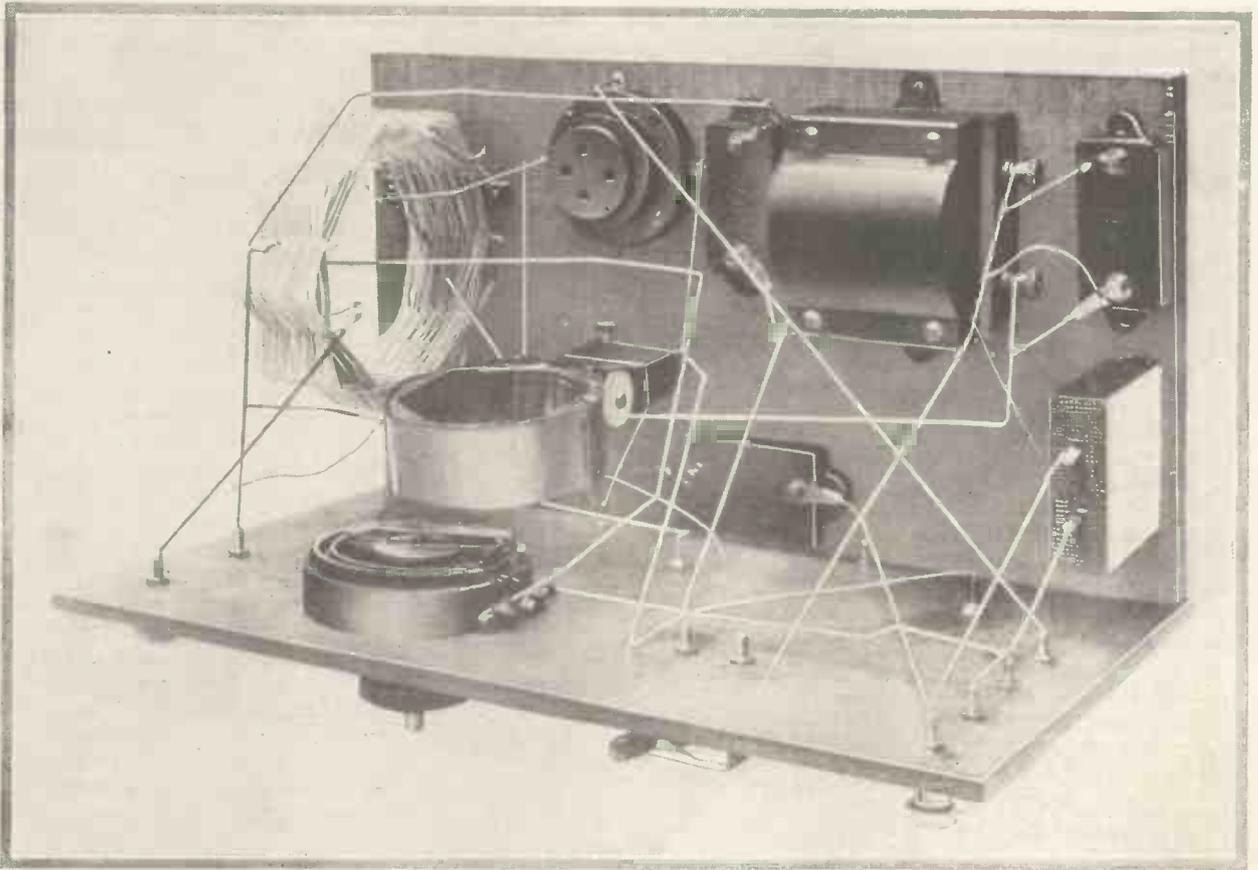
For the benefit of those few who desire to make their own cabinets a few hints are given.

Cut the two side pieces to exactly the same size, and see that the four corner angles are all right-angles. Next, cut the back piece to the dimensions shown, having the same height as the side pieces.

The back and the two side pieces should be glued and screwed to the bottom piece which, together with the lid, should have some kind of fancy moulding round the edges. The lid is hinged to the back of the cabinet at the top.

As an alternative to french polish-

Specially Designed by "The Wireless Magazine"—Try It!



The components required for the Reinartz One-valver with Reflex Action are few in number and inexpensive, as seen from this photograph.

ing the wood may be stained with a dark mahogany stain, after which a coat of varnish should be applied.

Baseboard

The wooden baseboard to which the panel is attached, and on which most of the instruments are mounted, measures 12 in. by 6½ in. by ½ in. thick.

Before any drilling operations can be commenced the panel must be cut and squared up. There are two ways of "cutting" the panel—one, by sawing it, and the other by breaking it. The latter is by far the quicker method and should be done as follows:

Mark out the exact size of the panel (12 in. by 7 in.) on the piece of ebonite from which the panel is to be "cut." Take great care that all the corners are at right-angles. Along the marks made lay a steel straight-edge and with a sharp steel point make grooves in

the ebonite not less than $\frac{1}{16}$ in. deep—the deeper the better.

Now place the ebonite on a table so that the edge of the table coincides with one of the grooves on the ebonite, and with a sharp blow from a wooden mallet the superfluous ebonite will break away leaving a clean fractured edge. All four edges may be dealt with in this way.

The fractured edges may be cleaned up by rubbing with emery cloth.

Drilling may now be started. Referring to the "Structograph" template and wiring diagram, it will be seen that there are twenty-three holes to be drilled in the panel, including the four screw-holes for the purpose of attaching the panel to the baseboard.

Using the "Structograph"

The centre positions and sizes of these holes are indicated so that all that is necessary is to place the template (which is full size) flat over

the panel and mark through with a sharp steel point at the centres all holes to be drilled.

The template is then taken away and holes of the sizes indicated drilled at these marks.

Having completed the drilling the next step is to mount the components.

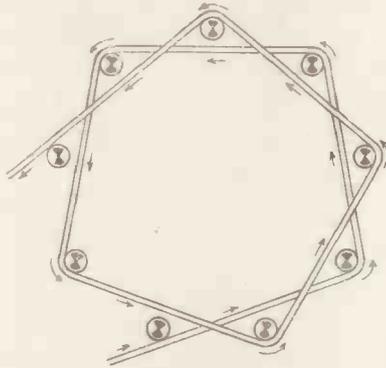
On the bottom of the panel are fixed the two phone terminals. Just above these are seen the three variable-condenser dials, while on the top of the panel appear the filament rheostat (on the left) and the crystal detector (on the right).

In the left top corner are the aerial and earth terminals, and on the right-hand side of the panel the four battery terminals.

The three variable condensers deserve special notice in that in each the whole instrument is enclosed in the dial itself. These condensers have a very low minimum capacity and in operation they possess a very smooth action.

A Reinartz One-valver with Reflex Action (Continued)

On the baseboard behind the panel the L.F. transformer, valve holder, coil holder, coils and the four fixed condensers are mounted. The



Method of Winding Coil.

low-loss coils are clamped between two ebonite strips which are then screwed down to the baseboard.

Wiring Up

Given away with this issue of THE WIRELESS MAGAZINE is a special "Structograph" coloured wiring diagram and panel-drilling template. All the instruments and terminals included in the grid circuit (this includes the aerial and earth circuit) are shown connected with a thick black line. The filament-lighting circuit is shown in red and the plate circuit in red and black.

Beside each terminal will be seen a small letter. These are for the purpose of indicating which wire to connect up first. For instance, all the terminals marked *a* are joined up first with one wire, then all those marked *b*, and so on. With this diagram as a reference wiring up is an easy matter.

Suitable Valve

Actual experience in the handling of this receiver shows that the type of valve used has a very great effect on the results obtained.

With some types of valves, indeed, results could only be described as poor. It is essential, therefore, that a suitable valve should be used.

We recommend for this purpose a Metropolitan-Vickers Shortpath, type SP 18, which gives excellent results. The filament consumption of this valve is .3 ampere at a

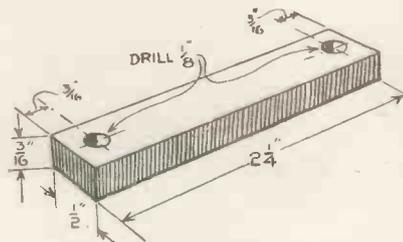
pressure of 1.8 volts. A 2-volt accumulator cell is suitable as a source of filament-current supply.

It will be noticed that the valve functions efficiently when the filament is at a dull red heat.

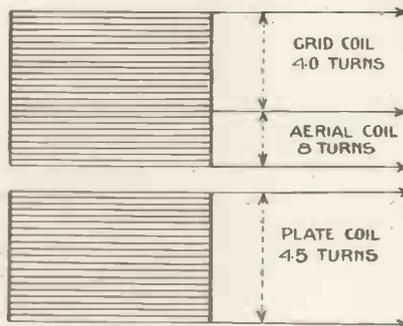
Operating the Set

The chief advantages of the Reinartz tuner are its simplicity in operation and its great selectivity—a rare combination. Tuning is accomplished in the following manner:

Set the reaction control condenser at zero and search round for signals by *slowly* rotating the grid-coil tuning condenser (in the centre) and the anode-coil tuning condenser (on the right). When signals are heard the catwhisker on the crystal



Details of Coil Support.



Arrangement of Coil Tappings.

should be adjusted until a sensitive spot has been found.

It should be noted here that when the catwhisker is off the crystal no signals should be heard, thus denoting the valve is not rectifying. If signals are heard the H.T. voltage should be adjusted until the signal strength is at a minimum.

Having brought the crystal detector to its best, signals can be further strengthened by adjusting the reaction condenser.

Good Aerial and Earth

If the constructor desires to bring in far-distant stations it is essential to have a good aerial-earth system. It is useless winding low-loss coils and increasing the efficiency of the whole set to a maximum if the most important part is neglected.

Some idea of what this set will do, provided the above instructions are carried out, may be gathered from the following test report. On an aerial about eight miles from 2 L O this station came in at remarkable loud-speaker strength. Three other stations were received on the loud-speaker—L'Ecole Supérieure on 458 metres, "Le Petit Parisien" on 345 metres, and Birmingham on 479 metres.

Many other stations were received using the phones. Among these the following were particularly good: Brussels on 265 metres, Hamburg on 375 metres, Bournemouth, Cardiff, Manchester, Glasgow and Madrid.

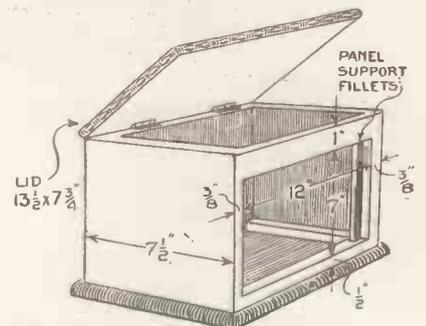
Tuning will be found to be extremely critical. Indeed, at this distance from 2 L O (8 miles), it was quite possible to cut out this station and tune-in Cardiff.

Reaction Control

Reaction is controllable throughout the entire tuning range by means of the left-hand variable condenser. In all probability it will be found that when the dial is set at an angle of about 25 degrees the set will burst into oscillation.

The most sensitive point for reception will be found to be just before this oscillation limit is reached.

Another very critical control is



Details of Cabinet.

the filament rheostat. If the brilliancy of the filament is too high it will become difficult to stop self-oscillation.

The Invisible Audience

*A Story by J.D. Millard
Illustrated by Leo Cheney*

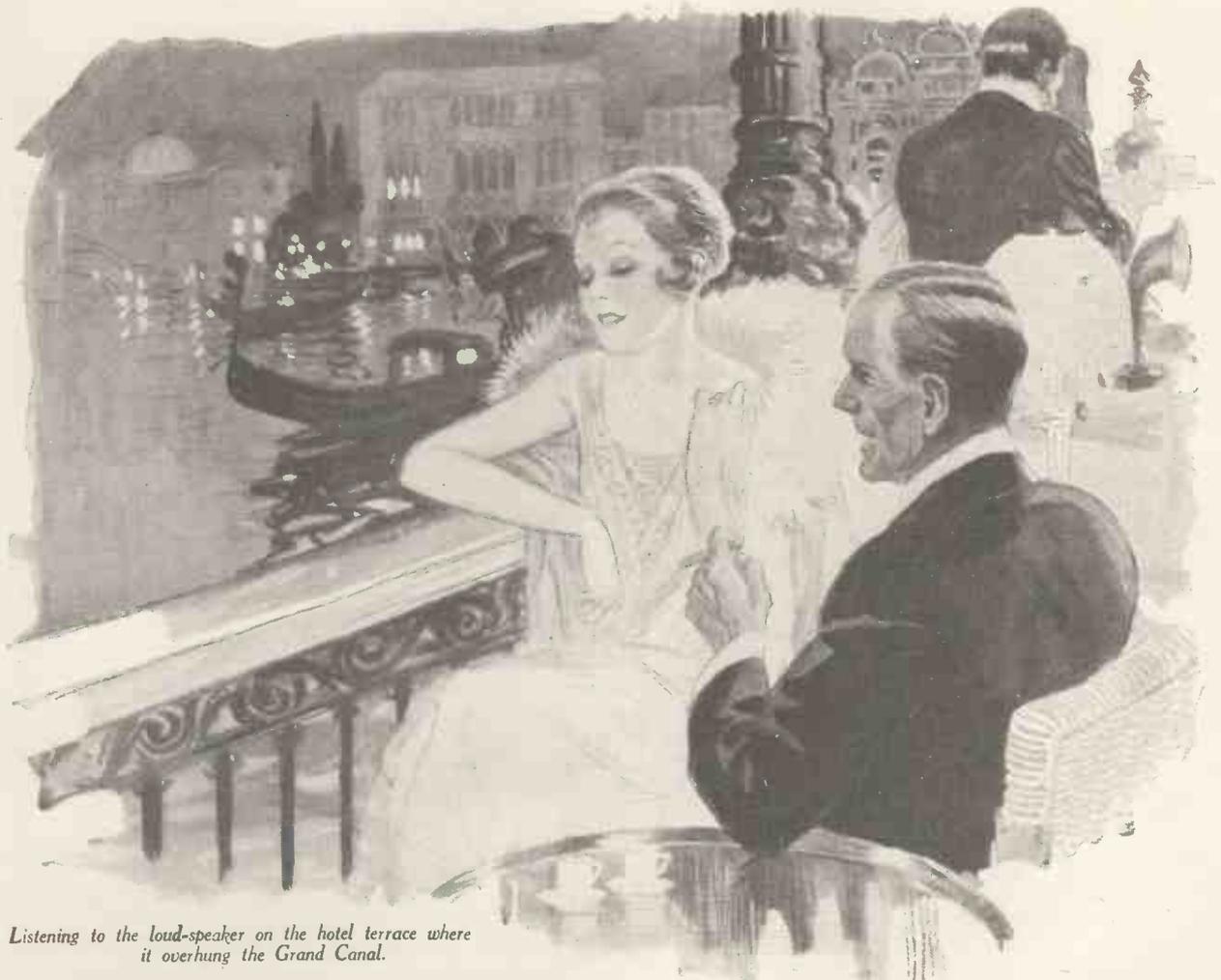
THE Stentor voice, borne by tireless waves of energy, of the mammoth broadcasting station at Haintree made itself heard over the length and breadth of the land—in crowded city dwellings and in isolated farmhouses on bleak wolds.

Over half the continent of Europe it sounded; for its voice was far more powerful than any other purely

(NOTE.—The conversations in this story set in *italic* type form parts of a programme transmitted from the Haintree high-power broadcasting station. For the sake of simplicity, the few words used to introduce and connect this dialogue have also been printed in *italic*. Each character and incident is imaginary.)

So Haintree had at the moment many millions more listeners in foreign lands than in the very England which it was intended to serve.

So perfectly had the broadcasting instrument been wrought by years of research, that the listener in the log-cabin in the Rockies, and the girl honeymooning with her lover in Venice and listening to the loud-



Listening to the loud-speaker on the hotel terrace where it overhung the Grand Canal.

broadcasting station in the world, and the excellence of its programmes attracted listeners in every land west of Suez.

It was even heard in the vast tracts of the North American con-

tinents; for on this particular night the nationwide chain of broadcasting stations controlled by the railways was relaying the programme that Haintree provided from the old country.

speaker on the hotel terrace where it overhung the Grand Canal, heard the clean-cut voice of the English announcer with as much clarity as the director in London.

THE INVISIBLE AUDIENCE (Continued)

§ § A Story by J. D. Millard
§ § Illustrated by Leo. Cheney

The station director was taking an easy evening. The programme was of the popular "round-the-stations" type, and the switching from one to the other of the English stations for excerpts from their programmes did not require his supervision.

There were no distinguished guests to receive, and he could safely leave the conduct of the evening's entertainment in the hands of his assistant.

* * * * *

"Haintree station calling. You have just heard the 'Ride of the Valkyries' played at Pinebourne. From a watering-place in the south we will now go over to a great manufacturing town in the north. Stand by for one minute, after which we will see what Manecaster has to give us for the next quarter of an hour or so."

* * * * *

The lonely man in the cabin in the Rockies, who had given up an ill-paid post in an insurance office in the homeland to seek fortune in the great Dominion, leaned forward with eager interest. Manecaster was his home town.

And the girl in Venice smiled at her husband.

"To think we've come all these miles to get away from it, dear, and now Manecaster is thrusting itself upon us even in this beautiful spot. What is the good of sitting beside the Grand Canal if a few wires stretched overhead can force us to remember Manecaster with its Market Street on a rainy day?"

* * * * *

A play was evidently in the course of being broadcast from the Manecaster station, for, after the slight clicks of the switches as the transfer was made to Manecaster, a man's voice was heard:

"Here's that young fool of a Kenneth on the phone wants you, Mona. But, before you speak to him, let's get to the bottom of this. What's the good of suggesting that I should go to the theatre alone? What would be the fun in that? Are you sure you've made no other arrangements? It seems as though you want me out of the way."

It was a woman's voice which answered:

"Whatever are you looking at me like that for? Of course I'm not

going anywhere. Whom should I go with?"

* * * * *

At the tones of her voice, the man in the Rockies and the girl beside the Grand Canal started slightly.

"No, it can't be the Mona I know," each whispered softly. "She has never acted before."

* * * * *

The man continued insinuatingly: "You know well enough whom I mean."

"What in the world are you talking about?"

"I suppose my lady innocence never thought of the man on the phone? Your—Kenneth?"

He paused before the last word, and spat it out at her like a pistol shot.

"Be quiet! He'll overhear everything you say."

"What do I care? I want him to. He's not altogether unconcerned in this affair. Were you going out with him this evening?"

"And suppose I were?"

"You don't usually refuse an opportunity to come to the theatre without some good reason. You've been seeing too much of your young bouncer lately. Perhaps my company isn't so entertaining as his?"

"Oh, please don't be ridiculous, and don't talk like the jealous husband on the stage. Let me have the phone. I have something to tell Ken."

* * * * *

The listener in the far west of Canada and she in Venice jumped up with sparkling eyes. There was no mistaking the intonation of the "please" in that "please don't be ridiculous." How often had not their sister Mona used the same expression to each of them?

"Gee, what luck Calgary relayed the programme from the old country to-day of all days," breathed the Canadian.

"Mona blossoming forth as an actress," murmured the girl on the Grand Canal, with just the tiny thought at the back of her mind—"She might have told me."

* * * * *

"Let Master Kenneth wait—answer my question. You'd rather go with him than with me?"

"Don't be so childish, Jim. I refuse to answer you."

"Come now, the truth!"

"Really, Jim, what does it matter if I did intend to go out with him?"

"Then you had arranged this thing?"

There was silence a moment. Then the man asked again.

"Come, answer me!"

"I shall not. Almost you make me hate you, Jim, with your silly suspicions."

"So you hate me, your husband, and the soft spot in your heart you reserve for this upstart, this intruder, Kenneth?"

"Yes! Yes! A thousand times yes. You jealous fiend!"

* * * * *

Everyone of the millions of listeners to that voice in two continents read the scornful passion and the exasperation of a woman tried too long that rang through it. The man listening in the lonely cabin in the Rockies moved a little uneasily in his chair. He knew Mona in a temper. To the girl in Venice the scene of the moon reflected on the waters of the lagoon seemed to have lost its peace and beauty. The conviction in the actress's voice rang terribly true. It was not so much her words as the meaning that she lent them.

The director of the Haintree station had an ear for a great actress. Her voice carried perfectly by wireless. He reached for the list of programmes. He must find out her name. It would be good to get her to act for his own station. He ran his finger down the list. It stopped at the words "Manecaster, Thursday, 7.30 p.m. to 10.0 p.m.—Light Orchestral Music."

The director looked at his watch. A quarter to eight. He frowned, and looked again at the programme. Then he rang the bell and told the boy who answered it to ask Mr. Smith to see him for a few minutes.

"What's this you're putting out?" he asked Smith, his assistant, when he presented himself. "I thought I heard your announcer say you were going over to Manecaster for an excerpt from their programme?"

"Certainly, it is Manecaster, sir."

"Look here, it's down plain enough: 'Manecaster, Thursday, 7.30 p.m. to 10.0 p.m.—Light Orchestral Music.' Get Manecaster on

the phone and ask 'em why they've altered their programme."

"Yes, sir. But don't forget that the private wire was blown down in the gale last night. We're on to the Manecaster studio by a Post Office telephone line."

"Yes? Well, just see what they're up to."

He turned again to the loud-

are starting from your head! You're mad, mad! Oh, don't touch me! Ugh! You frighten me! Oh, help! Help! Kenneth! Kenneth! Oh, Kenneth, can you hear me? Help! H's choking me. I can't stand it any longer. Oh my God! Oh! Ken! Ken! Ken!

The voice died away, sank with a thick sobbing sound.

What have I done? Mona! Mona! She's only asleep, asleep."

Then there was silence.

"Marvellous acting," said the station director. "What had Manecaster to say?"

"Manecaster are carrying on with their orchestral concert, sir. They haven't been broadcasting a play this evening. God knows where that is coming from!" He waved excitedly at the loud-speaker. "It—it didn't sound to me like acting."

"You mean?"

"I don't know, sir. It's too horrible. It's—"

"Well, never mind speculating now. Switch over to one of the other stations and then try to trace through the telephone exchange where this free play came from."

In the lowly cabin in the Rockies a man was standing with face blanched and with fear looking out of his eyes. He tried not to believe what he knew was true.

And in Venice a shriek pierced the silence of the heavy night and the honeymooning girl was carried indoors in a dead faint.

The next morning the post-bag of the Haintree station was filled with letters from all parts of the country commenting on the brilliant acting of the unnamed actor and actress in the portion of the programme picked up from Manecaster.

They continued to pour in for a week from all over the Continent. The next week brought hundreds of letters from Canada and the States, all congratulating the "magnificent performance, rivalling Sarah Bernhardt at her mightiest," as one writer put it. Many wanted to know the identity of the actor and actress.

There was, too, an incoherent cablegram from a Canadian, who apparently was under the impression that the actress was his sister, demanding assurances of her safety.

The explanation of the mysterious broadcast play must be sought in a room in Manecaster, in which are the "clever actor and actress" on that particular night.

She, a young and pretty woman, is lying back in an easy chair smiling blandly at her "opposite" in the play, who is her husband. He is

(Continued on page 273)



In the lowly cabin in the Rockies a man was standing with face blanched and with fear looking out of his eyes.

speaker. The male character was speaking:

"You really mean what you say—you hate me?"

"I do! I do! Let me come to the telephone. Oh, Jim! Jim! What are you thinking about? Don't! Oh, don't look so cruel. Your eyes

The man spoke in the soft, crooning tones of a madman.

"Oh, my darling little Mona, how still you are. Pretty! Pretty, you look! Wake up and kiss your Jim. Wake, I say, wake! Dear God, she's quite still! She doesn't move! Mona!

What You Can Do With Indoor Aerials

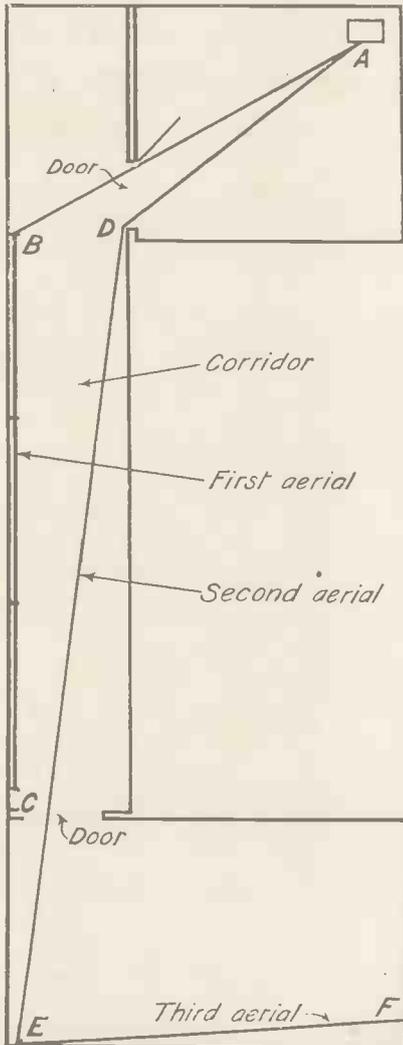


Fig. 1.—Plans of Three Indoor Aerials.

A VERY wet afternoon recently caused me to stay indoors when I should have been helping a friend to erect an outdoor aerial. I spent the afternoon and the greater part of the evening following in carrying out a number of experiments with indoor aerials.

Considering the results I obtained, I am very glad the rain kept me at home that afternoon. It is a long time since I tried an indoor aerial, and I was astounded at the signal strength I obtained.

Set Used

The receiving set used in the experiments was a three-valve set—detector valve, followed by two low-

frequency amplifying valves. A loud-speaker was used, and at no time did I employ my phones for tuning-in a station.

The wire used for the indoor aerials was ordinary double-lead electric lighting flex. The two leads were connected together at the receiving end of the aerials but not at the open ends.

First Aerial

My first indoor aerial was a length of the flex slung diagonally across the room in which was the receiving set, thence out through the door of the room and down a corridor. The length of the aerial was in all some 36 feet, 12 feet being in the room and 24 feet in the corridor.

Inside the room the aerial was free from the walls, but in the corridor it ran along the wall, being passed over several picture nails. Fig. 1 shows a plan of this aerial, the wire running from A, the receiving set, to B in the corridor and down the corridor wall to C.

With this simple indoor aerial and a good earth of buried metal, I was able to get Nottingham, 25 miles away, at weak loud-speaker strength. I was also able to hear Manchester and Birmingham, the former station being 40 miles away and the latter 50.

For my second indoor aerial I used a longer piece of the flex. This was stretched across the room in which the receiving set was placed, as was the first aerial, but immediately outside the door of the room the aerial wire was fastened to a hat-peg.

The wire was then taken down the corridor, through a door at the end of the corridor and into another room. This time the aerial wire was everywhere free from the walls of both corridor and rooms.

The run of this second aerial is indicated in Fig. 1 by the letters

A, D and E. At the end E a superfluous 10 feet of the wire was made into a coil and hung over the corner of a picture frame.

Results on this aerial were appreciably better than those on the first, but the loud-speaker signals were only of medium strength from Nottingham, Manchester and Birmingham.

My third indoor aerial was different from the second, the coil of wire at the free end being opened out and slung across the room in such a way as to be almost at right angles to the main portion of the aerial in the corridor and second room. The run of this third aerial is indicated in Fig. 1 by the letters A, D, E and F. The average height of this aerial would be about 9 feet.

Results

The extra 10 feet of aerial seemed to improve matters considerably. With a little patient tuning, the following stations were heard: Sheffield (20 miles), Nottingham (25 miles), Manchester (40 miles), Birmingham (50 miles), Leeds (55 miles), Liverpool (65 miles), Newcastle (120 miles), London (140 miles), Glasgow (220 miles).

Of these stations Nottingham

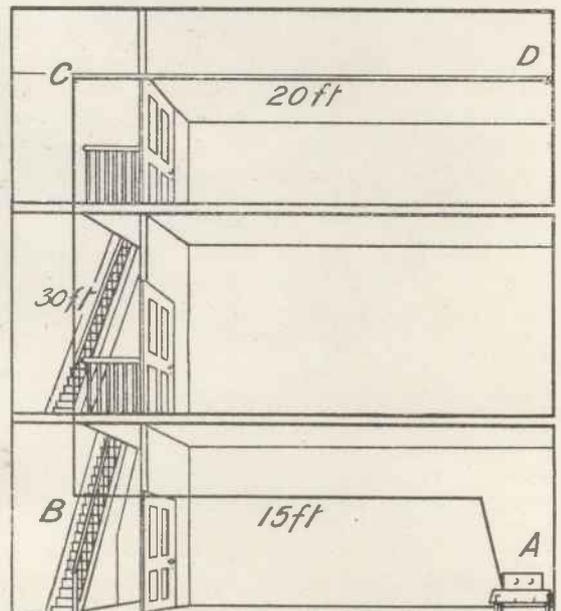


Fig. 2.—Fourth Aerial.

came in at good loud-speaker strength, and Manchester was also good. The more distant stations, although audible on the loud-speaker, were, of course, weak.

In putting up the fourth indoor aerial use was made of the available indoor height of the house. A length of 15 feet of the flex reached from the receiving set across the room and out of the room to the foot of the stairs. Thence the next 30 feet of the flex were taken up vertically beside the stairs right up to the topmost point of the house.

Fixing the Wire

At this highest point the wire was secured to a small screw placed in a beam which formed one of the roof supports. The remaining 20 feet of the aerial wire were then taken horizontally through a door and across an attic.

Fig. 2 shows the run of this fourth aerial, the portion A to B being on the ground floor, the portion B to C being vertical and the portion C to D being horizontal on the top floor of the three-storied house.

This fourth indoor aerial gave excellent results. Nottingham was audible on the loud-speaker all over the ground floor of the house, and practically all the stations mentioned in connection with the third indoor aerial were audible over the room in which the receiving set was placed.

J. R.

GETTING THE BEST FROM VALVES

WHEN you buy a new valve of the general-purpose type it is as well to test it out in various parts of the set to see if it has a "best position." Owing to the perfection to which modern methods of manufacture have been brought there is not usually a great deal of difference between any two of the same make.

Still, there are tiny variations which may make a good deal of difference to the valve's performances as a high-frequency amplifier, rectifier or note magnifier. Sometimes you will find that a valve makes a particularly good detector, and if you do so it is just as well to reserve it for this duty.

When a valve is found to function especially well in a certain position its cap should be marked H.F., R or L.F.

J. H. R.

Prof. E. Sopp's Fables

Nº 2. The Gratitude of the Sheik

ONCE upon a Time, the Sheik-engineer of a Wireless Broadcasting Concern who was resting from his laborious Tasks in his Den by the Forest of Hampstead was visited on a Certain Day by a Member of the Great Army of Listeners.

Without calling upon Him to state the nature of his Mission, the venerable Sheik bade him Welcome, set a cold Collation before him and besought him to partake of his Hubble-bubble.

As the rich smoke of the fragrant Latakia was wafted on the evening breeze, the Visitor spake thus:

"O, Thou Wise Master of Wires, I have come to Thee to appeal for monetary Aid. In the precincts of my Hut dwelt a lusty Radio Fan who, sadly enough, without timely Warning, hath been called unto his Fathers. It is our desire to give our Brother Oscillator a seemly Interment and we would wish to erect a sumptuous Mausoleum to encompass his Remains for the Consolation of his Kith and Kin. But we lack the wherewithal to defray the cost of such a lordly burial. Perchance, in Thy great Benevolence, mayest Thou grant

assistance to attain our laudable aims."

The Wise Sheik stroked his snow-white Beard and Silence reigned for an appreciable Space of Time, then taking the narghile from his lips, he replied: "Good Stranger, May Thy Shadow never grow less. An Oscillator, sayest Thou? Yea, readily will I offer aid and material assistance to such a noble Cause."

Whereupon, drawing from a well-lined silken purse, five shining silver Robertos of the Realm, he handed them to the Visitor. With profuse thanks and many genuflexions the Stranger prepared to withdraw, when the Sheik, by a peremptory—but courtly—gesture, arrested his departure.

Taking from a goodly Pile lying on his Alchemist's table, a crisp and crackling Fisher, he pressed it into his caller's hands, adding, the while, in sympathetic Tones: "Thou hast rendered unto Me a great Service, Friend, and I am truly thankful. Place this in Thy pouch and inter four more Oscillators. Peace be with Thee."

MORAL: *One good turn deserves another.*

JAY COOTE.

The Bewitched Aerial (Continued from page 249)

there had been a noble plenitude, alas! there was a vast shrinkage. The plenitude had shifted quarters. It was indeed reposing beneath the ample waistcoat of Mr. Mac, reposing gracefully—nay sprawling—in his comfortable chair, phones still in position though. Mr. Mac was nothing if not thorough.

"Righto," suddenly said Mr. Mac at this stage, apparently à propos of nothing. But Mr. Mac knew better. He was holding converse in his own way with certain heavenly bodies.

"Who?" roared Mr. Mac—he seemed to think it necessary to roar to be heard so far off—"right you are, son." (Or was it "Sun" Mr. Mac said?) "Venus? And Adonis? Eh, what? How do? How do?"

Mr. Mac made rumbling noises. He made curious sounds through his nose. Had it not been for the earphones and the crystal set in

close proximity one might almost have thought that Mr. Mac was not entirely conscious of his surroundings. He had that appearance.

But fancy Mars on a crystal set! Mr. Mac (nor nobody else) could not get over that. It must be the aerial. He would have a look at that aerial. Something—was—happening—out—there—

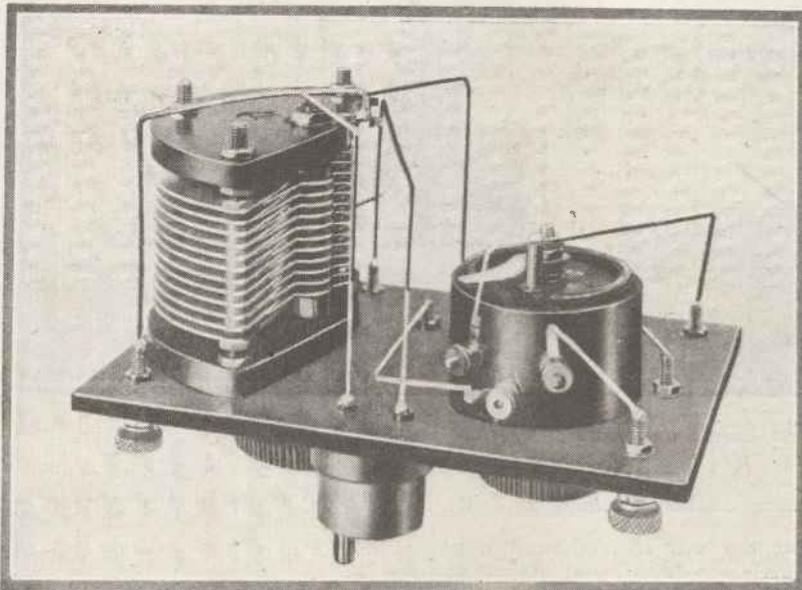
Mr. Mac extricated himself from the wreckage and gazed about dazedly. The phones were no longer on his ears and the aforementioned crystal set was a wreck.

"Why, whatever's madder?" quoth Mr. Mac to himself, having no other audience. "Thought had Mars—blessed—"

But Mr. Mac got no further for the door opened and Mars entered—that is to say the footstep was Ma's, and when Ma's wrath was exhausted on Mr. Mac he saw, if he did not hear, Stars!

PHILIP AUSTIN.

A Crystal Set with Potentiometer Control (Continued)



Under Side of Panel of Crystal Set.

panel. On one side of the panel is fixed the coil holder, while the crystal detector is plugged into a pin and socket mounted on the opposite side. The three terminals seen on one edge are for connections to the dry cells, the middle terminal being connected to the centre tap of the battery.

Having drilled the panel and mounted the components, wiring may be started. This is done as shown in the wiring diagram. Use No. 16-gauge wire for connecting purposes.

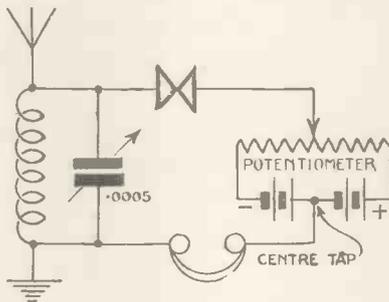
This type of wire is rigid enough to support itself, and with it there is no necessity to use insulated sleeving.

Cabinet

The cabinet consists of a plain oak or mahogany box into which the panel and instruments may be conveniently fitted.

Tuning is accomplished by plugging a No. 50 coil (or the equivalent) in the coil holder and rotating the variable-condenser dial. When signals are received the crystal is brought to its most sensitive point by the adjustment of the potentiometer.

When the set is not in use it is advisable to disconnect the dry cells, otherwise they will run down (although very slowly) through the winding of the potentiometer.



Circuit Diagram.

Watch Your Filaments

WE are often cautioned against allowing the filaments of our valves to run at excessive temperatures. This is sound advice as far as it goes, for filaments are short lived if they are allowed to burn too brightly.

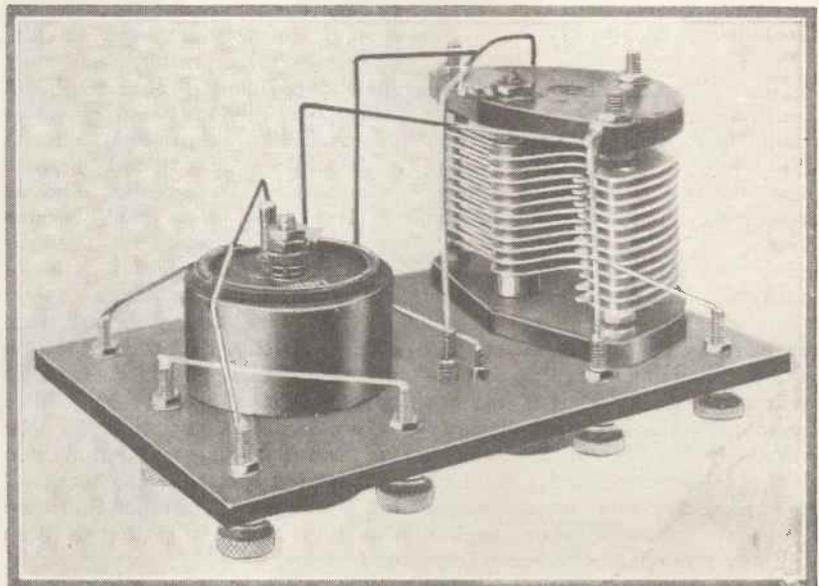
At the same time it must not be forgotten that very bad reception may result from failing to heat the filaments to a temperature that is high enough. This is not always realised by amateurs, who often apply too small a filament voltage in the interests of valve economy.

Distortion

If the filament is too dull the characteristic curve is a very short one, and distortion is likely to occur if signals are at all powerful, since the working point may be taken on to either the upper or the lower bend.

The best method of making sure that your voltage is neither too great nor too small is to use a good voltmeter, which should be applied across the filament legs when the valve is working. The makers' figures may be taken as correct when the valve is new, though the voltage may need to be a little higher after the valve has seen a certain amount of service.

J. H. R.



Another View of the Crystal Set.

The Submarine and Some Wireless Adventures

An Article by Lieut. Com. H.W. Shove,
R.N., D.S.O.

THE first wireless set ever constructed and installed by the writer was a small spark transmitter and crystal receiver, which was put together out of various odds and ends for use in the submarine then commanded by him. That was in 1912. The set was used during the manœuvres of that year and, with a good deal of tinkering, an effective range of about five miles for two-way communication with the depot ship was obtained.

This does not sound very great, but when it is remembered that the set had to work in a compartment containing a 600-h.p. 16-cylinder petrol engine, and that the conditions therefore approximated to those under the bonnet of a powerful motor-car, the reader will perhaps pause before scoffing at such results.

Submarines as Scouts

At that time there were no "official" wireless installations in British submarines. It was simply due to the initiative and enthusiasm of a few commanding officers that there were any sets at all. And those we had never really got beyond the experimental stage.

The reason for this apparent apathy on the part of the higher authorities was probably that no one had any conception, before the war, of the immense value of submarines as scouts. That it was not due to lack of keenness is sufficiently proved by the fact that the head of the Submarine Service at that time was the famous Sir Roger Keyes, the glory of whose exploit at Zeebrugge on St. George's Day, 1918, can only fade with the very memory of the British Navy itself.

The Latest and Largest of the K Class Submarines.

But the war soon showed what submarine scouts could do. Although the British Submarine Service did obtain some very fine and sometimes spectacular results in the actual infliction of damage on the enemy, it was in the unobtrusive, and often very monotonous, task of watching the German coast that the greater part of their real work was done and, alas! the greater part of their very heavy losses sustained.

A submarine, as was soon discovered, is unrivalled for this purpose, for it, alone of any sea or air craft, can see without being seen. And it, alone of all light scouting craft, need have no fear of being cut off by a superior force of the enemy. Mines, in fact, were our chief danger on these patrols. And even these we could often get underneath!

But it is obviously not of much use to obtain information without the ability to report it, and to report it quickly. The need for efficient wireless sets thus early became apparent, and throughout the war developments in this branch of submarine equipment went on apace.

There were two principal difficulties. Firstly, that the inside of a submarine, especially in the smaller boats, is not only very crowded but very noisy. Secondly, that the need for instant readiness for submersion necessitated special arrangements of masts and aerials in order that time might not be lost in getting them up and down.

The noise problem was tackled, as it had been in other craft, by the

fitting of elaborate "silent cabinets," somewhat resembling public telephone call-boxes, with double walls, the intervening space being filled with some fibrous substance to deaden the sound.

These were all very well, so far as shutting out noise was concerned, but, unfortunately, they also shut out air, so that the plight of the telegraphist during a prolonged watch tended to become rather parlous. This led to the fitting of special ventilating fans, which again had to be designed for silent running. So that complication and demands on space grew rapidly.

Aerials

The first arrangement of the aerial was to support it by a single mast alongside the conning-tower and have it in two or three lengths, so that they would telescope to a height not greater than that of the tower. An arrangement of pulleys and a small winch served for getting these masts up and down.

With these masts the aerial was a sort of inverted V, the two ends coming down to the bow and stern, the vertex supported by the mast. This had a very serious disadvantage, for the bow and stern of a submarine, in anything like rough weather, are practically constantly submerged. The aerial was therefore very frequently "earthed." So it was not long before a "two-mast" arrangement came in, the aerial then becoming an ordinary T type.

The two masts had to be of a different type from the single one. The telescopic principle was abandoned for a "folding down" one,

the masts being hinged at the foot and fitted with a large lead counterpoise weight.

They were situated, of course, near the ends of the boat and therefore in such a position that it would have been impossible in a seaway for men to get to them for the purpose of raising or lowering them. They had, therefore, to be fitted with special gearing, led through the hull so that they could be worked from inside. Originally this was hand operated, but later motors were provided to make the operation quicker.

The "Bight Patrol"

Two little incidents connected with these folding masts may not be devoid of interest. The first happened to the writer himself.

Returning one night from a "Bight Patrol" he was approaching the "Cockpit of the North Sea"—the Hinder Light Vessel. It was very dark, moonless and not over smooth. When only about a thousand yards from the light vessel (which, being Dutch, was burning its light) a succession of "shapes" suddenly loomed up in the glare of the powerful beam. "One—two—three—four!"

The writer did not wait to count any more! It was a destroyer flotilla! Whether British or German made no difference; for the British destroyers had orders to attack a submarine on sight, the onus of proving one's friendly character being on the submarine. Hastily pushing the look-out man down the conning-tower, the writer fell after him, ringing the alarm gong as he did so, and slammed down the lid.

Now, a well-drilled submarine crew could get right under in less

than half a minute from the alarm. So that by the time the writer reached the foot of the conning-tower we were at something like twenty feet depth.

"The masts are jammed!" said the first lieutenant.

"Let 'em!" I replied. "Take her to fifty feet!"

But, when we settled down at fifty feet, we found that the pressure of the water had made those masts utterly immovable. And, as they were a good deal higher than the periscope, we couldn't come to the surface without showing them for a considerable time before being able to see ourselves. It was close on dawn, and to come up in daylight with those masts up seemed the next thing to suicide, if there were anything about.

We struggled with them for about three hours but finally had to risk it. The first thing I saw as the periscope broke surface was a British squadron of light cruisers (Admiral Tyrwhitt's famous "Harwich Striking Force" to be exact) within about half a mile of us! Down we went again, expecting to be bombed unmercifully with depth charges!

But luckily the breaking sea, for it was getting rougher every minute, prevented them seeing even the masts. So finally we did get up and into harbour, after six anxious hours' delay, due to those wretched masts!

The other incident is really curious. In this case the masts saved the boat as they so nearly lost the writer's. A certain British "E" boat while on patrol sighted a Zeppelin disabled and floating on the water. She had, I believe, been hit by anti-aircraft guns and

gradually lost so much gas that she had to come down. The submarine promptly "went for" her with the twelve-pounder gun she carried, finished her off and rescued a number of survivors of her crew.

It happened to be the last day of her patrol, and accordingly, after dark, the "E" boat set a course for Harwich, the prisoners being safely shut up in a compartment forward. During the night the submarine ran suddenly right into the midst of a German light cruiser squadron (probably searching for the lost Zepp.).

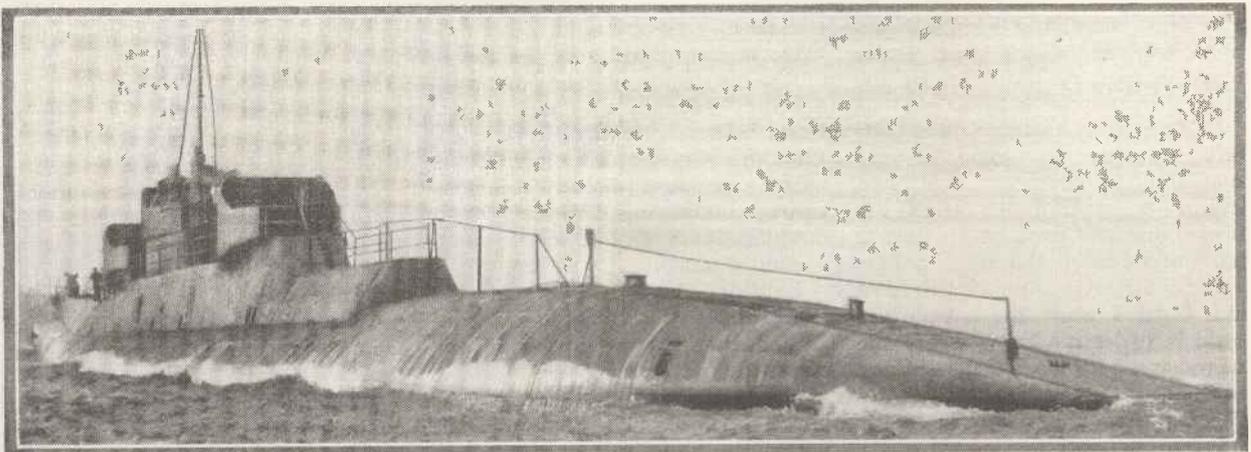
A Large Hole

Before she could dive she was under the glare of searchlights and a very hot fire at extremely short range. But she got down quite safely and, in due course, up again to resume her homeward voyage. What was the captain's astonishment on coming up in daylight to discover a large, jagged hole in the superstructure forward.

Investigation showed that a six-inch shell had hit and burst in the lead counterpoise of the foremast. The fragments of this were all over the superstructure, but the solid half-ton weight had prevented the shell from doing any damage to the main hull. It was a near thing! So near, indeed, that the Germans, who had been close enough to read the boat's number on her conning-tower, reported definitely that they had sunk her.

As they must have seen the shell burst as the boat disappeared, our official denial would have been regarded as futile lying.

But there was the evidence of their own prisoners who were, in fact, the only people on board who



A Unique Stern View of the World's Largest Submarine, X 1.

The Submarine and Some Wireless Adventures (Continued)

By Lieut.-Com. H. W. Shove, R.N., D.S.O.

heard the explosion, above the noise and scurry of diving. The compartment in which they were confined was directly under the foremast, and between them and their own shell-burst was only the thin plating of the hull. They had reason to be thankful for that lead weight!

Telescopic Masts

Later on the folding masts were abandoned in the boats designed and built during the war, and telescopic metal ones, collapsing directly into the hull and worked hydraulically were substituted. These, going straight up and down, parallel to one another, kept the aerial taut under all circumstances and avoided tangling up when submerged.

The actual sets first fitted were of the spark type. But with these the range was found to be comparatively short. In order to be able to send reports from the farthest patrols of the North Sea, gear of the Poulsen-arc type was fitted in the later boats, and many of the earlier ones were converted to this system.

As this was a much more bulky apparatus, the space problem became very acute and was finally solved in some of the boats by the removal of a torpedo tube.

This "tooth-drawing" was bitterly resented by some of the commanding officers, who had dreams of sinking the High-sea Fleet "off their own bat." But it was undoubtedly the right policy.

As Lord Beatty is reputed to have said, "All I want the submarines to do is to let me know where the enemy are. I'll do all the sinking required, if I can get the Battle Fleet at them!" (Alas, he never had the chance!)

Indeed, orders were sometimes

given prohibiting attacks, which might have had the effect of scaring the enemy back to port. Even an unarmed submarine would have been of the greatest service if she had had really good wireless.

As directional wireless was developed, it became possible to mark down the position of a submarine transmitting messages. For this reason only really vital reports were allowed to be made by our boats on patrol. The German boats were

of patrolling had really expired, he would be justified in leaving the area to "have a go" at her.

He therefore gave the necessary orders to the other boat (he being the senior officer of the pair) and the two "K" boats went inshore and dived before dawn, the writer five miles and his consort ten off shore. It was a lovely morning and ideal weather for an attack. The writer, however, saw nothing, and at last, rather disappointed, came up and made for the rendezvous.

PHONE FEVER.

(With apologies to the author of the well-known song
"Sea Fever.")

*I MUST go back to my set again, to my aerial up so high,
And all I ask is an ether wave and a coil to tune it by;
And the loud squeak and the valves' howl and the old phones shaking;
And the H.T. in the wrong place with the "lone toobe" breaking.*

*I must go back to my phones again, for the call of the ether wave
Is a shrill call, like the long howl which makes the neighbours rave,
And all I ask is a pitch dark night with the cold wind not too violent,
With G P Q and F F B and C N F all silent.*

*I must go back to my coils again to the wiry wireless way
To tune my set at 3 a.m. to receive K D K A.
And all I ask is an easy chair and a bright log fire well tended,
And a quiet sleep and a sweet dream when the long wail's ended.*

A. PEARMAN.

frequently tracked right in or out of the North Sea by this means. The writer's very last brush with the enemy was brought about in this way.

He was on patrol near the mouth of the Cattegat, in company with another submarine (both "K" boats belonging to the Grand Fleet Flotilla). On the last night of the patrol messages began to come through indicating a German boat creeping down the Norwegian coast, evidently making for home.

Plotting the positions on the chart, the writer came to the conclusion that she would be off the Naze (the southern point of Norway, at the entrance to the Cattegat) just about daylight. The Naze was not within the limits of our patrol, but the writer decided that, as the time

on the surface when he hove in sight.

There followed a duel with guns in which the British boat was unfortunately outranged. After that they played a kind of game of "hide-and-seek," alternately diving and rising, each probably trying to catch the other on the surface while he was submerged himself.

It ended in a stalemate and my colleague returned to the base without waiting at the rendezvous (which would have been dangerous in the circumstances).

With a little better luck this action would have proved a great triumph for directional wireless.

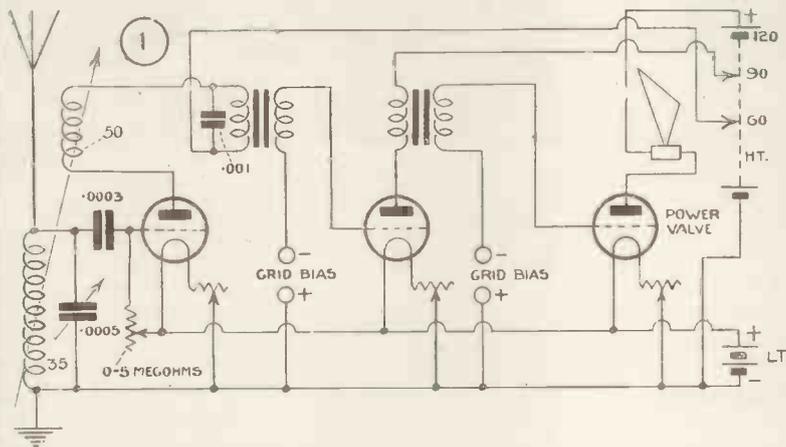
Even as it was the fact that contact with the enemy was established through its aid proved its very great value

"Hide-and-Seek"

The boats missed one another at the rendezvous, and it was only later, when we arrived near the longitude west of which wireless transmission was allowed, that we discovered the reason. We picked up our consort's report to head-quarters to the effect that he had been hotly engaged with the enemy submarine. The latter had been rather behind the calculated time, so that the British boat was

Loud-speaker Circuits

Showing the Inclusion of Power-amplifying Valves



(Left.) Three-valve loud-speaker circuit (detector and two stages of low-frequency amplification). A circuit very suitable for loud-speaker reception from the local transmitting station.

For good results it is essential that the low-frequency amplifying transformers should be of first-class quality, the ratio of the first being between 4 and 5 to 1, and that of the final transformer 2 or 3 to 1.

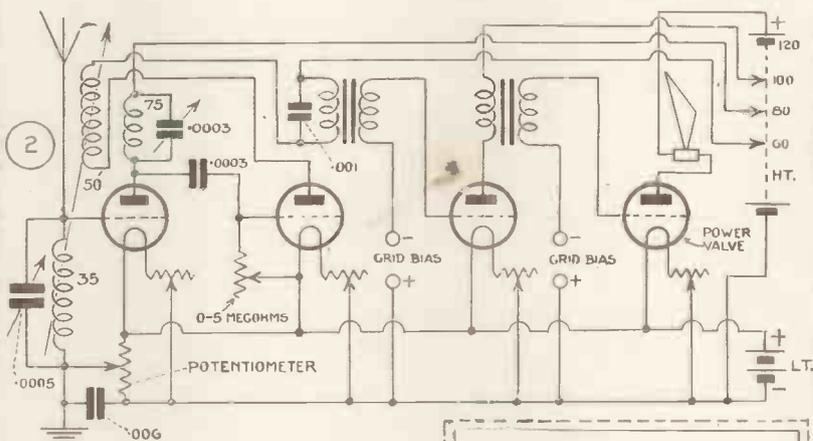
To obtain the best quality, reaction should not be used more than is absolutely essential.

(Right.) Four-valve loud-speaker circuit (one stage of high-frequency amplification, detector and two stages of low-frequency amplification). An excellent loud-speaker circuit, capable of receiving all main stations at good strength.

The remarks regarding transformers given with the first circuit apply to this circuit also.

In these circuits, high-resistance loud-speakers only should be used, unless a special step-down transformer is included.

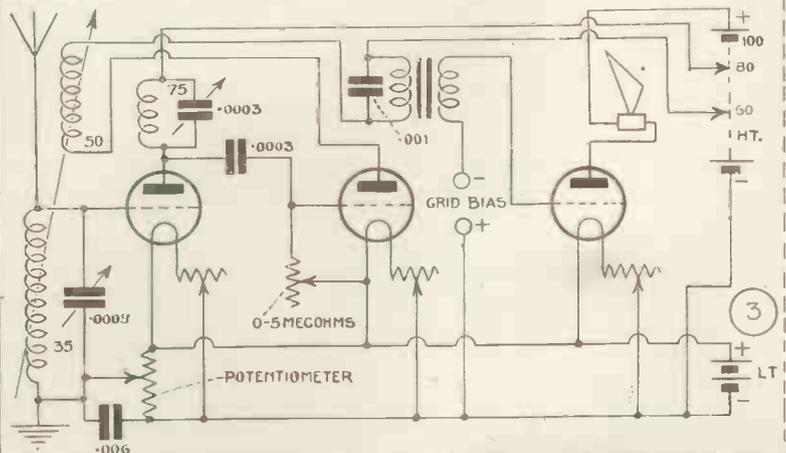
An improvement in quality can frequently be obtained by placing across (in parallel with) the loud-speaker a condenser of the order of .004-microfarad.



(Left.) Three-valve loud-speaker circuit (one stage of high-frequency amplification, detector and one stage of low-frequency amplification). A very useful circuit, capable of receiving a near-by station at moderate loud-speaker strength, with the added advantage that it may be used for long-distance headphone reception if required by the operator.

The low-frequency amplifying transformer in this circuit should have a fairly high ratio, preferably 4 or 5 to 1.

The .001-microfarad condenser across the primary may in some cases be increased to .002-microfarad.



IS CRYSTAL RESEARCH NEGLECTED?



by C. Spenser Sarle

THE invention of the thermionic valve, marvellous though its results have been in the development of wireless telephony, has in one respect been a misfortune. Except so far as a few enthusiasts like Mr. James Strachan are concerned, it practically put a stop for a long period to the scientific investigation of the crystal.

Half a Century Ago

The evolution of the valve goes back half a century to a period before Clerk Maxwell foreshadowed those electromagnetic waves, the existence of which was demonstrated by the experiments carried out from 1885 to 1889 by Heinrich Rudolf Hertz. It was in 1878 that the discovery was made that a heated globe of metal gave rise to an electrostatic disturbance.

In 1883 Elster and Geitel embodied this discovery in the production of a two-electrode valve. They enclosed a filament and a plate in an exhausted glass bulb and demonstrated the fact that when an electric current passed through the filament a stream of electric particles impinged on the plate. Edison made precisely the same discovery at almost the same time, and in 1888 Sir William Preece verified Edison's experiments and calculations, and Dr. J. A. Fleming established the fact that it was negative electricity that flowed from the filament to the plate.

A year later Sir J. J. Thompson startled the scientific world with the theory that there were particles infinitely smaller than the atom. It was not, however, until 1904 that Dr. Fleming was able to combine all these discoveries into a valve capable of rectifying high-frequency oscillations. Then, in 1906, came the introduction of the third anode—the

grid—by Dr. Lee de Forest, and so came, in effect, the valve in use to-day, of which new types and fresh developments are constantly being evolved.

Meanwhile the crystal remains the Cinderella of the wireless world. The valve has almost completely superseded it, notwithstanding the fact that it rectifies the incoming waves with perfect purity of tone and a complete absence of distortion. This neglect of the crystal is due in the main, of course, to its limited range, and also in some measure to the general belief that that range is more limited than is in fact the case. Reports of long-range crystal reception were generally criticised as "freak" results, due either to re-radiation or to some other cause not precisely definable.

The data already accumulated, however, puts the theory of "freak" reception out of course, and the "other causes" are beginning to assume a much more definite character. It has become an established fact that crystal reception is not only possible, but frequent, over ranges round about a thousand miles.

What Might Have Been

It is obvious, therefore, that had a tithe of the attention bestowed on the development of the valve been expended on the crystal, this simple method of reception might have occupied a far more important position than it does to-day. The valve enthusiast regards the crystal set as a toy, fit only for the beginner, whereas properly handled and developed, it may, and in some cases already has, become an instrument of extremely high scientific value.

Two circumstances have contributed to the general belief that the crystal set is essentially a short-range instrument. One is the fact that

the B.B.C. transmissions are sent out on an extremely low power, and the other that the majority of crystal sets on the market are regarded as perfectly satisfactory if they give good results within 15 or 20 miles of a transmission or relay station. The high-power station, however, is educating crystal users to ranges of 100 miles or more, and the time is probably not far distant when high-power transmission will be in general use.

Oscillating Crystals

Much has been heard of late of the work of a Russian experimenter, M. Lossev, who has succeeded with the aid of a potential of 20 volts in causing the crystal to oscillate. It seems to have been completely forgotten that this discovery was made nearly four years ago by an English electrician, Mr. Leslie Miller, and that it formed the subject of Patent No. 183,692 of 1921.

Had Mr. Miller's invention received the attention that was its due, we might easily by this time have been able to transmit as well as to receive by means of the simple crystal, and at the same time to have vastly extended its effective range.

It is a singular corollary to this neglect that scientists have to admit that even at the present time they cannot explain the unidirectional conductivity of the crystal. One hypothesis describes its action as electrolytic. Another attributes its peculiar properties to thermo-electric effects at the point of junction between the crystal and the fine-wire contact. There are other theories equally tentative, but the problem has not yet been solved. When it is, it is safe to prophesy that the crystal will have a new lease of life.

(Continued on p. 305).



A GLANCE at the programmes of the past months reveals an unaccountable "rise" in the pre-eminence of classical music: unaccountable inasmuch as it is against the direct preference of the general masses.

Where the Aerials Are

After taking a journey through the suburbs and outer ring of London, and noting that the aerials are not on the mansions but on labourers' cottages, it is difficult to conceive the inmates sitting down to enjoy a Brahms symphony or Bach's Italian Concerto.

Especial attention seems to have been paid to the instrumentalists during the month, and in most cases they have been of noteworthy fame.

Amongst the exponents of the piano have been Miss Irene Scharrer, one of the earliest of famous broadcasters, Lafitte, the French pianist, Edward Mitchell, of Manchester, Miss Irene Brooke and Miss Una Truman, Miss Isabel Gray and Wassili Sapellnikoff, the Russian pianist. The latter's playing in a recent Sunday programme of the Tchaikowsky B-flat minor concerto was entirely appropriate, for M. Sapellnikoff was the first soloist to introduce this work to London, playing under the conductorship of the composer himself at the Royal Philharmonic Society, of which Sapellnikoff is an honorary mem-

ber, a distinction which is shared only by two other living pianists.

He has appeared at over fourteen of their concerts, and played before almost all the crowned heads of Europe.

Appointed a professor of the Imperial Conservatoire at Moscow, he relinquished this for concert work. As a composer, too, he is widely appreciated, and at his special recital at 2 LO included an "Elfentanz" of his own composition.



Krish, Mannucci and Melzak.

Miss Irene Scharrer and Miss Beatrice Harrison

The work of Irene Scharrer needs little detailed comment; her work is known throughout the musical world, and it is sufficient to say that her co-operation early in the month with Miss Beatrice Harrison, the 'cellist, was a repetition of the triumphs both had scored together on earlier tours in Europe.

Miss Isabel Gray is a young pianist who has achieved a wonderful success since her first recital at Wigmore Hall a few years back. She is an ex-student of the Royal Academy of Music, where she is now on the staff, and she has broadcast on many occasions.

Two clever sisters are found in Miss Irene Brooke and Miss Una Truman, who have scored successes all over the country, both as soloists and duetists.

Miss Truman made her debut with Sir Henry Wood, recently adding another success by playing for Sir



Miss Mabel Constanduros.



Mr. Edward Clark.



Miss Kathleen Moorhouse.



Mr. W. Braithwaite.



Mr. Foden Williams.



Miss Isabel Gray.



Mr. J. H. Squire.



Miss Miriam Licette.

Landon Ronald the Saint-Saëns Concerto in G minor.

Miss Brooke is equally talented both as pianist and composer. She has played in most of the great cities of the kingdom and was the first pianist to introduce Glazounov's Concerto to Nottingham audiences. Both sisters are familiar names in broadcasting circles.

Best for Broadcasting

It is well known that for broadcasting purposes the violoncello is the "king of instruments." It was well represented, notably with the playing of Frederic Casano in his famous combination, the Casano Octet.

Mr. Casano has played both as soloist and in concerted music at every big city, and there is no doubt that he has indubitably proved the power of the miniature orchestra in broadcasting.

Beatrice Harrison has also appeared with immense success, while the same instrument has been heard to advantage in the hands of two young 'cellists, Miss Edith Lake, who made a reappearance at a Sunday programme recently, and Miss Kathleen Moorhouse, of Manchester.

The latter is an ex-student of the Manchester Royal College, as well as of Arnold Trowell, and she has appeared as soloist at the Hallé concerts. She is now also a member of the Edith Robinson String Quartet.

It was interesting to hear Mr. Leonard Hirsch in London when he broadcast at 2 L.O., for most listeners have heard him when tuning-in to Manchester.

Leader of the 2 Z Y Orchestra

Mr. Hirsch was the first leader of the 2 Z Y Orchestra, and for a long time carried on the first Radio Trio. He has played many solos, and has been playing concertos since the age of fourteen, afterwards winning the John Webster Memorial Exhibition and being sent by the Manchester Royal College of Music to represent them at the Patrons' Fund Concert in London. Here he played Lalo's Spanish Symphony with the Royal Albert Hall Orchestra.

A member of the Hallé Orchestra, prior

to his entering the broadcasting service, he has now relinquished this to become violinist in the famous Catterall Quartet, taking the place of Mr. J. C. Bridges.

Amongst the instrumentalists also may be remembered Miss Christine Hawkes, the lady concertina-player, who has broadcast on several occasions.

Although most people appear to think that a conductor is an amiable nonentity, intended more for ornament than for real use, it is safe to say that a vast deal depends on the man who "waves the baton."



Miss Edith Lake.

We have had admirable opportunity, also, of realising the differences made by various conductors.

In the provinces, of course, there is the weekly performance of the Municipal Orchestra at Bournemouth, under the famous conductor, Sir Dan Godfrey. Few men have achieved more successes or fought more strongly in the cause of the British composer.

It has often happened that the work chosen first by Sir Dan, and played in the Winter Gardens at Bournemouth, has become famous in London, where it might never have been heard had it not been for his intuitive recognition of the best in music.

Sir Hamilton Harty has broadcast



Mr. Middleton Woods.



Miss Edith Meredyth.



Mr. Louis Hertel.



Sir Dan Godfrey.

also, as well as Eugene Goossens, one of our most brilliant composers and conductors.

Mr. Warwick Braithwaite's work as musical director and conductor at Cardiff continues as always to make that station a power, while another famous British National Opera Company conductor was heard when Aylmer Buesst conducted the special performance of *I Pagliacci*.

On the side of the miniature orchestras come Mr. J. H. Squire and his Celeste Octet, the Kutcher Quartet, and The Modern Trio, Messrs. Melzak, Mannucci,

Once more the vocalists have been of the best. Headed possibly by Miss Miriam Licette, the opera star, who sang the part of "Nedda" in *I Pagliacci* with Ulysses Lappas, the Greek tenor, they include also Harold Williams, Dennis Noble and Herbert Thorpe.

B.N.O.C. Singers

M. Lappas will be remembered for his success at Covent Garden last year, while both Mr. Noble and Mr. Williams are B.N.O.C. singers.

Mr. Herbert Thorpe is a tenor whose fame is well recognised in "Old Vic." programmes, as well as throughout the country, and he has one of the widest repertoires both for operatic and ballad singing.

Amongst many others, the names stand out also of Miss Olive McKay, a singer famous in the Manchester district; Miss Lily Allen, who broadcast again recently; and the famous oratorio singer, Lilian Stiles Allen, who sang at 2 L O for the "Gems of Oratorio" programme, joining forces with Mr. Walter Hyde and Horace Stevens, the famous Australian singer.

Humour

Humour has been mainly given us by concerted sketches arranged by Mr. R. E. Jeffrey, and there is no doubt that extracts from the revues such as *Charlot's Revue* and *By the Way*, as well as his own arrangements of *Radio Radiance* make very good lighter fare.

Some good work has been done by Miss Mabel Constanduros, whose Cockney comedy studies are gems in themselves of imitation; Mr. Middleton Woods, one of the earliest of our broadcasting entertainers, who has toured all the stations; and Mr. Foden Williams, who has the knack of being humorous one minute and pathetic the next, without bringing bathos into his turns.

Louis Hertel, Ronald Gourlay and John Henry have all been on active service "along the line," together with Helena Millais; so, taking it all round, it has not been a bad musical month.

STUDIUS.



Mr. Aylmer Buesst.



Miss Lily Allen.



M. Sapellnikoff.



Miss Irene Brooke.



M. Ulysses Lappas.

and Serge Krish, of whom *Punch* deemed fit to embody their fame in verse:—

You may search through all Europe from
Nenage to Nish
For such a delightfully named coalish
As that of MANNUCCI and MELZAK and
KRISH.

In MELZAK we note the Slavonic ambish;
MANNUCCI suggests an Italian dish;
And there's an exotic allurements in KRISH.
Their combined cantilena's as soothing
as squish,

'Twould have banished the madness of
SAUL, son of KISH
Had he listened to MELZAK, MANNUCCI
and KRISH.

Their music I gather, is wholly delish,
But their names are the thing that I
specially wish
To applaud in MANNUCCI and MELZAK
and KRISH.

A NEW FOUR-ELECTRODE VALVE CIRCUIT

WHILE nearly every conceivable type of circuit has been tried and exploited in conjunction with the three-electrode valve, comparatively very little has been done with the valve containing four electrodes.

The Dutch firm of N. V. Philips, famous as the manufacturers of the Philips valve, however, have introduced (and patented in this country) a new four-electrode valve circuit which we have tested and found remarkably good.

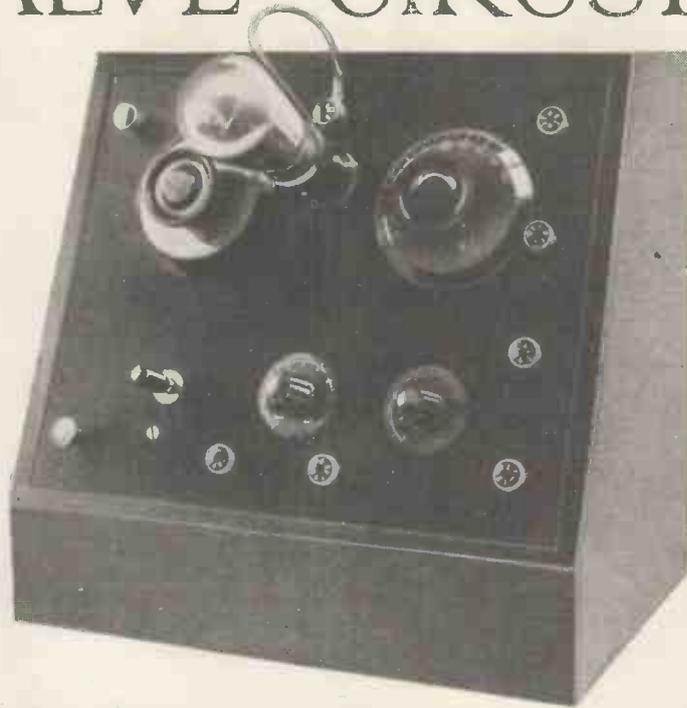
Indeed, results were such as to encourage us to build in the interests of our readers an experimental set incorporating the principles indicated in the patent specification.

Mullard Valve Used

At the time of carrying out the tests, however, we were unable to obtain a Philips valve of the right kind, and as an alternative we employed a Mullard type DG valve and found it to give excellent results.

Referring to the circuit diagram it will be seen that the filament of the valve is connected up in the usual way to the L.T. battery, while the plate is also connected through the phones to + H.T. in the usual manner.

The inner and outside grids are joined together, with the interposition of a fixed condenser and

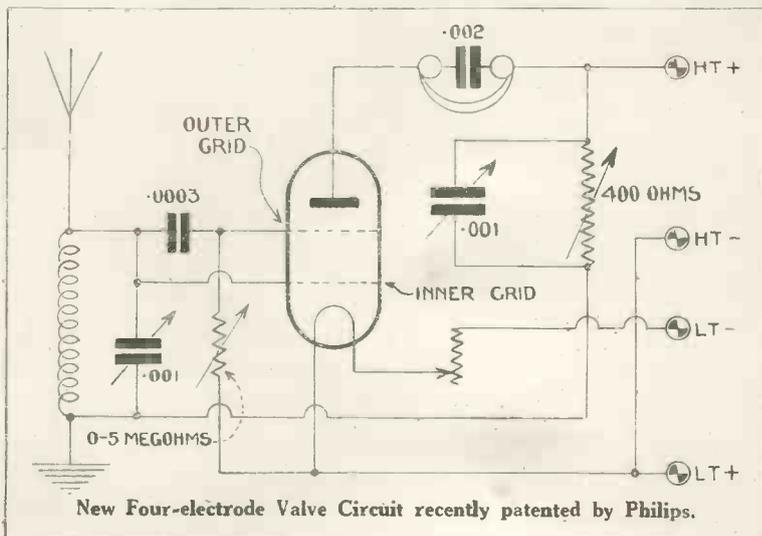


Built & Tested by "THE WIRELESS MAGAZINE"

Experiments with a four-electrode valve circuit recently patented by a famous Dutch valve firm

grid leak. The outer grid is connected through a variable resistance (in the form of a potentiometer) in parallel with which is joined a condenser to + H.T. Consequently the outer grid has about the same potential relativity to the filament as has the plate.

- Filament rheostat. (Lissen.)
- Potentiometer. (Lissen.)
- 2 .001-microfarad variable condensers. (Ormond square-law.)
- Variable grid leak. (Lissen.)
- .002-microfarad fixed condenser. (Dubilier.)
- .0003-microfarad fixed condenser. (Dubilier.)
- Fixed coil holder. 9 terminals. (Bell-ing Lee.)
- Oak cabinet.



New Four-electrode Valve Circuit recently patented by Philips.

No Special Valve Holder Required

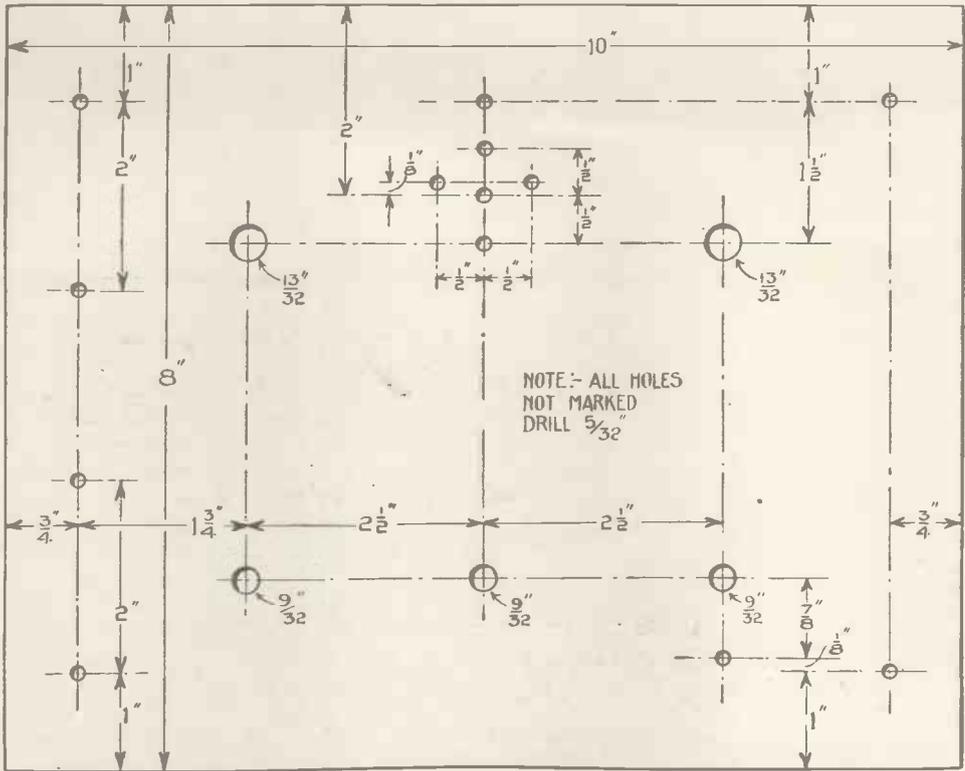
A special valve holder is not needed for the particular valve mentioned. The extra grid is connected to the metal cap of the valve and to this cap is attached a small piece of flex, which may be connected to a separate

terminal mounted beside the valve holder.

Cabinet

The dimensioned sketch (p. 273) shows one of the types of cabinet that may be used. The form that the cabinet may take, however, must be decided by the constructor himself, that illustrated here being of the well-known sloping type obtainable from most of the cabinet makers that specialise in the manufacture of wireless cabinets.

Planned oak or mahogany, $\frac{3}{8}$ in. thick, is suitable for the construction of the cabinet, the back of which should be capable of removal so that the panel need not be unscrewed to gain access to the components and the wiring, if such a course ever becomes necessary.



Layout of Panel for Experimental Four-electrode Valve Set.

Panel Supports

The panel fits in flush at the front and is supported by $\frac{1}{4}$ -in. square wooden fillets. A finished appearance can be obtained either by french polishing the wood or by staining and varnishing.

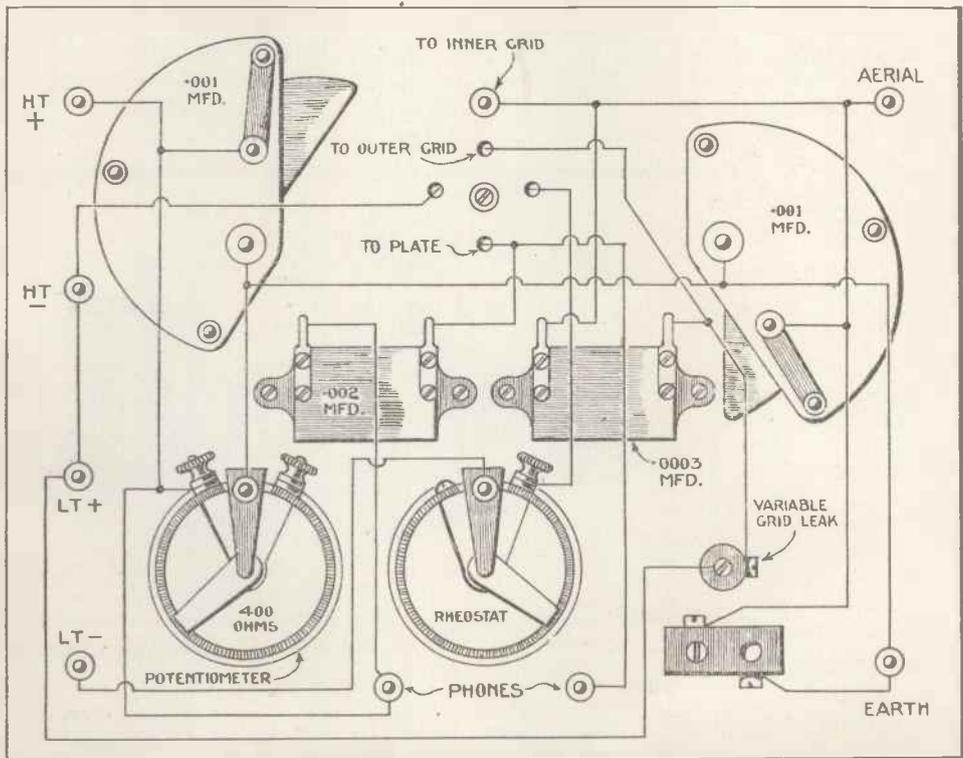
The nearest standard panel size stocked by the American Hard Rubber Co. is one having the dimensions 10 in. by 12 in., from which a piece 4 in. by 10 in. must be cut.

Mark out the piece to be cut off with a square, making sure that opposing edges are parallel and all angles are right angles. The superfluous strip may either be sawn or broken off, the former method being slower but more certain; the latter method is much quicker, however, and if done properly will leave a clean fracture that may be finished off by rubbing with fine emery cloth.

The next step is to drill the panel. For this purpose a drilling diagram is given showing clearly the positions and sizes of all the holes that are to be drilled. A full-size copy of this

diagram should be drawn out on stout paper and the template thus formed should be clamped in position on the panel.

Holes of the sizes indicated may



Wiring Diagram of Experimental Four-electrode Valve Set.

A New Four-electrode Valve Circuit (Continued)

then be drilled through the template and panel, or, if it is desired to use the template again, the centres of the holes should be marked through on to the panel by means of a sharp instrument. The template is then removed and holes drilled at the centres marked on the panel.

In order that each component be held firmly down on to the panel it is advisable to countersink very slightly each of the holes to remove the burr left round the edge of the hole.

Mounting the Components

Having completed the preparation of the panel the next step is to mount the components. In the centre of the panel are fixed the two small fixed condensers, above which is mounted the valve holder with the extra terminal beside it for the connection to the auxiliary grid.

Along the bottom of the panel the potentiometer, rheostats, grid leak and fixed coil holder are mounted, while in each top corner the variable condensers are seen.

The wiring diagram shows the disposition of the components and the manner in which they are wired together.

Remember that a connection is made to the *inner* grid of the valve by means of the flex attached to the metal cap.

This grid is joined to the aerial terminal and the fixed grid condenser, while the *outer* grid (the usual grid pin of the valve) is connected to

the other terminal of the grid condenser and to the variable grid leak.

Operation

The actual tuning of this set is

It is essential that the H.T. battery is of the type tapped at every 3 volts. The voltage applied to the plate of the valve is extremely critical, and for this reason it would be useless to

use an H.T. battery the voltage of which cannot be varied. On actual test it was found that 48 volts gave the best results.

Another point that may lead the operator to think that the set is not working efficiently is the little difference made by the rotation of the variable condenser connected across the potentiometer. In all probability it will be found that a fixed condenser of .001-microfarad capacity can be substituted for the variable condenser without any appreciable loss in signal strength.

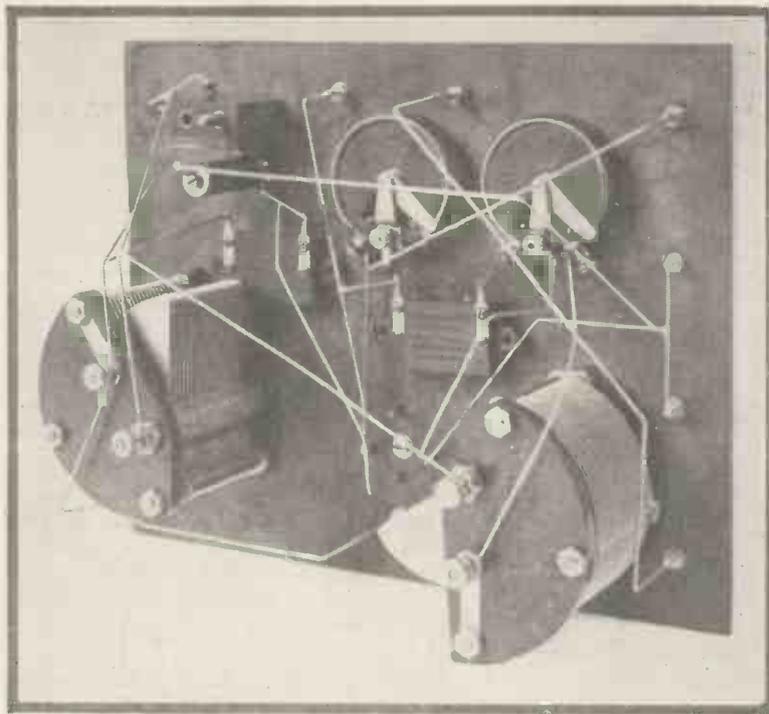
Oscillation is controlled by the adjustment of the potentiometer and the filament rheostat controlling the brilliancy of the filament.

It may be thought that the wiring of the potentiometer is shown incomplete for the reason that this instrument possesses three terminals and only two are shown connected up. It must be realised, however, that the potentiometer is not used in the usual way, but as a variable resistance.

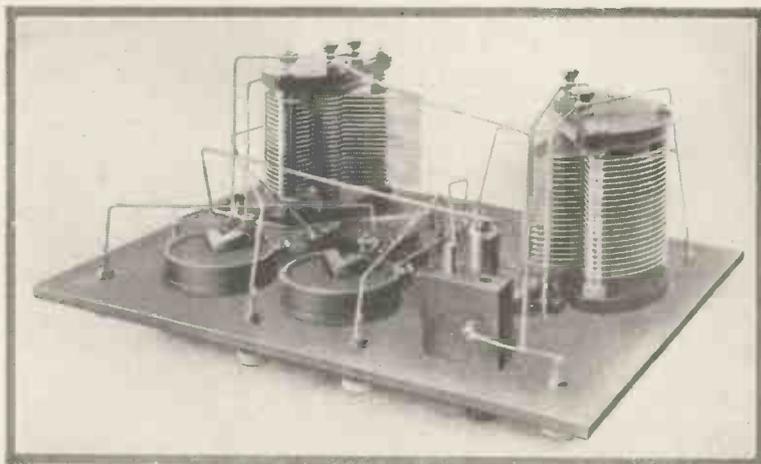
Results

Some of the results obtained with this set were remarkable. At a distance of 8 miles from 2 L O this

station came through at the loud-speaker strength usually produced by two valves. Daventry was also received on the loud-speaker with



View of Experimental Four-electrode Valve Set.



Another View of Experimental Four-electrode Valve Set.

coil, tuned by the variable condenser mounted in the top left-hand corner of the panel should be used for broadcast wavelengths.

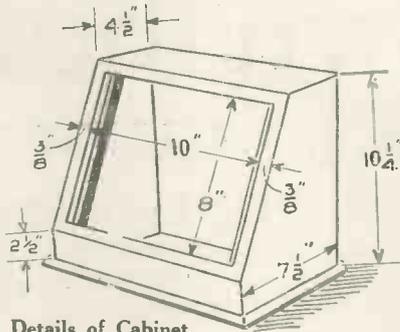
sufficient volume to be perfectly clear in a large room. Radio-Paris was slightly weaker than Daventry.

Most of the B.B.C. stations were received on the phones, while from the continent Königswusterhausen, Munich, Breslau, "Le Petit Parisien," and also L'Ecole Supérieure were audible.

Long-wave Results

It will be found that the set works more efficiently on the longer wavelengths than it appears to do on the shorter. For the reception of stations on widely different wavelengths, different tuning coils will be required.

The valve requires a 4-volt accumulator cell for the lighting of the



Details of Cabinet.

filament, which consumes about 0.7 of an ampere.

The Invisible Audience

(Continued from page 257)

working himself into a temper. Her smile only infuriates him further.

"Aren't you feeling well, Mona?" he asks. "Is it a headache?"

"No, I'm all right."

"Then what's the matter with you? Why won't you come to the theatre? Only last night you said you particularly wanted to see the piece and were grumbling because I shouldn't be able to take you this week."

He gets up impatiently from his chair and walks up and down the room.

"Here am I, home unexpectedly early; I book seats on the way, looking forward to a surprise evening together, and then you sit there like a dummy and say you won't come out."

"Haven't you ever felt you don't want to do something for no better reason than that you don't feel inclined?"

"Have you made arrangements to go elsewhere? I know you weren't expecting me back early this evening. If that's the reason—"

"No, no, of course not. I—I'd tell you if I were. I just want to stay in. Go by yourself if you're so keen."

There is a tinkle of the telephone bell. The man mutters impatiently, strides across the room and pulls the instrument roughly from its concealment in the skirts of a doll. He is in a vile temper.

"Hello! No, this isn't Mona. This is *Mister Beverley*. Oh! and you're Kenneth Leigh, are you? Hold the line a minute and I'll see if she's in."

* * * * *

Just at that moment an operator in the City exchange of Manecaster casually mixed up two plugs on her switchboard, and with one of them connected the luckless Kenneth with the Manecaster broadcasting station, with whom he held a fruitless and uncomplimentary conversation.

With the other she forged the final link in the invisible chain which bound half the world to the Beverleys' drawing-room, and a woman's choking cry was carried to the ears of millions of people, all but two of them unconscious of the tragedy to which they were listening.

SHORT LEADS

THE transmission of the majority of broadcast programmes takes place in Great Britain on wavelengths of between 300 and 500 metres. The use of the short wave entails the use of a frequency or number of cycles per second of between 10,000,000 and 600,000.

Such an extremely high periodicity requires the utmost care in wiring up a set, if the reception of distant stations with a maximum of strength and a minimum of coupling between the anode and tuning coils is hoped for. All the leads in a receiver carry a certain percentage of high-frequency current excepting the low-tension leads. The latter may, therefore, be comparatively long, yet not so long as to cause a very serious drop in the accumulator voltage.

H.T. Leads

As regards the H.T. leads, these carry both high-frequency current at radio-frequency and high-frequency current of an audio-frequency. Both are important matters in spite of the more usually accepted statement that it does not matter on the telephone side of the detector valve.

Undue capacities and resistances in the audio-frequency leads will often increase the fundamental or natural wavelength of the receiver and lead to losses in signal strength. It is, however, quite true that the leads on the aerial side of the detector are most important, and it is here that most attention should be

paid to cutting down the length of the wire.

The grid condenser and leads should be so mounted that they are directly joined to the grid terminal of the valve socket without an intervening lead, and the tuning condenser should be mounted close to this and as close as possible to the tuning inductance.

The latter, however, should be so positioned that the magnetic field of the coils does not pass across the metal condenser vanes; in other words, they should be an inch or so away from the condenser, and not right against it.

A. J. C.

BELGIUM has adopted O U as a wireless prefix. France adopted it as a financial policy, of course, some years ago.

IN selecting Ann Spice to lecture on "What to Read," 2 L O seems to have chosen a lady whose name sums up the whole modern tendency in literature.

THE health talks from Schenectady, in dry America, may be quite all right, but we prefer the well-known Coué system of repeating the words "Good health" at regular intervals about six times daily.

FIVE million Americans recently listened to two divers who were broadcasting what they saw at the bottom of the Atlantic. Five million minds waiting for news of the discovery of a sunken rum-runner!

"Pull Down the Savoy!"

A Scene Written by WILLIAM SHAKESPEARE,
One Time of Stratford-on-Avon.

Scene : London, an Antechamber.

Enthusiastic Constructor and Antipathetic Friend discovered.

ENTHUSIASTIC Constructor (excitedly). My instrument's in tune,
My ingenious instrument, hark! It works—come on!
(aside) Thou hast done well, fine Ariel.

Antipathetic Friend. Thou shalt have a Licence.

E. C. Come, shall we hear this music?
How London doth pour out her . . .

A. F. . . . strange and several noises of roaring, shrieking, howling, jingling chains;
and more diversity of sounds, all horrible.

E. C. Prithee, listen well.

A. F. The fire and cracks of sulphurous roaring—

E. C. (angrily). Listen, but speak not!

A. F. It struck mine ear most terribly.

E. C. A plague upon this howling!

A. F. Go, clear thy crystals,

E. C. The sound is going away, let's tollow it. . . .

A. F. It sounds no more.

E. C. . . . an impediment in the current,
hold off the "earth" awhile, till I have . . .
. . . coupled and linked . . .
. . . switches to them.

A. F. (sarcastically). Another experiment!
Thou break'st thy instrument.

E. C. Do not you meddle, let me deal in this.
(Enter French Expert.)
Who's that? A Frenchman?
The Frenchman hath good skill. (to Fr. E.): Let me have your express opinions,
Where is best place to make our battery next?

Fr. E. I'll have the current in this place.
What a coil's here!
A reason for this coil?

E. C. Because my power is weak:
Let's tune and do it lustily.

Fr. E. (impatiently). Reduce their currents;
To amplify too much, would make much more . . .
. . . hiss the "speaker."
You are well tuned now.

A. F. Only there is one thing wanting,
What says Monsieur re—Morse?

Fr. E. (excitedly): Yonder comes Paris! Yonder comes Paris!

A. F. Paris? Paris is dirt to him!

Fr. E. Hear you?

E. C. Nay, I hear nothing.
Is Paris lost?

Fr. E. (fresh from Chelmsford): 'Tis not thy Southern power, of Essex—

E. C. This at Daintry . . .
. . . hath power enough to serve our turn.

A. F. (pityingly): Pray you, poor Gentleman, Take up some other station; here's no
place for you.

E. C. (resignedly): Let's away to London.

Fr. E. What time o' day is it?
Between nine and ten, sayest thou?

E. C. Be silent, that you may hear,
. . . attending but the signal to begin

Tam. of Shrew iii. 1.
Cymb. iv. 2.
Temp. i. 2.
II. Hen. VI. iv. 3.
Much Ado ii. 3.
Hen. V. v. ch.
Temp. v. 1.
J. Cæs. ii. 4.
Temp. i. 2.
Macb. iv. 1.
Temp. ii. 1.
Temp. i. 1.
Hen. ii. 3.
Temp. iii. 2.
Temp. i. 2.
M. for M. iii. 1.
Ham. v. 1.
K. John iii. 1.
Hen. VIII. v. 4.
M. Wives iv. 2.
J. Cæs. iv. 3.
Much Ado v. 1.
All's Well iv. 5.
M. Wives ii. 1.
I. Hen. IV. iii. 1.
Tim. of Ath. i. 2.
Tit. And. iii. 1.
Rich. II. ii. 3.
Two Gents iv. 2.
Rich. III. ii. 2.
Lear v. 3.
Macb. iv. 3.
Oth. ii. 1.
Cor. ii. 1.
I. Hen. IV. i. 2.
Tr. and Cr. i. 2.
Tr. and Cr. i. 2.
Cor. iv. 5.
I. Hen. VI. i. 1.
III. Hen. VI. i. 1.
III. Hen. VI. v. 1.
Rich. II. iii. 2.
Cor. iv. 5.
III. Hen. VI. v. 5.
Tim. of A. i. 1.
M. Wives iii. 5.
J. Cæs. iii. 2.
Rich. II. i. 3.

A. F. (aptly) : Westminster, be ^{it} your charge.
 (Pause).
 E. C. Now the clock strikes.
 Fr. E. What says the fellow there . . . where do the Palmers lodge ;
 I do beseech you ?
 E. C. (repeating items) . . . extremity of weather continuing . . .
 . . . no more forecast . . .
 . . . and . . . dote upon the exchange . . .
 A. F. What news ?
 E. C. There is no news.
 . . . the world in praise of Henry . . .
 A. F. The Devil take Henry !
 E. C. Oh, that this good Blossom could be kept !
 A. F. It hath struck ten o'clock ;
 Hie you to your bands ;
 Their music frightful as the serpent's hiss, and boding screech 'owls make the
 concert full.
 E. C. (absorbed) . . . bids me a thousand times " Good-Night " * * * * *

E. C. (after few minutes) : This music mads me ; let it sound no more.
 Fr. E. (kicking over loud-speaker) Hence, vile instrument !
 E. C. (with a sigh) . . . God save the King ! . . .
 A. F. (sotto voce) . . . and pull down the Savoy !

Rich. II. iv. 1.
Com. of E. iv. 2.
Lear i. 4.
All's Well iii. 5.
W. Tale v. 2.
III. Hen. VI. v. 1.
Much Ado ii. 1.
Two Gents 1. 3.
I. Hen. IV. v. 1.
Rich. II. v. 5.
II. Hen. IV. ii. 2.
M. Wives v. 2.
Cor. i. 2.
II. Hen. VI. iii. 2.
Much Ado iii. 3.
Rich. II. v. 5.
Cym. iii. 4.
Rich. II. iv. 1.
II. Hen. VI. iv. 7.
 G. R. PALMER.

I GIVE UP WIRELESS ◇ By THE GROUSER

I AM giving up wireless. Wireless enthusiasts are such unfriendly and selfish people.

I thought wireless was going to be a really good thing. I used to borrow an amateur wireless weekly from little Timkins, and I got to know quite a lot about the subject ; in fact, from its columns I was able to give Timkins much useful advice on the kind of set he ought to buy or build.

But after a while Timkins said he had to use the periodical so much himself, as he was making a set, that he couldn't spare it. And it was only a threepenny weekly, the skinflint !

Snodworth was a much pleasanter fellow. He didn't take in any periodicals, but he lent me a fine text book, and when I had persuaded him to build a two-valve set he used to be very glad for me to pop along to his house every evening and help him listen-in.

Then Mrs. Snodworth got huffy (as he explained it afterwards) because they only had two pairs of phones and she wanted to use one.

" Well, that's easy," I pointed out. " Get another pair, and I'll come along as usual."

But a strange look came into his eye, and he said he didn't think his " hook-up " would stand another

pair—it would weaken the signals or something. So I can only suppose that his wife is too selfish to have me there.

A schoolboy neighbour whose father I know slightly made a very good set, and I was beginning to derive much pleasure from it in his little " den " when his habit of taking bits out of it and explaining

AT YOUR SERVICE.

If your set is not giving the results you think it should ; if you do not understand how any particular piece of apparatus works ; if you are in trouble over any wireless point—we are ready to help you.

Send your query, together with a stamped addressed envelope and the coupon on p. iii of the cover to The Editor, THE WIRELESS MAGAZINE, La Belle Sauvage, E.C.4.

them to his young friends, just as I was listening, forced me to realise that I was getting a little too old for such juvenile company.

I started asking my (city train and tube acquaintances about their sets, but I found none of them very keen

for me to call round and give them wrinkles. Funny how unsociable some people can be, isn't it ?

The last straw came when I tackled Blumpham, who had a three-valve set.

" I hear you've got a fine wireless," I said chattily.

" That'th tho," replied Blumpham. " And look what I thave in the thinema, concert, and tho on. Tho the phoneth were a thound invethment."

" Phones ! " I said. " What you want is a loud-speaker, man. I'd love to come along one of these evenings and help you if you had a loud-speaker."

What do you think Blumpham said ?

He said—quite nastily :
 " You go home and buy a thet yourthelf—I've heard of you before ! "

Well ! Do you wonder that I am giving up wireless ?

INCIDENTS from the miner's life having been broadcast, what about a similar chapter from the plumber's daily round ? Only it would be rather wearisome during the intervals when he was waiting for his mate.

Are Blind Spots a Myth?

DO such areas as blind spots actually exist, or are they due for the most part to insensitive receivers?

A few years ago, blind spots, that is, areas where no wireless signals could be picked up, were an acknowledged fact, but since the advent of broadcasting and the more thorough and universal research into the physical side of wireless, the presence of blind spots is now beginning to be seriously doubted.

Blind Spots Abroad

Some of these blind spots, well known to commercial operators, are situated off the coast of Ceylon, and from these spots wireless communication with the land station of Colombo is very difficult, if not practically impossible, when a crystal receiver is used. The spots have been investigated by the Mercantile Marine Department of the Board of Trade, and ships' operators are warned of the futility of attempting to communicate with Colombo when the ship is passing through these areas.

Other blind spots have been reported along all the various sea-boards of the many different countries of the world, and many have been reported in the interior of Great Britain and America.

A number of reasons have been advanced to account for these blind spots. One theory is that they are due to the deflection of wireless waves into the earth at some particular point. This theory is based on the fact that if the earth consisted of some purely insulating material such as mica, or sulphur, as suggested by Dr. Fleming, any wireless waves radiated from a transmitter would immediately glide right into the earth and be lost. For any insulator such as mica is, curiously enough, a good conductor of wireless waves and the waves would pass into the mica in preference to travelling on through the atmosphere which would be the more difficult path.

Now some of the constituents of the earth, such as mica, marble, lime, silica and felspar are good

insulators if dry, and so it may happen that certain parts of the earth's surface have a preponderance of these materials. Thus when wireless waves reach these areas they sink into the earth, and so we have a blind spot.

Investigation, however, has shown that the constituents of the earth in these blind areas is no different to the constituents a few miles away. So the theory fails somewhat. Also, if the constituents of

Blind spots are areas where no signals can be picked up.

In this article our contributor deals with the various theories regarding blind spots and the reasons why their existence is doubted.

the soil caused a blind spot, a shower of rain would cover the area with a layer of moisture, and it is well known that the latter prevents wireless waves from penetrating into the earth. But these blind spots continue to be blind, rain or no rain—so again the theory fails.

Another theory is that blind spots are caused by the presence of magnetic fields radiated from substances in the earth. This theory in its turn depends upon the fact that certain ores and rocks such as basaltic rock radiate a very intense magnetic field which may have the effect of deflecting the wireless waves from that particular area.

This theory accounts for the presence of blind spots at sea, and these intense magnetic fields are very well known to mariners owing to the fact that the field radiated from the highly-magnetic basaltic rock at the bottom of the sea very often upsets the ship's compass.

The writer suggests, however, that blind spots in mid-ocean, such as those mysterious areas in the Atlantic where no wireless signals have ever been heard, do not exist except in the imagination of those who have told this obviously "sea yarn."

A slightly different aspect of the last-mentioned theory is that blind

spots are caused by the absence of a magnetic field in certain parts of the earth. This idea is based on the Steinmetz etherless theory of wave propagation. Briefly, this theory contends that wireless waves are not waves in ether, but are vibrations in a magnetic field set up by the earth, which is known to be a gigantic magnet. Thus, if at any particular point no magnetic field exists for some reason or other, no wireless waves can travel through that area—and so we have a blind spot. Nevertheless, compass needles appear to act in the usual way when tested in these blind areas, so there would appear to be no absence of lines of force in these spots.

Screening

Although a large number of blind spots have been reported in England, research has shown that, in practically all cases, these blind areas have been due to an insensitive receiver, or the phenomenon of screening, or a combination of both.

Screening is very apparent with a crystal receiver. For example, if a crystal receiver is placed on the eastern side of a hill and the transmitting station is to the westward of the hill, that is, on the opposite side to the receiver, the latter will only pick up a very small amount of energy compared with what it would receive if no hill intervened between it and the transmitter. This is because the hill screens the receiver from the transmitter; or, in other words, the transmitter casts a wireless shadow over the receiver. In this case, if it is desired to bring the energy in the receiver up to normal strength, all that is necessary is high-frequency amplification.

Thus it has been found that if a receiver embodying a number of stages of high-frequency amplification is used in a blind spot, normal reception will be obtained, which goes to prove that blind spots are usually, if not always merely, screened spots.

In addition to hills, buildings—especially of the metal type—and trees also cause screening, and it is now generally acknowledged that the New Forest is the cause of some

of the blind areas in the Bourne-mouth area, for trees absorb a considerable amount of wireless energy.

It is probable that some of the reported bad reception from the new 2 L O is due to some such screening effect, and it has been suggested that the steel masts supporting the aerial cast a wireless shadow—especially when the down-lead only is used as an aerial. In this case high-frequency amplification will bring the strength up to normal in any receiver; or in the case of London, low-frequency amplification should be sufficient.

Similarly it is now believed that the blind spots around the various seaboard of the different countries are due to screening from coastal mountains, and there is hardly any doubt but that the blind spots off Ceylon are due to the high ground in the vicinity of Colombo.

In fact, wherever investigation into blind spots has been carried out the results tend to show conclusively that there are really no blind spots at all, but merely screened spots which can be remedied by the use of a suitable receiver with sufficient amplification. G. H. D.

RIPPLES

WIRELESS will give us more vision, says a professor. He must mean tele-vision.

EXPERTS admit that there are many weak spots in the programmes. But it is just the weak spot that causes the strong language.

It has been suggested that the new Food Council should undertake the broadcasting of current food prices. So far as our own suburb is concerned this is already done most effectively by our travelling fishmonger and greengrocer.

THE ENTHUSIAST'S NIGHTMARE!



What is Wrong with That Loud-speaker?

A Drawing by MAJOR C. FLEMING WILLIAMS



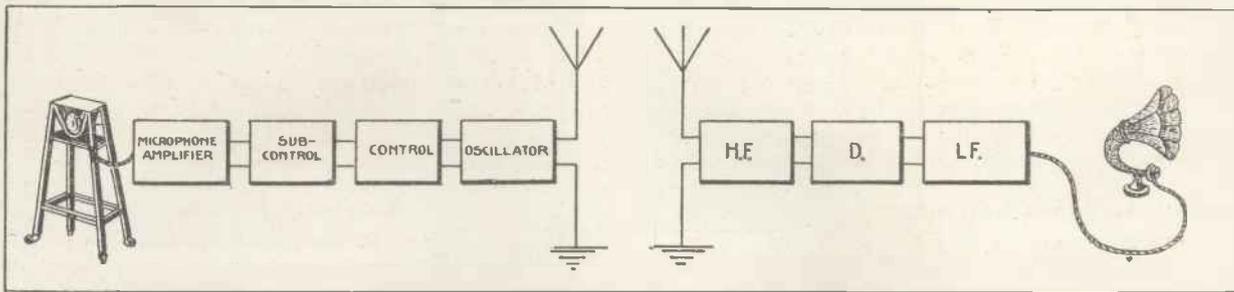


Fig. 1.—Illustrating Eleven Links between the Microphone and the Listener's Ear.

What is Distortion?—^{by} Paul D. Tyers

THE chief aim of the wireless enthusiast seems to be that of obtaining distortionless reproduction, and to this end the wireless periodicals have published from time to time a considerable amount of matter relating to the construction of distortionless amplifiers. The idea seems to be prevalent that if one uses a resistance amplifier, distortionless amplification must inevitably result. No more erroneous idea could possibly exist. In fact, it is far easier to construct a distortionless transformer-coupled amplifier than to construct a distortionless resistance-coupled amplifier, although of course, a correctly designed resistance amplifier will give far truer reproduction than a transformer amplifier.

Paradoxical State of Affairs

No doubt many readers will emphatically state that they can obtain better results with a transformer-coupled amplifier than with a resistance-coupled amplifier. This is quite within the bounds of possibility. How, then, can this seemingly paradoxical state of affairs exist? Before trying to find a satisfactory explanation we must ask the question, "What is distortion?"

If we refer to a dictionary we find

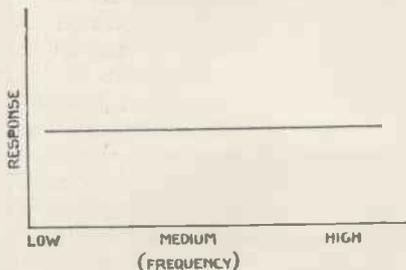


Fig. 3.—Response and Amplification.

that distortion is defined as "Putting out of shape or misrepresenting." Looking at the question from a practical point of view, the loud-speaker should reproduce sounds which, when appreciated by the ear, are identical with those which emanate from the source of the music or speech, as the case may be.

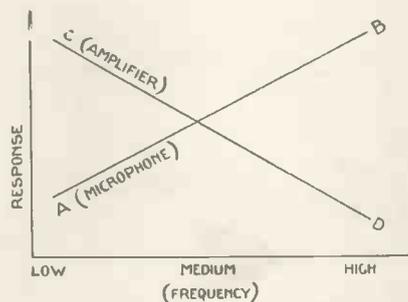


Fig. 2.—Sensitivity of Amplifier.

Probably very few amateurs realise that after the sound waves reach the microphone their effect is passed on by eleven different links before it reaches the listener's ear. This is illustrated diagrammatically by Fig. 1, and in each separate section there is a possibility of distortion arising.

Effects Counterbalanced

An interesting fact, however, is that a distortional effect which may be produced in one section may be counterbalanced by an opposite distortional effect in another section. This fact explains why a badly-designed transformer-coupled amplifier will sometimes give better reproduction than a resistance-coupled amplifier.

There are really two fundamentally different causes of distortion in a

broadcast transmission or receiving system. The first source of distortion is associated with the incorrect adjustment or operation of the various devices which are used, such as valves and loud-speakers. The other cause of distortion is intimately associated with what may best be termed the "frequency characteristic" of the various components of the system.

Microphone Response

For example, the microphone may respond more readily to the lower frequencies than to the higher frequencies, with the result that if the rest of the transmitting and receiving system respond equally to all frequencies the resulting music will contain far too much bass.

As a matter of fact, the writer has not come across any microphone which responds equally to all frequencies. The well-known Marconi Round-Sykes magnetophone, for example, has a sloping characteristic, or, in other words, it responds more readily to some frequencies than to others. This fact, however, is of no importance, as it is very easy to make an amplifier which has an exactly opposite characteristic.

For example, if a given microphone responds feebly to the high

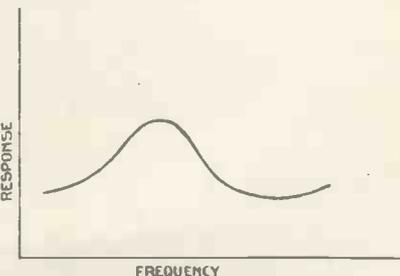


Fig. 4.—Loud-speaker Characteristic.

frequencies, and fully to the low frequencies, the amplifier would be so constructed that it was exceedingly sensitive to the high frequencies, and comparatively insensitive to the low frequencies. This point is further illustrated in Fig. 2.

Constant Amplified Current

The line AB shows the response of the microphone in relation to frequency, while the line CD illustrates the amount of amplification with respect to frequency. The result of a combination of this description is indicated in Fig. 3 which shows the amount of amplified current with respect to frequency. We thus find that although the response of the microphone and amplifier vary with frequency, the resulting amplified current is constant over the entire frequency range.

This amplified current is then passed on to the sub-control and control valves which modulate the output of the transmitter. In all these different sections there is again a possibility of distortion occurring. The conditions which might bring about distortional effects, however, are far too complicated to be considered here.

We now come to the actual receiver, which, for the sake of argument, we will consider consists of a high-frequency amplifier, a detector, and a low-frequency amplifier which operates the loud-speaker. Distortion can again be produced in these four sections. Here we must distinguish between the two types of distortion which have previously been mentioned, namely, maladjustment and frequency characteristic.

Three-part Chord

Let us consider what should happen to a certain chord, for example, consisting of three main groups of frequencies, high, medium, and low, which we will call X, Y, and Z, respectively. If the three frequencies have been equally treated by the transmitter we can say for the sake of argument that we have in the aerial circuit of our receiving system three amounts of high-frequency current which are proportional to X, Y, and Z.

If our high-frequency amplifier is functioning efficiently, we can consider that we have applied to the grid of the detector valve three amplified voltages which are again proportional to X, Y, and Z. Again,

if our detector is functioning efficiently we can consider that we have passed on to the low-frequency amplifier three sources of low-frequency current which are again proportional to X, Y, and Z; and similarly if the low-frequency amplifier is functioning efficiently we can

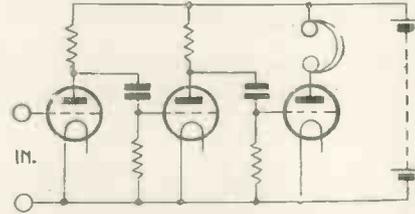


Fig. 5.—Resistance-coupled Amplifier.

consider that three amplified currents will be passed on to the loud-speaker, which are also proportional to X, Y, and Z.

Are we then justified in saying that the loud-speaker will emit a musical sound which is identical with that which passes through the micro-

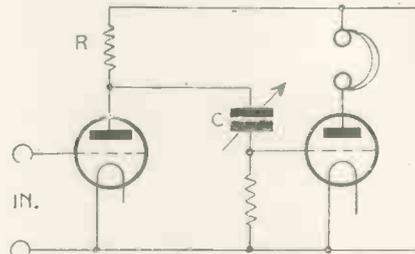


Fig. 6.—Last Two Stages of Amplifier.

phone? It would appear at first sight that this must be the case, but as a matter of fact it is not so.

Although the low-frequency currents which are applied to the loud-speaker truly represent the sound waves which originally affect the microphone, it must not be imagined

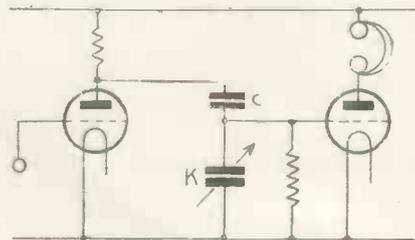


Fig. 7.—Circuit to Diminish Treble Frequencies.

that the loud-speaker will reproduce identical sounds. The loud-speaker has a frequency characteristic in exactly the same way as the microphone has a frequency characteristic.

In the case of a loud-speaker, however, the frequency character-

istic is far more complicated. The frequency characteristic of the loud-speaker is determined partly by the electrical constants of the windings, but more particularly by the acoustic properties of the sound conduit or horn.

Sensitivity Increased

It is not at all uncommon to find a characteristic of the shape shown in Fig. 4, which indicates that over a certain range of medium frequencies the sensitivity is enormously increased. If, now, a loud-speaker of this type is connected to a receiver which amplifies all frequencies equally, it should be obvious that distortion must inevitably result, as the medium frequencies will be reproduced considerably louder than the extremely high or low frequencies.

We thus come to a very important fact, namely, that if the transmission is proportionally representative of the original speech or music, our receiving system should actually distort in order to obtain pure reproduction. Theoretically it is quite possible to calculate and design a receiving system which, when combined with a loud-speaker having a characteristic similar to that shown in Fig. 4, will give substantially pure reproduction.

Good and Bad Amplifiers

As has been previously mentioned, a really bad amplifier will frequently give better results than a good amplifier; this is due to the fact that unequal amplification is occurring over various frequency bands, and it may happen that less amplification is obtained at the frequency at which the loud-speaker is most responsive, with the inevitable result that a very good approximation to correct reproduction is obtained. The reader should not imagine that he can be assured of good reproduction merely by using what may be termed a bad amplifier.

Obviously the scientific way in which to approach the subject is to build a receiver in which each valve amplifies substantially distortionlessly, and further, to include in various parts of the circuit devices which will differentiate with regard to various frequencies, or bands of frequencies. The reader will find that much interesting work can be carried out on the following lines.

Reception is first carried out by employing an ordinary resistance-coupled amplifier, such as that shown

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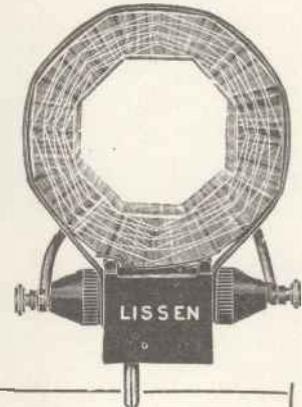
The aerial coil for a Reinartz circuit must be tapped; the old disadvantage of having to wind special coils, however, no longer exists now that LISSENIUM X COILS are available, and an extremely

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WHAT IS DISTORTION? (Continued)

in Fig. 5. For the sake of argument we can say that each valve will amplify the various frequencies equally.

Bass Frequencies

Suppose, now, that the loud-speaker is too responsive to the bass frequencies. In order to obtain pure reproduction it is obviously necessary to diminish the amplification at the lower frequencies, or alternatively, to increase the amplification at the higher frequencies. The simplest method is to diminish the amplification at the lower frequencies. Fig. 6 shows the last two stages of the amplifier, and it will be seen that the anode of the last valve but one is coupled to the last valve by means of a condenser C.

The potentials which are produced across the resistance R are conveyed to the grid by this condenser. Now it is a well-known fact that the impedance of a condenser is inversely proportional to the frequency or, in other words, in a given condenser the lower the frequency applied to it, the greater will be its impedance. If, for example, our coupling condenser were .25 microfarad, we could consider the impedance of this condenser comparatively negligible at all frequencies which were required.

Condenser Impedances

This means that the grid of the last valve would be affected equally by all potentials set up across R. If, now, we were to cut this value down very considerably, even as small as .0005 microfarad, the condenser would offer very little impedance to the higher frequencies, while considerable impedance would be offered to the lower frequencies. This means that the grid would be normally affected by the higher frequencies, but would be influenced to a considerably smaller degree by the lower frequencies. In this way we have found an easy manner of reducing the amount of bass in the last valve, and accordingly we can obtain a truer reproduction.

A similar method can be adopted in order to diminish the proportion of treble or high frequencies, a suitable circuit being shown in Fig. 7. In this case the usual coupling condenser C is employed, but in addition

another condenser K is connected between the grid and the filament.

The value of this condenser is quite small, and accordingly would offer a very high impedance to the low frequencies, and a comparatively low impedance to the high frequencies. This means that the grid of the last valve will be fully affected by the lower frequencies, but the action of the condenser K on the high frequencies will be to by-pass them to a certain extent, and accord-

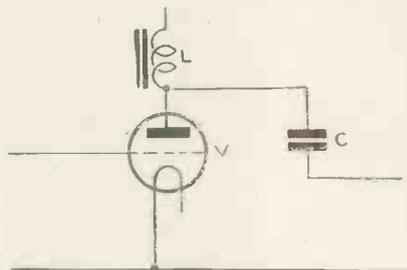


Fig. 8.—First Stage of Amplifier.

ingly the last valve will amplify the lower frequencies far more strongly than the high frequencies, with the result that a small percentage of treble will be obtained from the loud-speaker.

Fig. 8 illustrates another method of approaching the subject in which the valve V represents the first stage of the amplifier. Instead of using an ordinary resistance, a choke L is employed, and we will assume that the loud-speaker responds too fully

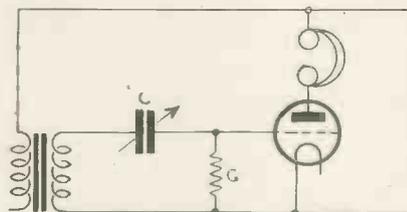


Fig. 9.—Transformer-coupled Amplifier.

to the bass. Now the impedance of the choke is, in this case, proportional to the frequency. In other words, for a given impedance the inductance has to increase as the frequency decreases. If, then, we wish to eliminate some of the bass the inductance of the choke should be fairly small. This means that it will have a low impedance to the low frequencies, and a very much higher impedance with the high frequencies, with the result that

the low frequencies will not be amplified so strongly. It is more difficult, however, from an amateur's point of view to adjust the frequency characteristic of the amplifier by means of chokes, as the problem is infinitely more complicated.

Iron Cores

For example, it is very important that the iron core of the choke should not become saturated. It is important to remember that in the case of the resistance amplifier the methods which have been outlined are only correct for what may be termed straight characteristics. In order to correct a characteristic such as that shown in Fig. 4, it is necessary to use various filters either directly in the loud-speaker circuit or in the amplifier itself. These filters are rather complicated in nature, and consist of various networks of resistances, capacities and inductances.

Readers should remember that a large proportion of the distortion which exists in many broadcasting receivers is not due entirely to frequency characteristics, bad adjustment of the apparatus being far more probable.

Unless a valve is working on a straight part of the characteristic curve distortion will inevitably result, irrespective of the method of amplification employed.

Harmonics

Again, too small cores to transformers and chokes very frequently give rise to harmonics owing to saturation. However, the fact remains that the best way to obtain true reproduction is to build as distortionless an amplifier as possible, and subsequently adjust for the characteristic of the loud-speaker by means of the methods indicated.

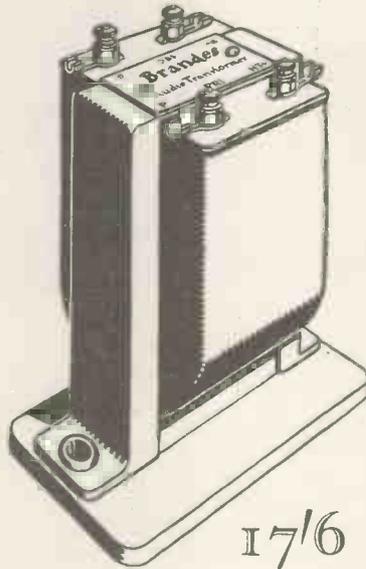
The idea of varying the coupling condenser in a resistance amplifier can also be used in a transformer-coupled amplifier, and this is indicated in Fig. 9, a grid leak G, of course, being necessary in order to overcome the difficulty of a free grid.

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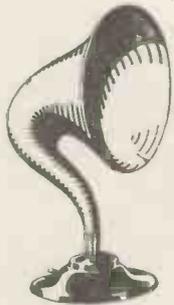
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In most cases they will welcome the services of an expert to undertake the maintaining of their sets in good working order. In the following article the writer offers a few suggestions for carrying out overhauls to broadcast receivers—hints, in fact, for becoming a wireless doctor.

Selecting Your Tools

It is useless going to visit a friend in trouble with his set, looking wise and offering to take the set away for adjustment: most people, especially the non-technical ones, want the repair done on the spot—a few useful accessories should therefore be carried. The wireless expert's set of tools should be carried in a small attaché case, one measuring about 9 in. long by 4 in. wide by about 6 in. deep being a handy size. This case should be of real leather for preference, as it will not only last longer, but look considerably smarter in appearance than one of the cheap cardboard cases so common to-day.

The most useful selection of tools would be two small and one large screwdriver, two pairs of pliers, one pair being of the usual combination type with wire-cutting sides, the other pair being the small type used by watch and instrument repairers.

One or two small box spanners, to take 2, 4, and 6 B.A. nuts, will also be handy, together with one small flat file, rather coarse, and one smooth half-round file. A pair of surgical forceps will be useful for picking up small screws and putting connecting wires in place.

A small roll of adhesive tape (in a tin) and several coils of wire, including about 12 feet of aerial wire, 12 feet of rubber-covered flex and some silk flex will complete the kit. To prevent these fittings from shaking about in the case, two large dusters should be laid on top and these will come in handy at times for polishing panels, etc. It is a good plan to carry a really good pair of headphones, a small buzzer for testing connections, and a 4-volt pocket-lamp bulb for testing individual cells in H.T. batteries.

In nine cases out of ten the causes of failure or weak signals will be quite simple to locate. Take crystal sets; some people are not even capable of adjusting the catwhisker, and complain that the set will not function as it did when it was purchased. It is a good plan in these cases to endeavour to get them one of the permanent cartridge crystals which do not require any adjustment.

Another good type of crystal detector for the novice is a bornite-zincite combination.

Both crystals are sensitive practically all over, and may be screwed down tightly without losing sensitivity.

Points to Notice

Particular care should be taken to see that earth connections are good. More often than not the earth wire is coiled loosely round a dirty water pipe, affording little or no connections to earth. The aerial itself is often inadequately insulated, and the addition of an extra insulator at either end will usually work wonders. With regard to valve sets, the most common troubles are accumulators run down and H.T. batteries worn out. Broken or burnt-out valves are easily detected, the more obscure troubles being burnt-out L.F. transformers, faulty grid leaks, fixed condensers and broken connections.

The internal connections of loudspeakers occasionally break, and it is a good plan to test both these and headphones before dismantling the set. Many wireless dealers make the mistake of selling to a private customer of means an elaborate valve set with a multiplicity of controls, which the customer fails to understand.

It is usually sufficient in these cases to tune-in the broadcasting station required and to then show the owner how to switch off the

(Continued on page 309)

THE WUNCELL

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OUR morning mail would be exceptional if it did not contain at least one letter from some enthusiastic Cossor user commenting upon the long life of his valve. Among our most treasured possessions are these hundreds of letters—each one of which has been written spontaneously to express the writer's keen approval of the satisfactory service he has received.

Typical among them is the following from Mr. H. Hayward, of 9 Daisy Gardens, Dagenham, Essex. He writes as follows :

"On looking through one of your ads. in 'Modern Wireless' a few days ago, and noticing the claims of some of your users, I think I ought to bring to your notice the performance of one of your valves. I bought this in July 1923, and after using it practically 4 hours per night on the average, and more so during week-ends, it has just given up the ghost. I reckon the life of this valve at about 4000 hours. Can anyone beat this? I won't say any more!"

But if the Cossor bright emitter is reckoned to possess a long working life, then truly the Wuncell Dull Emitter is a centenarian among valves. Here is a valve which is fitted with an entirely new type of filament—one which can be obtained in no other valve.

A filament which, instead of being whittled down to an exceptional thinness to obtain low current consumption, is actually *built up layer upon layer* until it is practically as stout as that used in a bright emitter valve. A filament which, mounted in arch formation and further secured at its centre by a third support, will readily withstand all the shocks and abuses of everyday use. A filament, moreover, that owing to its unique method of manufacture gives off an intensely powerful electron stream when barely glowing.

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The essential features of every Cossor Valve—irrespective of type—are its hood-shaped Grid and Anode and its arched filament. As every wireless enthusiast knows, the action of the 3-electrode valve depends upon an effective use being made of the electron stream given off by the heated filament. Previous to the introduction of the Cossor this had always been done by means of a spiral grid and a tubular anode. But obviously such a design suffers from severe limitations on account of considerable leakage of electrons from each end of the anode. In the Cossor, on the other hand, the arched filament is almost totally enclosed by the hood-shaped Grid and Anode, and few, if any, of the electrons can escape.

The Wuncell Dull Emitter incorporates every salient Cossor feature. It functions at 1·8 volts, while its current consumption is only ·3 amp.—so low as to enable the standard six-volt accumulator, with its cells connected in parallel, to last six times as long as with bright emitter valves. The man changing over to Wuncells from ordinary valves, therefore, gets an additional *five weeks' Broadcasting free of cost* every time he has his accumulator charged.

So that, not only do you get a long-life valve when you choose the Wuncell, but you effect tremendous economies as well. In the face of such incontrovertible facts can you delay buying Wuncells any longer? In two types: W1 for use as a Detector or L.F. amplifier, and W2 (with red top) for use as a high-frequency amplifier. 14/- each from all Wireless Dealers

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Valve Sets in Theory & Practice

Detection: High-& Low-frequency Amplification

IT is now time to take into consideration an actual valve circuit. One is shown in Fig. 2, wherein A is the aerial-tuning inductance. To the aerial side of this is wired the grid condenser B, across which is a grid leak C. From the farther plate of the condenser connection is made with the grid D of the valve, of which E is the filament, heated by a filament-heating battery or accumulator F, and G is the plate or anode.

Position of Phones

Following the course of the anode circuit from G you will see it is connected in series with the telephone or telephones H, then with the positive terminal of a high-tension battery K, and thence back to the negative filament terminal, from which an extension wire goes to the earth side of the inductance.

The sequence of functioning of the various parts of the circuit is therefore: Energy from inductance A passes through the grid condenser B and builds up in the grid D, influencing the rate of electron flow from the hot filament E to the anode G. According to this rate of electron flow, more or less current is able to pass from the high-tension battery K by way of the filament E to the anode sheath or plate G, and so through the telephones H, energising their diaphragms and thereby reproducing sound and speech.

Amplification

That there should be sound magnification or amplification produced coincidentally with valve rectification is due to the fact that an alteration of voltage or potential charge in the grid has as much effect on the electron current between filament and anode as would from four to twelve times as great an alteration of voltage in the high-tension circuit, the particular multiplication of amplification factor depending upon the design and manufacture of the valve itself.

Instead of connecting the telephones H at the position shown in Fig. 2 an L.F. (low-frequency) trans-

former may be attached at that point instead. Such a transformer has a central core of tightly-packed fine iron wires, or a number of stampings (laminations) of thin, soft iron fastened together, over which are wound two separate windings of fine insulated copper wire. The inner winding, called the "primary," generally has about five thousand turns of wire

The second of three on valves and valve sets, this article is a continuation of our "Absolutely for the Novice" series by Colin Bennett. The author explains in simple language the whys and wherefore of detection, and high- and low-frequency amplification.

and the outer winding, or "secondary," of still finer wire, has from twenty-five to thirty thousand turns, or possibly more.

These two windings are not in metallic connection, so that whatever effect occurs in the secondary winding, as a result of wireless signals circulating through the primary winding, must come about simply through induction, in the same way that circulation of energy in the aerial inductance of a double-circuit tuner induces sympathetic energy in the closed-circuit inductance.

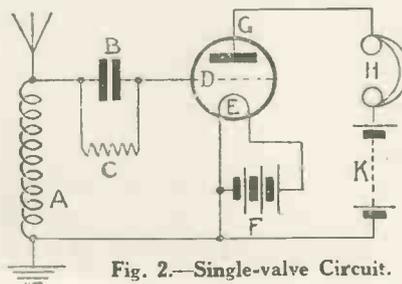


Fig. 2.—Single-valve Circuit.

Since the secondary winding of a low-frequency transformer has about five times the number of turns of the primary winding, voltage induced in the secondary winding will be round about five times as high as the primary voltage which produces it. We have already seen that voltage, or potential, is the determining factor

deciding the amount of influence of a valve grid upon sheath or anode current flow. So it follows that if we connect up the grid circuit of a second valve with the secondary winding of a low-frequency transformer that has its primary energised from the sheath circuit of a rectifier valve, this second L.F. amplifying valve will greatly magnify the effect of the first valve.

Sevenfold Increase

Actually it is possible to get an increase of loudness of sound, or "note magnification," of about sevenfold for each stage of low-frequency added to a wireless receiving set, though more than two stages of L.F. amplification produce a serious amount of sound distortion, so that in practice a third L.F. stage is rarely used.

The diagram, Fig. 3, shows how an L.F. stage may be wired up independently to any set, whether rectification has been by valve or crystal. In this diagram the phone terminals of the set are marked T T; P is the primary winding of the transformer, W its iron core, and S the secondary winding. G, A and F are respectively grid, anode and filament of the L.F. amplifying valve, to which L.T. and H.T. current are fed from separate batteries, wires being taken from them to the valve and to the secondary winding of the transformer as shown.

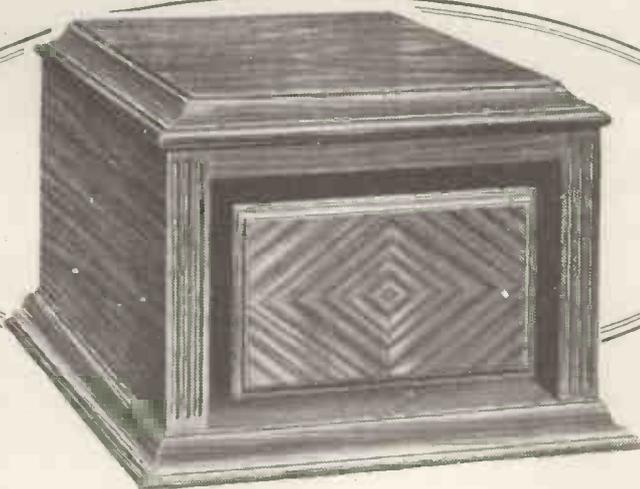
Valves used for rectification and for amplification (either H.F. or L.F.) in receiving sets are usually different, special valves being made for various positions in the set.

Iron Core

An iron core is placed in low-frequency transformers to impart to their action an intentional sluggishness, so that while they respond to rectified signals coming through at audible frequency, they "choke" any unrectified signals which might pass into the transformer primary at high frequency.

Unless the original signal picked up by the aerial is of a certain

BRITISH THROUGHOUT



As pleasing to the eye as to the ear

—this elegant Brown Cabinet Loud Speaker marks a new era in design

It has been left to the manufacturers of the first Wireless Loud Speaker to produce the first British Cabinet Loud Speaker. The handsome Instrument illustrated above is a welcome relief to some of the more usual type of Loud Speakers. Beautifully finished in a rich rosewood shade and made of the best mahogany, it will undoubtedly achieve a very wide measure of popularity.

The same superb volume and purity of tone so characteristic of the Brown will be found in this new Cabinet model. If you have been prejudiced against the use of Loud Speakers—either on account of their appearance or their performance—your last objection has now been removed.

For supreme beauty of outline, clarity of tone and ample volume, the new Brown Cabinet Loud Speaker stands alone. Supplied in all resistances. **£6/6/0**

S. G. Brown, Ltd., N. Acton, London, W.3

Showrooms: 19 Mortimer Street, W.1. 15 Moorfields, Liverpool.
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Brown

HEADPHONES AND LOUD SPEAKERS

The New HQ

A handsome new Loud Speaker possessing the same beauty of outline as the luxurious Q-type whilst retaining the full volume and sensitiveness of the well-known H1. Can be supplied either in a rich brown colour or a glossy black. Polished mahogany base with nickelled fittings. A superb instrument which will charm everyone with its exceptional fidelity of reproduction. Height 20 in 4000 ohms. **£6**
Also in 120 and 2000 ohms.



The New A-type

At last we have been able to produce the new Brown A-type headphones at the sensational price of 30/-. The same famous tuned reed movement is used. At such a low price you cannot afford to be without a pair of genuine Brown A-type Headphones—famous throughout the world. **30/-**

Brown Featherweight Headphones sold everywhere at 20/- per pair (4000 ohms resistance).

Standard Brown Loud Speakers

H2	120 ohms	£2 5 0
	2000 ohms	£2 8 0
	4000 ohms	£2 10 0
H1	120 ohms	£5 5 0
	2000 ohms	£5 8 0
	4000 ohms	£5 10 0
Q type	In all resistances	£15 15 0

The New H3

A new Loud Speaker embodying all the well-known Brown features. Although only 15 inches high it gives the same superb tone as the larger H1 and is equally clear on speech and music. No other Loud Speaker on the market within several pounds of its price can give such a fine volume as the H3. **£3**
In all resistances



The New H4

We are proud of being able to offer a real Brown Loud Speaker—British throughout, and a replica in every detail of the larger models—at the amazingly low price of 30/-. Small in size but big in performance it is wonderful value for money. 2000 ohms. **30/-**
Height 10 inches.

The New Crystavox

The new and improved horn now fitted to the Crystavox will enable this Loud Speaker to give an exceptional volume of sound direct from a Crystal Set without the use of valves. The powerful Daventry Station will permit thousands of Crystal Set users to get Loud Speaker results direct from a Crystavox. **£6**

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VALVE SETS IN THEORY AND PRACTICE (Continued)

strength, its effect either upon a rectifying valve or a crystal detector is not strong enough to bring about rectification. And again, unless a signal has been rectified, no amount of note magnification will make it audible in a telephone receiver, for

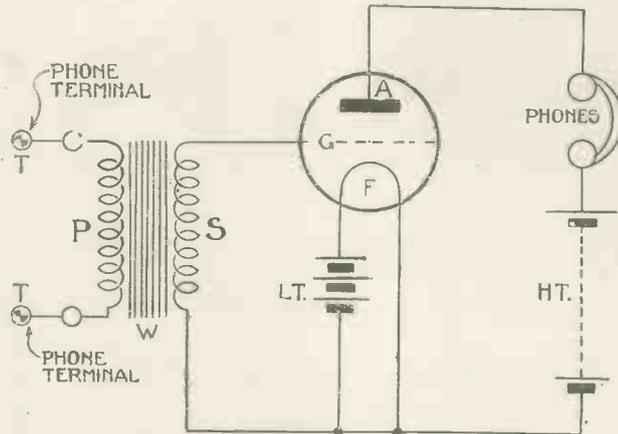


Fig. 3.—Independent L.F. Amplifying Stage.

the simple reason that there will be no "note" to magnify or reproduce. There is, however, a way in which rectification of extremely weak signals may be indirectly brought about. That way is by first of all amplifying the signals at oscillatory or radio frequency, this being what is called H.F. or high-frequency amplification.

H.F. Transformers

High-frequency amplification may be produced by using a double-wound transformer, as with low-frequency amplification. A high-frequency transformer differs from a low-frequency transformer in that it has no iron core and very little, if any, "step-up" effect. (The number of turns of the secondary winding is not more than about one-fifth more than the number of turns of the primary winding.)

For very long-range reception of British broadcasting two stages of high-frequency transformer amplification may be added before the rectifying valve, or, alternatively, a single stage of auto-transformer H.F. amplification, known as "tuned anode." Other less efficient methods of H.F. amplification, which are not of great practical interest to the receiver of British broadcasting, are the "reactance-capacity," or semi-

tuned-anode system for short wavelengths, and the resistance-capacity method for wavelengths over one thousand metres. It will be sufficient here to give a brief outline of H.F. amplification by transformer and by tuned-anode coupling.

Fig. 4 gives a diagram of the essentials of radio-frequency amplification by transformer. Here B is the rectifying valve. The aerial lead (or closed-circuit lead with double-circuit tuning) is connected instead to the grid of a preceding valve A, which is the H.F. amplifying valve. Sheath or anode current from this H.F. valve passes through the primary winding of an air-core transformer on its way to the positive terminal of the high-tension battery. The primary H.F. transformer winding may or may not have connected across it (that is, in parallel with its terminals) a small variable condenser, not exceeding 0002-microfarad capacity.

If a separate condenser is used the transformer primary is said to be tuned. If not, it is an untuned "aperiodic" primary. But whether a separate outside condenser is or is not connected with the transformer winding, we must not forget that the turns of wire possess, within themselves, both inductance and capacity. Hence this primary winding of the transformer forms in itself a small oscillatory circuit.

Every variation of electron flow to the sheath of the valve, therefore, not only produces a variation of current flow up the winding to the H.T.

battery terminal, but actually starts a sympathetic oscillatory current surge within the H.F. transformer's primary coils. This oscillatory circuit at once induces a similar oscillatory surging of current in the transformer's secondary winding. The grid of the rectifier valve being connected to the H.F. transformer secondary, induced oscillatory current thus passes through grid condenser to the grid of valve B, there to influence rectification in the way we know.

Advantage of H.F. Amplification

Since no marked step-up is made between the number of wire turns in the winding of a H.F. transformer's primary and secondary coils, signal strength going to the rectifying valve is not much increased in that way. The advantage comes in with the very considerable amplification effect between grid and energy input and anode energy output from the H.F. valve itself.

Notice, in Fig. 4, the position of the grid leak L is on the grid side of the grid condenser D. Also, that instead of bridging the condenser it connects with the wire coming from the positive terminal of the low-tension battery. This is the right way of connecting the leak wherever

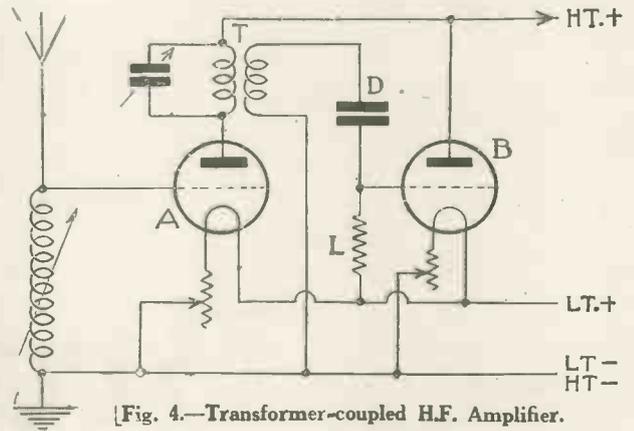


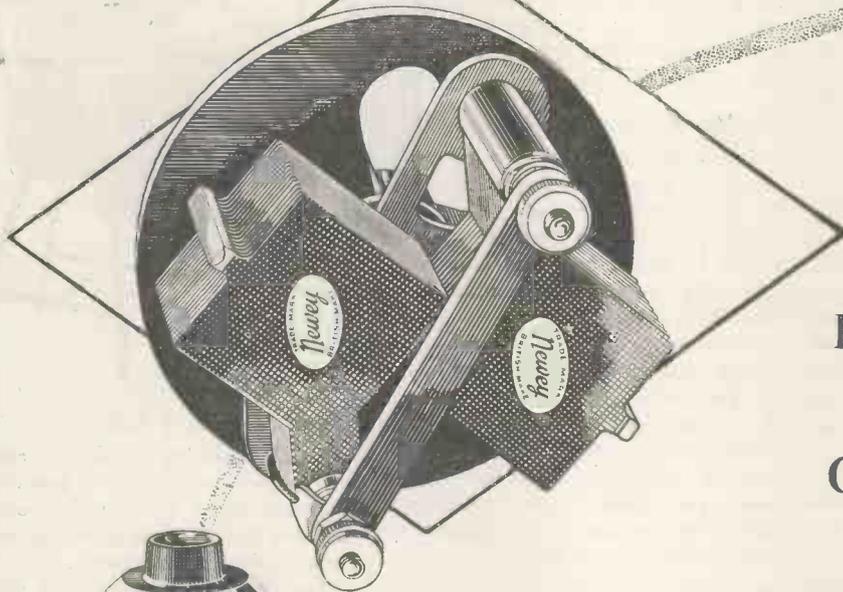
Fig. 4.—Transformer-coupled H.F. Amplifier.

tuned-anode H.F. valves precede the rectifying valve. If the leak were to bridge the grid condenser with such a wiring as shown, high-tension current, straight from the high-tension battery, could find its way through the leak to the rectifier-valve grid.

COLIN BENNETT.

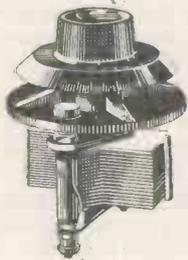
(To be continued.)

The "4 Point" Condenser



A
REVOLUTION
IN
CONDENSERS

- 1 ZERO LOSS
All plates in this condenser are of gold-finished brass, and are welded together, thereby eliminating electrical loss experienced with all types of condensers using spacers between plates.
- 2 LOWEST MINIMUM CAPACITY
The illustration shows the condenser fully extended, and it will be seen that there is $\frac{1}{8}$ " air space between the two sets of vanes, impossible to obtain in the usual form of condenser.
- 3 NO HAND CAPACITY
No metal plates are used whatsoever, only the very highest grade Bakelite being employed. The moving shaft connected to the dial is entirely insulated from the Condenser by means of Bakelite Sectors.
- 4 360 DEGREES
Vernier is unnecessary, as the condenser is geared and has a calibration range of 360° as against 180° in the usual form of condenser.



Lastly, the Condenser, which is single-hole fixing, is beautifully finished, only the best Bakelite and high-grade brass being used, and it bears the

Newey British Hall Mark of Excellence.

PRICES :

.001 mfd.	...	20/-
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Wireless Femininities

I WAS much struck by a recent suggestion, made to the B.B.C. by a correspondent, that folks who have paid for their wireless licence should receive as receipt a metal plaque; this would be stuck prominently outside their houses to dare inspectors to call again for the money!

I feel sure the G.P.O. will not be hard-hearted enough to grudge us such pretty playthings. The L.C.C. already ornament with blue plaques London houses in which famous folk have lived, and there is plenty of scope still left for brightening our dwellings on these lines and saving the precious time of cash demanders.

They Won't Agree to Differ

The controversy about the merits of wireless transmissions from the studio or from concert halls respectively, rages on with unabated zest. Far be it from me to embark upon it here. *Chacun à son goût*, and who's to say if it's better or worse than that of the woman next door?

But what does strike one about this and similar arguments on subjects connected with the B.B.C. programmes is the amount of grabbing and intolerance that is about. Hardly ever will the disputants agree to differ and quietly switch off when the type of amusement they dislike is in progress. No, nine out of ten of those who pay ten shillings annually for their licence think that the modest sum ought to entitle them to a year-round programme based entirely on their personal tastes. They display the greatest contempt for those who think differently.

In defence of my sex, though, I must add that most of the complainants appear to be men. Either women are more tolerant or they have less energy in writing to air their grievances. Perhaps it wouldn't be safe to say which factor rules most.

I was much interested in hearing recently of a nursing home for nervous breakdown patients, where the treatment consists principally of singing classes for patients and of facilities for them to listen to broadcast songs. This fits in with my own experience that there is no more

admirable emotional outlet than singing for all who are hysterically or nervously inclined or are emotionally starved for the time being.

Curing Nervousness

If singing were a daily instead of only a weekly item in the curriculum of girls' schools, maidens in their teens would be better balanced and less liable to nervous trouble than they are.

Singing for sound mental health is quite irrespective of the possession of a voice and of private lessons. Evening sing-songs round a piano, choral meetings, a folk-song class—all these meet the need quite adequately and cater for the social instinct as well as the emotional one.

Tips from the Men

By the way, mesdames, I wonder if you've discovered that it's often worth our feminine while to look through all the weird things that men use in their hobbies, wireless or otherwise. I find that some of their tools and materials can be converted to other than masculine uses.

For instance, not one woman in a thousand seems to have discovered that the insulating tape her husband uses for motoring and electrical purposes is simply splendid in the house. I've mended all sorts of broken things with it myself, including a leak in a gas pipe. It wasn't till months later that the gas man had to be called in to that hole, so successful was the temporary repair!

The other day, in a home wireless workshop, I picked up a sheet of ebonite grained to represent a brown wood. And here was the end of my search for something to renovate a very scratched and shabby dressing table top. Funds wouldn't run to plate glass, but by getting the very thinnest ebonite (it's sold by weight you know) grained to match my wood, I've a beautiful new top within my price limit.

So keep an eye on the wireless tool chest, and in time your vigilance may be rewarded as mine was.



What Are they Like?

Photographs of broadcast artists are frequently published, of course, but they never seem to answer one question that is in my mind regarding these unseen entertainers.

That is: do they, like the visible artists of the theatre and concert room, conform to the apparently stern law of nature which regulates the height and build of entertainers? Thus, are all the contraltos and basses big broad people weighing well above the average? Are all the sopranos only of average height, but also weighing well above the average? And, particularly, are the comedians very small and slim, and incredibly nimble on graceful little feet?

From the glimpses I've caught of artists in the studio when I've broadcast, I should think they are cast in the regulation mould, with few exceptions. Why nature made that mould is, of course, another matter.

Anyhow, what a change it would be to come across a six-foot funny man! Even Charlie Chaplin, so original in other respects, is conventionally small. A. M. M.

ACCORDING to a detective, some night clubs have wireless installed. That accounts for the fact that bad language is excessively used in such establishments.

QUITE a lot of brides have run away lately on the eve of their marriage. If only some of our busybodies could blame wireless for this its success would be assured for all time.

Two outstanding developments in Radio Design



Polar-Twin

A two-valve, single-dial, Loud-Speaker Set, at a remarkably low price, and without any complications.

The Polar-Twin set is for use with dry cells or accumulators, can be switched on or off with a single knob, and has a surprising "Loud Speaker" range. It will readily operate a Loud Speaker at a distance of 20 to 60 miles from a main Broadcasting Station, and has even proved effective in Loud Speaker reception up to 400 miles (of which we have ample written testimony).

Tuning is Effected with a Single Knob



A unique plug-in Aerial-Reaction coil System is used, and tuning for all B.B.C. short-wave stations is effected on one dial.

Complete Set, ready to connect to Aerial **£13 : 10 : 0**

Accessories include : 2 Mullard D.06 Valves, 2 H.T. Batteries and Plugs, 3 Polar D.E. Cells, 1 short wave Aerial-Reaction Coil Unit, 1 Daventry Aerial-Reaction Coil Unit, 1 Amplion Junior Loud Speaker and the necessary connecting wires.

Set, without accessories, but including short-wave Aerial-Reaction Coil Unit, Royalty paid **£6 : 15 : 0**

Cabinet, as illustrated above, £2 2s. extra.



Polar-Four

A powerful four-valve set with dual tuning systems and a unique system of control.

The Polar-Four has been designed so that it can be placed inconspicuously in any room or in the garage, etc., and by means of a simple system of triple lead-covered wire and specially designed Jack Boxes, the Loud Speaker and Remote Control can be plugged-in and operated from any point of the wiring system. Wherever these are plugged in on the system, complete control can be obtained, just as if the Set itself were present.

The Remote Control Box

permits switching over from one station to the other at will. It also regulates and turns on and off the filament current.



Price, without accessories, but with Remote Control, Control and L.S. Jacks, Coil units for two Stations and Leads. **£32 : 10 : 0**

Including Royalty.

The sign that means service.



Sold by all high class Radio Dealers.

Write for details to:—

Radio Communication Co. Ltd.

34-35, Norfolk St., Strand, London, W.C.2.

The name of the nearest Polar Service Agent is supplied on request.



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What the Reader Thinks

Wanted: A New Valve

To the Editor of "The Wireless Magazine."

SIR,—As an experimenter of many years' standing, I have often wondered why no British valve manufacturers have been enterprising enough to manufacture and place on the market a dull-emitter valve operating at 1.8–2.0 volts and consuming .06 ampere. If foreign firms are able to accomplish this, why not British firms?

A valve such as described would do away with the awkward and cumbersome 4-volt accumulator, and with such a valve and a good 2-volt accumulator, wireless would proceed and more valves be used.

Whichever firm brings out a 2-volt .06 ampere valve will be assured of the support of all valve users now troubled with heavy accumulators and current-eating valves.—E. L. BURGESS (Rampton, Notts).

More Praise

SIR,—I should like to congratulate you upon the excellence of your new paper, THE WIRELESS MAGAZINE. I have read both the magazine and *Amateur Wireless* since their inception, and have come to the conclusion that for the average wireless enthusiast they are superior to any others.

I am able to make this statement with some degree of assurance as I regularly read all the other English journals and some of the American. I would like especially to congratulate you on your article in the July issue entitled "How a Super-hot Works." Like many other "radio fans," I am very interested in this type of receiver and propose to construct one. Lack of knowledge of the underlying principles has, so far, deterred me from so doing, and although I read many other articles in other journals, I failed to become acquainted with the fundamentals. Since reading your article, however,

I feel quite confident to proceed with the construction.

Wishing both of your publications every success.—WILLIAM E. CALLINGHAM (Battersea, S.W. 11).

From Down Under

SIR,—I was unable to procure the first number of your wonderful magazine, but have read subsequent issues. I find them very instructive, especially to a novice like myself.

The licence fee in England is small compared to Australia, where we have to pay 35s. the first year and 30s.

VALVES FOR LETTERS.

Correspondents whose letters we have printed this month have been awarded Ediswan valves. The writers of all letters printed next month will receive Mullard valves.

the next. This fee prevents quite a number of people availing themselves of one of the best entertainments possible.

We have about one hundred amateur transmitters in N. S. Wales and two first-class stations—2 FC (Farmers) on 1,100 metres, and 2 BL (Broadcasters) on 353 metres.

There are also several B. class stations, so we have plenty of variety.

We could do with a monthly magazine out here similar to yours.—J. MOXON (Sydney, Australia).

On a One-valver

SIR,—In reply to Mr. D. S. Fountain's letter in the July issue, I give my results with a single-valve set as follows:

All main B.B.C. stations and the following relay stations: Sheffield, Plymouth, Edinburgh, Leeds-Bradford, Dundee, Nottingham, Hamburg, Koenigsberg, Munster, Breslau, Leipzig, Munich, Petit Parisien, Madrid,

Stockholm, Radio-Paris, and L'Ecole Supérieure.

The following American stations were also received with the same set: W G Y (Schnectady), W B Z (Springfield, Mass.), K D K A (East Pittsburgh), W E A F (New York). A New England station was also heard, but the call-sign was inaudible.

The set is a straight-circuit single-valve receiver employing a D.E 3 .06 dull-emitter valve. The aerial is 60 ft. long single wire, 35 feet high, and the earth is an ordinary water pipe.—W. HUNTER TOMISON (Milngavie, Dumbartonshire).

SIR,—I was keenly interested in Mr. Fountain's letter, and I am so bold as to say that I can beat his results. In addition to having received all the B.B.C. main stations and 5 X X, I have also received all the relays, except Swansea (and only Plymouth among them was received on the special Monday experimental night).

The continentals heard include Radio-Paris, Vienna, Zurich, Berlin, Munich, Frankfurt, Leipzig, P T T, Stuttgart, Stockholm, Rome, Breslau, Munster, Hamburg, Madrid, Oslo, Radio-Ancell, Bremen, Nuremberg, Dresden, Hanover, Cassel, Radio-Toulouse, Malmo and Brussels, and Petit Parisien.

I have only coils for reception of the 250 to 530, and 1,500 to 1,800 metres wavelength-bands and so, of course, have been unable to "get" Hilversum, Copenhagen, etc.

More than 50 per cent. of the above-mentioned stations are regularly received even during the summer months after dark. I attribute my success chiefly to the situation of my station and good luck.—A. R. BURTON (Sheffield).

LONDON amateurs have established continuous contact with the Arctic. More unfair competition for the ice-cream trade.

An Entirely New Wireless Condenser

GECOPHONE

LOW LOSS-SLOW MOTION VARIABLE CONDENSER



THE large control knob, rotating in the same direction as the dial, easily allows the most delicate adjustments to be made.



THE patent reduction mechanism, giving micrometer adjustment without backlash. Dead silent, velvety movement in operation.

The GECOPHONE Low - Loss Slow - Motion Variable Condenser will supersede the old-type condenser wherever valve-sets are used. The result of close and protracted investigation into the essentials of *ideal* condenser design, it is entirely new in conception, and gives to tuning an amazing degree of ease, certainty and selectivity.

Wireless enthusiasts everywhere will discover in the new GECOPHONE condenser the knowledge—not previously accessible—of what perfect tuning can be.

The GECOPHONE Low-Loss Slow-Motion Variable Condenser provides micrometer adjustment, absolutely without backlash. Minimum capacity is uniquely low, hand-capacity eliminated, and dielectric losses are the smallest possible. The condenser is adapted for one-hole fixing, and can be mounted on a metal panel without insulation.

Sold by all GECOPHONE Service Depots, Wireless Dealers and Stores.



INSULATION of fixed plates outside electrostatic field. This reduces losses to a minimum.

PRICES

.0002 mfd. - -	22/-		.0003 mfd. - -	24/-
.00025 mfd. - -	23/-		.0005 mfd. - -	27/6
.001 mfd. - -			32/6	

(Manufacturers—wholesale only)

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AT 2 SAVOY HILL, W.C.2.

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

WITH the coming of winter the B.B.C. is formulating plans for more ambitious broadcast entertainment. As much variety as possible will be introduced into the programmes during the long, dark evenings, and the policy of providing two or three classes of entertainment each evening will be developed. Broadly speaking, for each hour of serious music that is given, the B.B.C. is aiming to provide as a set-off an equal amount of humour or light entertainment. Wireless plays will be chosen to provide contrast, tragedy and comedy being balanced in suitable proportions; and any single play will need strong recommendation from listeners before it is given a repeat broadcast; for the recommendation of listeners is the best standard of judging the most suitable broadcast material.

Competitions

It is hoped to run several competitions in connection with "unfinished" plays, which listeners will be asked to complete in a form that they consider best suited to the broadcast medium.

While close attention is being paid to the lighter side of broadcast entertainment, it is admittedly no easy task to discover the kind of humour that is adapted to wireless transmission. The comedy artist gets no help or inspiration from his invisible audience, and partly for that reason some well-known comedians, whose deportment alone constitutes a strong appeal to the risible faculties of visible audiences, are inclined to be squeamish about appearing before the microphone. So far, however, as present plans go, the B.B.C. hopes to secure the assistance of anyone who is worth hearing.

The "stars" of broadcasting will also be heard pretty frequently, but care will be taken to prevent overworking them to the degree of staleness. Names that have grown familiar to broadcast listeners, such as those of Beatrice Harrison, the Sisters Goossens, Kate Winter, Mavis Bennett, Mabel Constanduros, Wynne Ajello, A. J. Alan, John Henry, Ronald Gourley, and Louis Hertel,

will figure often during the coming winter, along with a fair sprinkling of celebrities.

Concert Parties

The concert parties who have broadcast at intervals have now got a thorough grip on the new medium, and this side of the programme work will be extended. It is considered essential to provide more alternative programmes than are at present possible to the great majority of listeners. About 60 per cent. of the population is now within reach of alternative services capable of crystal reception. The B.B.C. does not consider this percentage satisfactory and wants to improve it as soon as possible. The P.M.G. has stated that it is hoped to continue the policy of giving greater scope for broadcasting; alternative programmes will figure largely in the development thus foreshadowed and a considerable sum of money is being earmarked by the B.B.C. for that purpose.

Forthcoming Speakers

Speakers have been chosen for the coming season with an eye to their ability to present their ideas in an attractive manner and in simple language, as well as for their knowledge of the particular subject with which they are qualified to deal. Professor Julian S. Huxley, M.A., in a series of fortnightly talks on evolution, entitled "The Stream of Life," will tell listeners some interesting facts respecting the origin of man and racial development. Professor Huxley is the eldest son of Dr. Leonard Huxley, editor of the "Cornhill" and grandson of Thomas Henry Huxley, the famous scientist. He has had a remarkably brilliant scientific career and has just been appointed to a professorship in Zoology at King's College, London.

Then we shall have Dr. E. H. Barton, F.R.S., author of many writings on Magnetism, Electrical

Waves, Acoustics, etc., who is to talk on "Musical Sound."

Dr. George Macdonald, C.B., M.A., who has been Permanent Secretary of the Scottish Education Department since 1922, is an authority on coinage who will be well worth hearing when he broadcasts on "The Origin and Development of Coinage." Dr. Macdonald is a member of numismatic societies in America, Holland and other continental countries, and it is probable that his talks will be received by them as part of the international programme scheme which is now being developed.

New Fortnightly Series

Among other speakers whom listeners will, it is thought, be glad to hear, are Mr. C. E. M. Joad and Mr. J. Strachey, who are to conduct a fortnightly series of discussions on "After-dinner Philosophy," in which they will argue such debatable topics as "That Courage is only a form of Cowardice," "That Nothing ever Changes," and "That Men are no better than Monkeys": although the latter is a subject with which Professor Huxley is no doubt better qualified scientifically to deal.

The B.B.C. is also arranging to tap the intellectual resources of the great Universities, and as a start will set up a small studio at Oxford to give listeners the benefit of some of the many brilliant debates which are conducted there, a privilege hitherto reserved to a comparatively small but fortunate body of students. If the experiment should prove successful a similar arrangement will probably be made at Cambridge.

On the engineering side a good deal of attention will be paid in the ensuing months to improving the apparatus in use and to the general work of polishing up. The efforts of the engineers will to a great extent be concentrated on the new super-receiving station at Hayes, Kent, with its peculiar short aerials, and on the transmissions from Daventry; in the first-named case because here foreign programmes will be received and selected for

(Continued on page 296)

T

HE N.A.R.M.A.T. Exhibition settled the question—made Ediswan superiority clear undeniably.



The Exhibition Dispersed any doubts!



THOUSANDS of Wireless Enthusiasts, not quite convinced of Ediswan perfection, learned at the Exhibition of the thoroughness that goes to the making of each Ediswan Valve, each Ediswan Set and each Ediswan Component, realised that such painstaking care in manufacture, backed by the Ediswan patents, must inevitably result in Ediswan users "Hearing more—Hearing better."

If possible, see that all your Wireless is stamped with the genuine Ediswan Trade Mark. In any case remember that—

EDISWAN VALVES

		File. Volts..
P.V. 5 D.E.	22/6	5.0
P.V. 6 D.E.	18/6	1.8-2.0
P.V. 8 D.E.	22/6	3
A.R. (L.F. or H.F.)	8/-	4
R.	8/-	4
A.R.D.E. (L.F. or H.F.)	14/-	1.8-2.0
A.R.O. 6	16/6	2.5-3

At all Wireless Dealers.

EDISWAN VALVES

Will improve any set

THE EDISON SWAN ELECTRIC CO., LTD.,

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At 2, Savoy Hill, W.C.2

(Continued from page 294)

re-broadcasting to British listeners; and in the latter case because 5 X X will this winter gain a big reputation, both as a national and an international broadcasting station.

It is not, however, intended to make any extravagant claims on behalf of 5 X X at this juncture. It is therefore well to keep in mind the fact that a good deal of experiment has to be carried out before the necessary factor of safety can be guaranteed for regular transmission and relaying of foreign programmes. If the expectations are to be fulfilled, the B.B.C. will begin its foreign service by re-broadcasting the programmes of the Radio Corporation of America, and will then arrange for exchanges with all the leading American broadcast organisations, an ambitious scheme which the Company has been promoting throughout the summer months.

Daventry—the Pivot

Daventry will be, in addition, the pivot on which continental exchanges with America will turn. Germany has already arranged an interchange with the Radio Corporation, but the Germans are unable, through lack of money, to broadcast their programmes direct to the United States of America. The B.B.C. will, therefore, align its relay plans with those of Germany, and will receive the German programmes at Hayes for re-broadcast to America by way of Daventry.

The schemes in hand also provide for a regular exchange with Canada as part of the larger project of broadcasting to other Dominions. Chelmsford, for example, was received regularly in India. Daventry, possessing the latest developments in broadcasting apparatus, should be still better received in the Dependency. Moreover, experiments are being made in short-wave transmissions, simultaneously with long-wave experiments, from a station the name of which may not be disclosed, and it will not be long ere the eagerness of Australia to hear a broadcast message from the Old Country is satisfied.

The engineers are also showing great activity in the study of

acoustics, with the object of ensuring reception as near to perfection as it is possible to attain. Research work is to be conducted in the arrangement of the studios, and in the new studio that has been prepared the draping will differ considerably from that previously in use. In the original studio, situated on the third floor of 2 L O and brought into operation early in 1923, experiments were conducted from the aspect of the extreme of non-resonance, the studio being draped with five thicknesses of cotton. The studio, therefore, had practically no resonance and, in addition, the time echo was eliminated. This was an important omission, as in an auditorium possessing ideal acoustic properties, musical sounds have a time echo of about two seconds.

The Non-resonant Studio

It was found that the non-resonant studio, in eliminating this time echo, tended to spoil reproduction. It was discovered also that certain draping materials tended to obscure or actually to cut out certain sound frequencies. It was therefore decided to allow greater resonance in the second studio, which came into operation early in 1924. It had four times the capacity of the old studio, but "damping" was only carried out to about a quarter of the extent. The old studio was reserved for speakers chiefly and was very little used for music, while the new studio was used for practically all musical transmissions, vocal and instrumental. The latter studio was draped with one thickness of cotton material, and the results represented a considerable improvement on those secured in the old studio.

Studio Experiments.

Even in the latest studio it is felt that conditions are not perfect. Here adjustable curtains are to be tried and will be used very much on the principle of the photographer's methods of getting light and shade on his pictures. The curtains will work on pulleys and will be controlled by an official from within the studio, being raised to sharpen the echoes or lowered to produce a damping effect, as occasion may require. The new studio will be divided into two sections, one of which can be set for a play while the other section is being used for instrumental or vocal broadcasts.

Two-wavelength Transmissions

The division will also be useful in enabling effects to be transmitted from one section to coincide in point of time with a play which may be in progress in the other section. It may also serve the purpose of enabling transmissions to be made on two wavelengths at some future time. Another and smaller studio will shortly be brought into use for talks only. This will be more heavily draped, in order to secure the essential "damping" effects required for a broadcast speech.

No one at Savoy Hill was surprised at the receipt of complaints from crystal users respecting the non-reception of Daventry programmes in the South-eastern areas, which previously were successful in getting Chelmsford; indeed, it would not have been surprising if complaints had been more numerous than they actually were. This may perhaps be accepted as a testimonial to the efficiency of the apparatus at the new 5 X X.

Blaming the B.B.C.

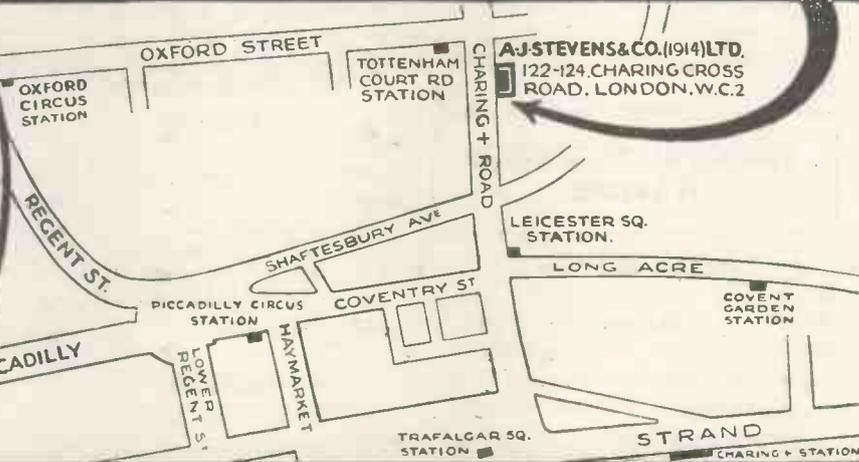
Certain Essex and Kentish listeners have shown a disposition to blame the B.B.C. for the changed conditions, an attitude of mind which can be appreciated but not justified. It should be remembered that 5 X X was started at Chelmsford purely as an experiment, and it was all along emphasised by the B.B.C. that there was no intention of installing a permanent high-power station on that site. The location of Chelmsford rendered it ill-suited for broadcasting to listeners in this country. The radiation covered a large sea area, and much of the potential utility of the station was therefore wasted, so far as British broadcast listeners were concerned.

The Postmaster-General may be assumed to be acting in the interests of wireless generally in co-ordinating the work of the various applicants who claim a right of way in the ether. The wireless services, the Navy, the Army and Air Force, and the inalienable right to the use of the ether by our Mercantile Marine, which depends to an ever-increasing extent on efficient wireless communication, must naturally be taken into account. Hence the necessity of removing 5 X X, when its claim to function became permanently established.

(Continued on page 301)

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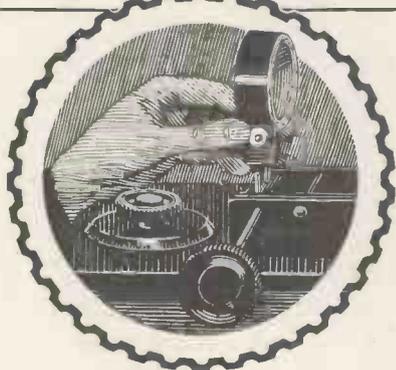
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FLUXITE SOLDERING SET

It is perfectly simple to use, and will last for years in constant use. It contains a special "small-space" Soldering Iron with non-heating metal handle, a Pocket Blow-lamp, FLUXITE, solder, etc., and full instructions. Price 7/6. Write to us should you be unable to obtain it.

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FLUXITE SIMPLIFIES SOLDERING

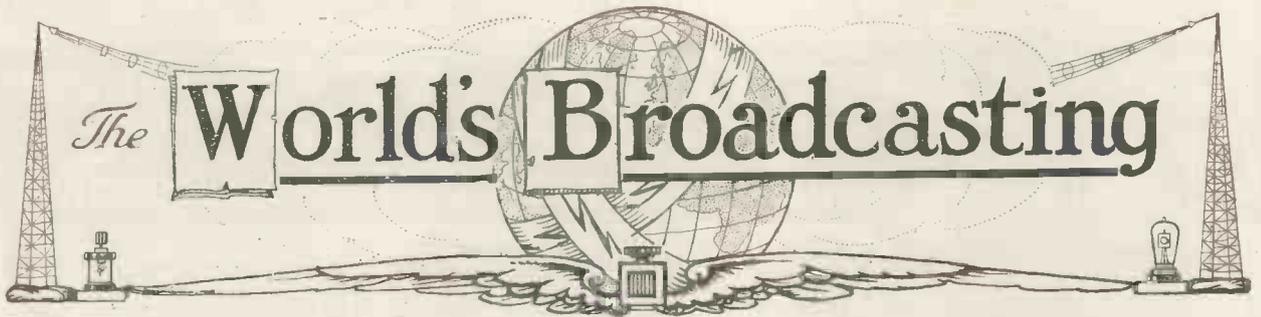
All Hardware and Ironmongery Stores sell FLUXITE in tins, price 8d., 1/4, and 2/8.

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479	Birmingham	5 I T
386	Bournemouth	6 B M
310	Bradford (relay)	2 L S
353	Cardiff.	5 W A
331	Dundee (relay)	2 D F
1,600	Daventry	5 X X
328	Edinburgh (relay)	2 F H
422	Glasgow	5 S C
335	Hull (relay)	6 K H
346	Leeds (relay)	2 L S
315	Liverpool (relay)	6 L V
365	London	2 L O
378	Manchester	2 Z Y
403	Newcastle	5 N O
325	Nottingham (relay)	5 N G
338	Plymouth (relay)	5 P Y
302	Sheffield (relay)	6 F L
306	Stoke-on-Trent (relay)	6 S T
482	Swansea (relay)	5 S X

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345	"Le Petit Parisien"	—
1,750	Radio-Paris	C F R

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418	Breslau	—
275	Cassell (relay)	—
288	Dortmund (relay)	—
292	Dresden (relay)	—
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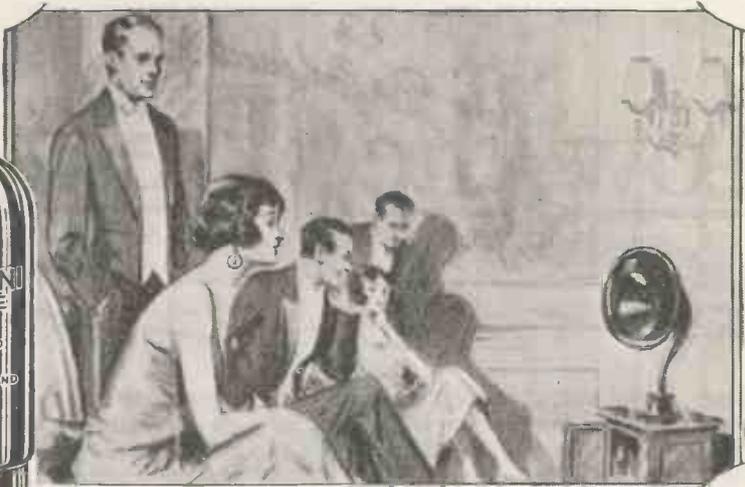
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460	Barcelona (Radio-Catalana)	E A J 13
451	Bilbao	E A J 9
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Your enjoyment of all the wonder and charm that lies in the realm of radio is governed by one thing and one thing alone—the merit of the valves you fit your receiver with. However good your set, valves absolutely rule radio. Whatever clever arguments are produced for valves the test of actual performance is the only true one. Fit Marconi Valves to your receiver and your loud speaker or headphones will prove that in both tonal purity and sound volume your choice has been the right one.

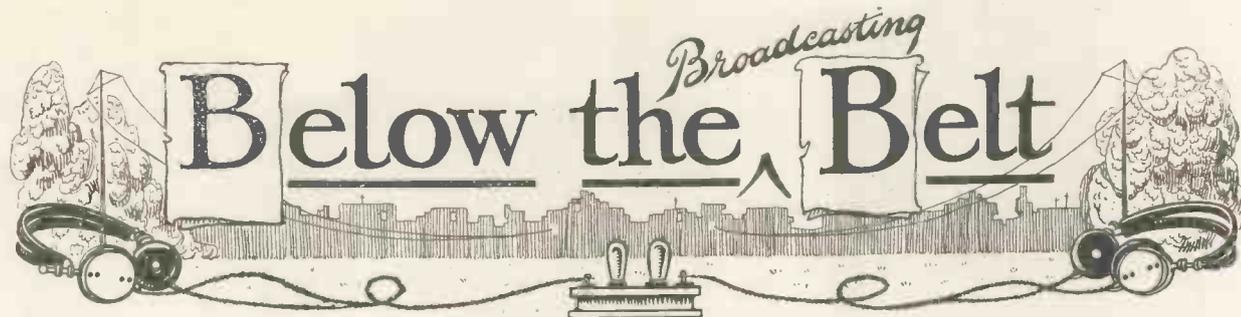


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Announcement of THE MARCONIPHONE COMPANY, LTD.,
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299



WITH the coming of the long evenings and intensive activity on the part of the transmitting amateurs, the great game of "card collecting" is growing in favour. It is not a new game so far as transmitters themselves are concerned, but there are now increasing numbers of receiving amateurs taking part. The rules are very simple. You listen on the wavelength bands where amateur transmitters most do congregate, log them carefully, and then write a post card giving as full particulars as possible.

If you are lucky you get a prompt reply from the transmitter on a decorative card with his call-sign overprinted in colour. The aim is to get as many different cards as possible and they make not only a very fine record of the efficiency of your station, but also contain a large amount of information as to the various types of transmitter, aerial and receiving sets in use.

The transmitter is glad to have your report because it helps him to judge the efficiency of his set. To play the game properly you should have some knowledge of morse. It is not necessary to be a quick reader because transmitters usually send their call signs many times. Do not forget that the call sign of the station called comes first, then "de" and then the call of the transmitting station.

Making Reports

When sending your report make it as full as possible. If you do not know the "R" code of audibility say the signals were "loud," or "very loud" or "faint" or "very faint," or just "comfortable." Give, if possible, the approximate wavelength on which you heard the transmission, and add brief details of your set and aerial. Fading is a problem we are all interested in, and if you notice fading give particulars.

The distance of your station is

useful and, obviously, the farther off a station is the bigger is the score for you. You can find the addresses of transmitting amateurs in one of the many directories now published for amateurs, and you will usually find that the transmitter is most glad to have your report. Personally, I get most useful information from the friendly cards sent in, and always answer them promptly. The wavelengths to listen on are 150 to 200 metres, 80 to 120 metres, and in the neighbourhood of 40 and 20 metres.

The addresses of foreign transmitters are published in some of the directories, and the foreigners are usually most prompt in answering. If you do not know the address of a foreign station and hear him working with a man in this country you can usually get the address from the Britisher.

Small Tube for Short-wave Set Connections

The use of small diameter copper tubing is not a new idea for making connections in short-wave receiving and transmitting sets, but now that such tube can be obtained with ease, many home constructors are using it with very beneficial results in the reduction of the almost inevitable losses when dealing with very high frequencies. The tubing on the market corresponds to about No. 16 gauge wire, and is properly "tinned" to reduce oxidation and make soldering easy.

Besides being most useful for connections, it is the very thing for building "low-loss" coils. It has to be handled carefully, however, as it is easy to injure it and pinch it so that the sides fall together, when part of its efficiency is destroyed.

As most of my readers will know, high-frequency energy travels only on the outside of the conductor. The metal in the interior of a wire is useless from the carrying point of view, and it introduces losses be-

cause some of the energy tries to get down into the interior and surges up and down between the surface and the depth to which it is able to penetrate. This puts up the resistance of the conductor and brings other troubles in its train as well.

The claims made by the original firm that put "Radio Condit" on the market are most interesting. They say that it gives a minimum of high-frequency resistance, a maximum conducting surface with the minimum of capacity, the almost entire elimination of lateral surges, an absence of complex magnetic induction and energy absorption, and they also state that much of the confined internal air column is ionised.

The advantages of most of these claims are obvious, but I must confess that I have not yet worked out for myself the advantages to be gained from the last claim, though I have no doubt that it is a real one.

The Efficiency of Short-wave Sets

The true measure of efficiency in a short-wave set is its ability to tune-in telephony. Anyone can make a set that will receive morse C.W. down to about 20 metres. It is merely a question of getting the set to oscillate and providing a smooth reaction control so that the note of the C.W. can be tuned to best audibility—which is not, of necessity, tuning the note to its loudest.

The reception of telephony, of which there is now a very large amount on the 150-200 and 80-120 metre bands, is altogether a different proposition. To be heard at its best and clearest, telephony must be tuned-in with the set in a non-oscillating condition. Those oscillating fiends who tune-in broadcasting by getting on to the "silent point" where the beat notes of the transmitting and receiving sets are obliterated, are quite at a loss with

(Continued on page 302)

At 2, Savoy Hill, W.C.2.

(Continued from page 296)

Unavoidable Sufferers

In locating the new 5 X X north of a line drawn from the Severn to the Wash, the B.B.C. realised that crystal users who had hitherto been able to receive strong signals from Chelmsford with the aid, in many instances, of indifferent apparatus, were bound to suffer. Although the Company is anxious to provide a service for everyone who wants to listen to broadcast programmes, particularly in those parts of South-east Essex and North Kent where the Chelmsford programmes were heretofore received in comfort, listeners are counselled to await a thorough examination of the results of the work of Daventry before suggesting further new stations or increases in power. It may, however, be taken for granted that Savoy Hill is carefully watching the situation, and will act in the best interests of listeners, with due regard to national interests, at the proper time.

Australian Broadcasting

WHAT is claimed to be the world's most up-to-date station is nearing completion on the roof of the State Government Insurance Buildings at the corner of George and Elizabeth Streets, Brisbane, Australia (writes our Australian correspondent).

The station is to be wholly built in Australia by the Amalgamated Wireless Company of Australia and the Works Department.

The aerial system used will be a squirrel cage L-type, but no earth will be used, a counterpoise being employed.

The station will broadcast with the power of 5,000 watts on the wavelength of 385 metres, and it is hoped that many English amateurs will try for 4 Q C. R. S. R.

WHAT are known as doughnut coils are being used a lot in the U.S.A. Probably because no currant is required with that type.

NEW YORK is supposed to be a bad spot for D X. And for X X X, if the prohibition agents are to be believed.

Amazing Autumn Offer

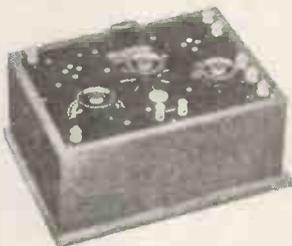
Till October 15th we are offering two particularly fine wireless bargains at 33% below their usual prices. The Little Giant, a most efficient All Station Two-Valve Set which is also capable of operating a Loud Speaker, is priced till that date at £3 15s.

The Fellocryst Super, a most useful crystal set is priced at 20/-. The cost of both sets complete with all accessories is also correspondingly low. Every set is fully guaranteed and tested.

Fill in the coupon below and post it to us with your remittance. We will then forward you the goods requested, packing free carriage forward, on Seven Days' Approval. If at the end of that time you are not fully satisfied with the set, send it back to us, carriage paid, and we will refund you your money in full.

LITTLE GIANT ALL STATION TWO-VALVE LOUD SPEAKER SET **£3 15 0**

Inclusive of Marconi Royalty.
Usual Price £5 15s.



ACCESSORIES AND EXTRAS:

6-v. 20 A.H. Accumulator 20/-
H.T. Battery 9/-
2 Louden Valves 9/-
Aerial and Insulators 3/6
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SET COMPLETE **£6 15 0**

inclusive with Fellows Junior Loud speaker and all accessories and extras as detailed above.

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FELLOCRYST SUPER **20/-**
Usual Price 29/-

The Fellocryst Super, is mounted in a handsome oak case. It is reliable, efficient and easy to operate. With the addition of a suitable Fellows loading coil, it can be tuned to Daventry's wavelength.

SET COMPLETE **33/6**

with Headphones, Aerial and insulators, absolutely ready for use. Usual Price £2 10s. 6d.



Save 6/8 in the pound. Send for Special Catalogue.

To THE FELLOWS MAGNETO CO., LTD.,
Cumberland Avenue,
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Herewith Remittance value.....

Please forward me.....

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on conditions as per your advertisement.

Name.....

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W.M.O. This coupon is not available after October 15th.
Please write clearly in Block Letters and register Cash or Treasury Notes.
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BELOW THE BROADCASTING BELT (Continued from page 300)

short-wave work because the "silent point" is so very small that it is almost impossible to find and hold it. The result of this method is also that the operator defeats his own ends.

The Only Remedy

The only thing to do is to so carefully adjust reaction control that the set can be brought just up to the point of oscillation, and no more. Then it is in its most efficient state with regard to the reception of telephony. But to build such a set is not an easy task as stray capacity must be reduced to its very minimum. I have recently been experimenting with a set that gave a great deal of trouble in this respect. It was most excellent on C.W. morse and would receive right down to below 10 metres; but it was no earthly good on "fone" even as high as 250 metres, which was the upward limit of the set.

After much investigation the fault was found to be in a variable grid leak of American make. This contained a very large amount of metal and was found to be introducing any amount of stray capacity coupling. The removal of this gadget and the substitution of an ordinary fixed leak improved telephony reception out of all knowledge. Its effect on C.W. reception was curious. It seemed to reduce the strength of many well-known stations somewhat, but it brought in many distant stations that had never been heard before.

The Grid Leak

Of course, if your set will not receive telephony it is not sure that you will find the remedy in changing your grid leak. But look for any big mass of metal and cut it out. And keep your tuning condensers as far as possible from your inductances. Of course, you will have started with the idea of cutting down stray capacities to the minimum, so all leads will follow the shortest paths and will be well-spaced.

On short-wave sets it is as well to discard appearance and use as little solid dielectric in the way of ebonite mounting panels as possible. The minimum of ebonite that must be used for supporting condensers, etc., is all that is required and all that should be used. Condensers should be of the very best construction and have low losses.

"Blind Spots"

And now a few words on the subject of "blind spots." These are not the blind spots of which we used to hear so much at the beginning of the broadcasting era; but blind spots in receivers on which the set will not oscillate and on which nothing can be heard, save, perhaps, very loud telephony. The wavelength of the aerial is a factor in causing these blind spots and to eliminate them the wavelength has to be shifted. There are various ways of doing this. One is by putting a small air-spaced condenser in the aerial lead. Another is by removing the earth connection from the set and yet another is by putting a small air-spaced inductance in the aerial lead.

The Aerial Condenser

The aerial series condenser, unless it is very carefully adjusted, is likely to result in a very considerable reduction in signal strength. Removing the earth lead has the same effect. The aerial series method of removing blind spots can be made to work very well, however. On some sets it is possible to put in a good variable condenser of .0005-microfarad maximum capacity and tune with it until the best result is obtained. This will usually be found to be at somewhere near half setting on an average P.M.G. aerial.

A very cheap way of experimenting with this method is to attach a length, say a foot, of rubber covered flex to the aerial terminal of the set and tying the aerial lead-in to it. This acts as a small condenser because the only path for the H.F. energy from the aerial to the set is by way of the capacity between the two wires, the aerial lead not being attached to the set. The length of the two leads in contact can be adjusted until best results are obtained.

But the best way is to put in a series inductance. This can consist of about ten turns of bare copper wire four inches in diameter. One end is attached to the aerial terminal of the set and the aerial lead is clipped on to different turns until the required result is obtained. In my experience this method removes the "blind spot" without cutting down signal strength and is preferable to either of the other methods.

By the way, it is often possible to obtain the same result by reducing the number of turns in the "fixed tune" aerial coupling coil. By using only two or three turns in this "pick-up" coil, even on 200 metres, blind spots may often be completely eliminated without any extraneous devices. It is a question of discovering the method which best suits your own set.

A New Idea in Tuners

The other day I was shown a most excellent short-wave tuner for the band between about 25 and 100 metres. Of course, it was not really new, because it was a variometer; but it was the very first time I had seen a variometer used for really short-wave reception. This variometer was "ball" wound with enamelled copper wire of either 16 or 18 gauge and was, of course, air-spaced between turns. The stator was just over three inches in diameter and the rotor about 2½ inches. There were twenty turns on the stator and sixteen on the rotor.

To my mind the great ingenuity of this tuner was that the variometer had been adapted to the Reinartz circuit and provided with both an aerial pick-up coil and reaction. The reaction coil was tuned in the usual Reinartz way with a series condenser connected between one end of the coil and the common negative.

It consisted of only a few turns of thin wire wound round the supports of the stator. The aerial "pick-up" was a three turn "helix" that could be variably coupled with the variometer. The tuner was most efficient and brought in telephony wonderfully.

Variometer-tuning for short waves seems to me the right thing because the condenser capacity, which is always a disadvantage, can be removed completely and a larger inductance used with all its consequent advantages.

5 Y M.

A BARRISTER says that a loud-speaker is not a nuisance in law. It's more likely to be a mother-in-law. An Englishman is using wireless to teach English to the Viennese. Perhaps some benefactor will discover a way of using it to teach the language to some of the American visitors over here.

THE
MAGAZINE
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TO DAY
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Yesterday—to-day—and to-morrow—the experiences of yesterday in the light of the knowledge of to-day point clearly to the practices of to-morrow. (See the *Climax Magazine Catalogue*.)

The Climax Radio Earth (Prov. Pat. 17653)—the low loss direct tubular earth. Far better than the old-fashioned water-pipe or gas-pipe earth. Provided with flanges which break up the earth around the tube, thereby preventing any rocking of the tube in the ground. In addition the surface projections provide water courses, making perfect electrical contact. Ready to use. Easily fitted. Maximum efficiency. Length approx. 30 in. Price 5/-
Climax Insulated Low Loss Earth Lead, 20 ft. Price 1.8

The New Climax Aerial Insulator. (Registered Design No. 708718.) Stands four times the flash over voltage. Far less capacity to earth. Will stand a direct pull of hundreds of pounds. Entirely non-hygroscopic. Cannot absorb moisture even if fractured. **INSULATES PERFECTLY DURING RAINFALL.** Self-cleaning on all surfaces. Price per pair, 2/6

The Climax Insulated Shock Absorber Set.

Comprising set of 4 Climax low-loss Aerial Insulators and 2 Climax Aerial Shock Absorbers. 3/- per box. If you believe in metal—and who does not?—use exclusively Climax Rheostats and Potentiometers. They are wire-wound on metal-cooling cores with vitreous enamel insulation.

Climax Rheostats, 6 ohm pattern for one, two or three bright valves 3/- each.

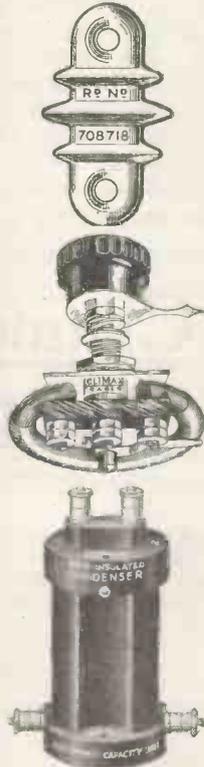
Climax Rheostats, 30 ohm pattern, universal pattern for D.E.E. or bright valves 4/- each.

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Climax Resistance Capacity Unit for L.F. Amplification.

A new convenient design of resistance capacity coupling unit embodying the Climax fixed Mica Condenser, the Climax Wire-Wound Anode Resistance, and the Climax New System Grid Leak. Each item is readily replaceable and interchangeable, so that the discriminating user has complete freedom of control. Price, 12/6

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A set with a highly efficient tuning system, giving remarkably close coupling, wide wavelength variation, fine tuning and selectivity. Fitted with the Climax superb crystal and cat-whisker, which is designed on an absolutely new principle to give at every point a setting of maximum efficiency without skill or care in operation. Exceptionally fine finish on all parts is a distinctive feature. Price for wavelengths 300-500 metres 12/6
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Cooled Rheostats. Obtainable in 2, 3 and 4 valve sets.
Prices, £4 15 0 + £1 5 0
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For the WIRELESS BOOKSHELF

"Loud-speaker Crystal Sets"

THERE are those amateurs who contend that the humble crystal has never received the attention to which it is entitled and that a crystal set to-day is not quite the efficient instrument it ought to be.

While there is possibly some foundation for such an opinion it cannot be said that the crystal has been altogether neglected. *Amateur Wireless* has, since its inception, always catered to a large extent for the user of the humblest of receivers, and many highly satisfactory receivers of this type owe their existence to the efforts of that journal, the outcome of which are contained in "Loud-speaker Crystal Sets," the new "Amateur Wireless" handbook (published by Cassell and Co., Ltd., London, price 2s. 6d.).

Details and working instructions for many highly efficient sets are contained in the publication, which is profusely illustrated.

Included in the book also is a full explanation of the "A.W." loud-speaker set, together with information and working drawings that will

enable the merest novice to construct this well-known instrument. It may be added that since the first announcement of this crystal loud-speaker circuit further experiments have been carried out, the result of which are given in the book.

"Talks About Wireless"

Inspired by many years of study and research on the part of one whose name is a household word in the world of science, "Talks About Wireless" (written by Sir Oliver Lodge and published by Cassell & Co., Ltd., London, price 5s.), is a book that traces the history of wireless from the earliest days. It is questionable if any man, other than the author, could have made such a book so entertaining and devoid of technicalities.

Being, as he is, one of the pioneers of the science, Sir Oliver Lodge, is one of the few living men who are able to carry us back to the days when broadcasting was an undreamed-of proposition.

Coming to the present time, the author has much to say of the present system of wireless communication. His history of the science and the valuable data and explanations of the *modus operandi*, are treated in a way we should like to see more universally employed. Simplicity has been his watchword and our thanks are due to so eminent an authority for such clear and concise definitions.

Catalogues and Pamphlets

Radcom components are fully described in the catalogue issued by Radio Components Ltd., 19, Rathbone Place, London, W.1.

A set of six humorous postcards on wireless terms may be had from A. Rist, Ltd., Waveney Works, Lowestoft, price 6d.

A booklet illustrating cabinets for sets of all descriptions may be had from Carrington Manufacturing Co., Ltd., 18-20, Norman's Buildings, Mitchell Street, Central Street, London, E.C.1.

Hellesen batteries are fully described in a circular obtainable from A. H. Hunt, Ltd., H.A.H. Works, Tunstall Road, Croydon, Surrey.

A folder describing the Watmel variable grid-leak may be had from Watmel Wireless, Ltd., 332A, Goswell Road, London, E.C.1.

A leaflet describing Siemens' batteries will be sent on application to A. J. Dew and Co., 33-34, Rathbone Place, Oxford Street, London, W.1.

The latest catalogue of Igranic wireless accessories may be had from Igranic Electric Co., Ltd., 149, Queen Victoria Street, London.

The British Thomson-Houston Co., Ltd., Newman Street, Oxford Street, W.1, have just issued a booklet describing Mazda House and its products.

Autoveyors, Ltd., 84, Victoria Street, Westminster, S.W.1, have issued a brochure containing full particulars of their specialities.

Is Crystal Research Neglected? (Continued from page 266)

In the meantime the serious experimenter may materially increase the effectiveness of his crystal set by observing the following points. The essentials for "super" results are:— The longest and most effective aerial possible under the Postmaster-General's regulations; the most effective earth, in the form of a buried plate, or better still, a series of buried plates (the usual water-pipe connection is an excellent makeshift and good enough for all ordinary purposes, but not for serious experimenters who seek long ranges); the finest crystal obtainable, a condition which can only be satisfied by repeated trials; an inductance wound with a heavier gauge of wire than is customary in crystal sets—not smaller than No. 18 gauge and preferably larger, even though its bulk offends the artistic eye (after all it is not beauty that is sought, but effectiveness); and perfect insulation, or insulation as nearly perfect as is humanly and mechanically possible, in order that every conceivable source of leakage may be eliminated.

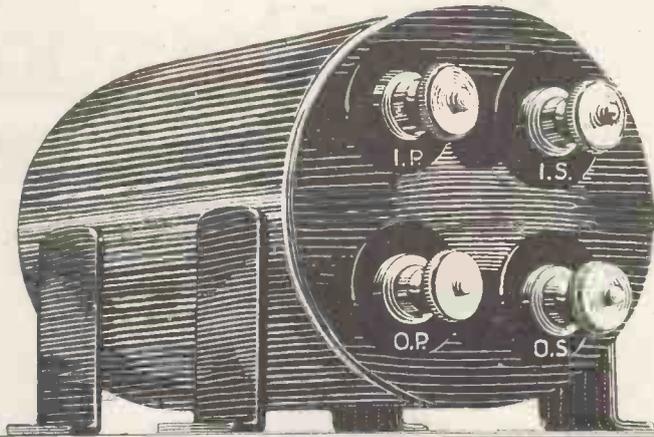
A Chance for the Amateur

Here, surely, is good work for the ambitious amateur, who should not forget that no less eminent an authority than Dr. Eccles has declared that "the most valuable work accomplished in the field of experimental wireless telephony has been achieved by the amateur for the sheer love of the pursuit." Dr. Eccles even went farther than this, for he averred that "if wireless investigation, invention and design had been confined strictly to commercial firms for its development, it would be in a position less advanced than it is to-day. The tendency of the commercial world is to resist the inconveniently rapid introduction of new ideas."

On this note we may confidently leave this fascinating subject to the amateur himself.

A GOLF CHAMPION found himself practically speechless before the microphone recently. Quite natural—there ought to be a special type of microphone made for the kind of language that golfers use.

Announcement of Portable Utilities Co. Ltd., Fisher St., W.C.1



Eureka introduces three new models:

FOR the past two years Eureka has been accepted as the finest Transformer that money can buy. It has always been selected by those to whom quality of reproduction is the first essential. Owing to its unique principles of construction and the immense amount of fine copper wire involved, it is of necessity high-priced. As a result, although coveted by every discriminating amateur, not everyone can afford to buy it.

Six months' work in our extensive laboratories has now enabled us to reproduce for the first time in the new Eureka Baby Grand a worthy competitor of the famous Concert Grand. The same quality of workmanship—the same freedom from breakdown—the same high-grade materials—the same purity of tone—still the same Eureka but in a smaller size.

No longer is it necessary for you to accept an inferior substitute because the Concert Grand is beyond your means—choose the Eureka Baby Grand and you are guaranteed the same Eureka standard of quality

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A new and inexpensive first stage Transformer embodying all the well-proved Eureka principles. Unconditionally guaranteed. Price 15/-

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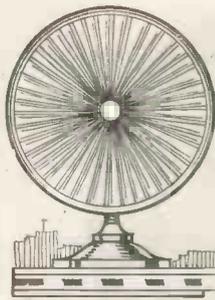
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Don't experiment—specify Eureka

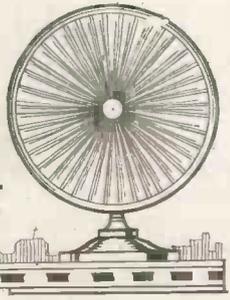
EUREKA

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Questions Simply Answered



Unsatisfactory Crystal Reception

Q.—My introduction into the mysteries of wireless reception has resulted in disappointment.

I purchased a cheap crystal set and, as a preliminary, erected an indoor aerial, but all I can hear with any degree of certainty is the time signal transmitted from Big Ben by 2 L O. I am roughly five miles from this station's aerial. My reason for getting a cheap set was so that I might be guided in my choice of a good set later. Can you advise me?—B. P. (Hammersmith).

A.—An unaided crystal receiver is not ideal for telephony reception, even under the best conditions. To obtain fair results you must use a good high outdoor aerial. You are also advised to invest in a good pair of phones of reliable make, as upon these much depends.

Ensure a firm and clean earth connection and link up the set to earth with low resistance copper wire at least as thick as that used for the aerial.—L. A. C.

Grid Bias and Distortion

Q.—Exactly how does the introduction of grid bias obviate distortion and improve amplification in an amplifier?—J. McM. (Banffshire).

A.—Strong signals reaching the grid of an amplifying valve are liable to make the grid so positive as to cause grid current to flow.

By inserting a negative bias the curve is moved bodily to the left, thus minimising the possibility of grid current flowing, and the addition of extra H.T. increases the length of the straight portion of the curve, permitting a greater variation in plate-filament current.—S. C.

Eliminating Interference

Q.—As I am within five hundred yards of 2 L O's aerial I wondered if I might build and use the 7-valve super-heterodyne receiver to receive other B.B.C. stations whilst 2 L O is working. Do you think this at all possible?—W. H. D. (London).

A.—It is impossible to guarantee any receiver to be able to accomplish this. The receiver in question is certainly intended for selectivity of tuning, but we are afraid you are a little too near to 2 L O to expect satisfactory reception from other stations.

A great improvement would be to enclose the complete receiver in a copper container or screen. This will eliminate reception due to induction. Results depend largely upon the operator.—C. M. N.

Working to Set Plans

Q.—I have a distinct aversion to working to plans of wireless sets as designed and published in several of the many wireless periodicals. Up till now, however, I have not deviated from the instructions merely because I have been loth to endanger the efficiency of the set under construction. Is it essential to follow all instructions implicitly?—F. R. (Dunkirk).

A.—There is no necessity to adhere in every way to the actual layout of the panel, design of cabinet, etc., but the wiring, spacing and values of the components should be followed in every case.

On no account should a set be altered to fit into a smaller panel.—R. T.

Tropadyne v. Super-het

Q.—What advantages has the Tropadyne over the Super-heterodyne receiver?—F. T. (Cornwall).

A.—The Tropadyne receiver may be used in conjunction with an outdoor aerial with little or no danger of re-radiation; thus no interference will be experienced in near-by receivers. It is also a little more selective in tuning

than the super-heterodyne receiver, this being a great asset.

Apart from these two considerations they give much about the same results.—L. A. C.

Short Aerials

Q.—I wish to erect an efficient aerial, but as the length will be limited to thirty feet I should like your advice before wasting money in needless experiments.—M. E. (Bury).

A.—Where space is very limited, as in your case, a double-wire aerial is certainly advised.

The wires should be spaced at least six feet apart and the free ends left "open," whilst the down leads should be joined to each other at the point where they reach the lead-in tube.

If a crystal set is being employed, it may be found an advantage to use three wires, provided that they are well spaced, but with a valve set, two wires should not be exceeded.—Q. C.

Reflex or Straight-circuit Receivers

Q.—I wish to build a receiver which will combine purity of reproduction with maximum efficiency and should be obliged if you would advise me upon the subject. Should I use a reflex or a straight-circuit receiver? I do not require a plan or circuit diagram.—T. R. (Malden).

A.—There is no doubt that the reflex receiver has at least one advantage over the ordinary straight-circuit receiver, but for purity of reproduction the straight-circuit is best.

Generally speaking, a valve may be made to perform one duty much more efficiently than two, so that we have no hesitation in recommending the straight circuit for your requirements.—M. C.

Cutting Out Generator Hum

Q.—I have made up the set (with refinements) "as good a set as money can buy," and get perfect results except during the hours 7 p.m. to 10 p.m.

During these hours the generator at a near-by cinema causes terrible noises in the loud-speaker which completely blot out signals.

How may I overcome this difficulty?—E. M. J. (Bangor).

A.—Any one, or all, of the following should be adopted according to the extent of the interference experienced.

Fit and use a counterpoise earth in place of the orthodox earth.

Use loose-coupled aerial tuning. Screen and earth the iron core of each L.F. transformer to the counterpoise.—C. T. M.

YOU CAN'T SOLVE IT ?

You don't know to where that connection should go or why your set works well one day and badly the next ?

Well, why worry ? We keep a staff specially to solve such problems as yours. Let them have your queries so that they may give you the benefit of their long and varied experience.

Replies to queries of general interest are published each month on this page, but every querist is answered direct by post.

Please observe the following conditions :

Ask one question at a time ; write on one side of the paper only ; attach to your query the coupon on cover iii, and send it with a stamped addressed reply envelope to : The Editor, "The Wireless Magazine," La Belle Sauvage, London, E.C.A.

Remember Our Query Service is Free!



Accuracy!

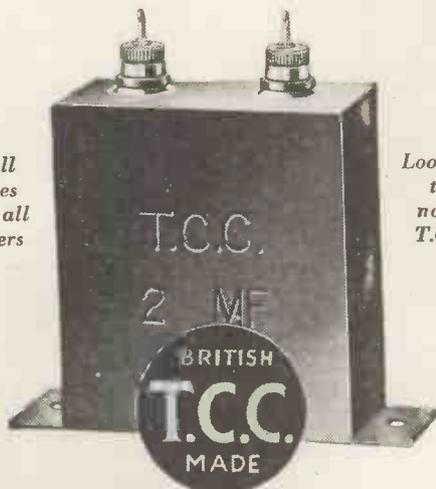
IT is twenty years since the first T.C.C. Condenser merited the approval of the electrical industry. When Wireless loomed ahead—we, as the largest condenser-building specialists in this country—were quick to realise its immense possibilities.

New plant was laid down—factories were extended—but still the demand for the familiar Green Condenser exceeded the available supply. Under such circumstances, any other firm might have been tempted to relax some of the restrictions which govern the quality in an effort to speed up production.

But twenty years of manufacturing experience have proved the wisdom of keeping faith with the public. A condenser for wireless use—nine times out of ten—is bought on the reputation of the maker. We are proud to think, therefore, that within the last three years many hundreds of thousands of T.C.C. Condensers have been chosen for the most strategical points of the Receiving Set.

The Improved T.C.C. Mansbridge

Every T.C.C. Mansbridge Condenser is now being fitted with the new Duplex terminals, which can be used as soldering tags or to hold connections by means of their knurled heads. The top of every Condenser is now *all-metal*, which is, of course, quite impervious to the heat of the soldering iron or the action of the atmosphere.

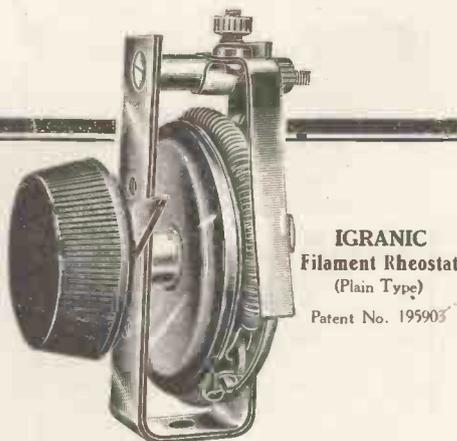


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Igranitic Rheostats, remarkable for their extremely smooth action, critical control of filament current and absolute reliability, are particularly valuable components for the wireless enthusiast engaging in experimental work.

These filament Rheostats are constructed for panel mounting and can readily be adjusted for panels of from one-eighth to one-half an inch in thickness. Positive travel stops are provided so that the main Rheostat body comes to rest at zero and at full resistance positions. The Igranitic Rheostat for bright emitter valves is made in two types, vernier and plain. The vernier type is recommended for detector valves. Both are supplied with 4, 6, 8, or 10 ohms resistance as required.

The Igranitic D.E. type filament Rheostat is suitable for controlling all types of dull emitter valves. It is smoothly and evenly variable over its whole resistance range, and permits of very fine adjustment.

IGRANIC RADIO DEVICES include:

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All carry the IGRANIC guarantee.

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RUBBISH! You can build the famous P.P.V.2 de Luxe from childishly simple instructions in **RADIO PLAN No. 6.** Radio Plans tell and show you everything. Every wire, every connection. No complicated diagrams, but an "easy-as-easy" system a child can understand. Over 500,000 amateurs have succeeded in making our ultra powerful long range loud speaker circuits such as this

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 which works a loud speaker at 40 miles, and enables you to **Sweep Europe for your Programmes**
 Two valves and just a few ordinary, inexpensive parts.
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Please send for List of F.E. Wireless Publications. Everything in simple circuits for the amateur constructor. Post free on request.
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MORRIS SOLID OAK STANDARD CABINET WITH LOCKS,
 to lock up any set and batteries with panel up to 36" x 18"
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22" wide inside	£4 15
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2-VALVE AMPLIFIER, 35/-

1-Valve Amplifier, 20/- both perfect as new; Valves, 4/6 each; smart Headphones, 7/6 pair; new 4-Volt Accumulator, celluloid case, 13/-; new 60-Volt H.T. Battery, guaranteed, 6/-; 2-Valve All-Station Set, £24.
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HEAVY GAUGE VALVE WINDOWS
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 PRICE 6/- EACH N.P., PB. OR BLACK IN PACKETS

Continental Notes

"SWEATY work, this!" muttered the College Youth, as he folded back the tent flaps, in the early morning prior to the usual daily "clean up."

You see, we are still on our holidays, out here, far up in the hills, about 15 miles N.E. of Cologne. We have been blessed with perfect weather and more than our allowance of sunshine. The sudden arrival of sundry nephews and nieces out from home compelled us to erect three bell tents, and the College Youth and I were luckily allotted to one of them. Bedding *qua* bedding was unobtainable from the village—a matter of three miles distance—but blankets, rugs and dolly cushions were at hand: as the weather was fine and warm we fared well. Three or four boards, scrounged from the barns, grain sacks, filled with clean straw or hay have provided the necessary palliasses and personally, I must admit that my sleep has been sounder and dreams sweeter under canvas than on many other nights since the great war.

Our Temporary Aerial

We have erected a temporary aerial—made of thin insulated copper cable and slung between two lofty pines with a lead-in straight through one of the tent ventilators. For an earth—we have the earth. Results are all that could be desired. The College Youth and I share the tent, and I greatly fear that our hurricane lamp is the last one to be extinguished at night as, when all is quiet with the farm at rest—usually about 10 p.m.—we connect up and set the dim lamps glowing. We do not tie ourselves down to a schedule, nor do we consult any programmes but merely roam through the ether, following up, as we gently twirl the condensers, every squeal, every rustle in an endeavour to resolve all carrier waves.

Luck must be with us—or is it due to our favourable site near the brow of the hill?—for we pass from morse to jazz, from time-signal to orchestra, from news bulletin to lecture. Many lands fall to our cast and we only dwell

long enough over each capture to identify its origin. And so, well into the late hours of the night or early morn when distant voices can be heard, when music can be received without a too heavy accompaniment of mush and atmospherics.

Morning Exercise

On some days, when feeling particularly energetic, we have tuned-in Berlin at 6.30 a.m.—a ghastly hour in town—and switching on the loud-speaker have endeavoured to carry out the physical exercises—which the Vox Haus studio broadcasts for the benefit of adipose and overfed citizens of the German capital. His orders, although somewhat alleviated by a musical accompaniment, come through in the strident tones of a grumpy sergeant-major, and it is easy to imagine the groans and other unsympathetic noises made by the conscientious Berliners who, by the order of their better halves, are compelled to improve their contour!

"Sweaty work, this!" mutters the College Youth every morning, as he folds back the tent flaps, although we take the orderly work in turn. In very sleepy tones he grumbles incessantly as he slackens the guy ropes, rolls up the skirting and tosses out the straw sacks to be aired on the grass, and just as regularly, every morning, although we consider that we are early birds, peasants from the neighbouring hamlet are already astir and cluster around our little camp, never having seen—so they tell us—civilised beings, who, of their own free will, prefer an airy tent to a stuffy farmhouse loft or barn.

On some evenings, by means of the loud-speaker—and by the aid of 5 X X, we have treated the local yokels to the Savoy Bands. It is difficult to explain to these simple people that the music is "trapped" through the wire on the pine trees, and that they are actually listening to an orchestra some 400 miles away. They appear to realise that it is not a gramophone, as they see no records, but very little

(Continued on page 310)

In writing to advertisers, please say you saw the advertisement in THE WIRELESS MAGAZINE.

When the Filament Sags

MANY an old valve is passed out of service with its electrodes still intact. Most valves meet their end by a filament burn-out, but in many cases they become useless owing to the sagging of the fine wire, which eventually comes into contact with the grid. It is often quite possible to effect a cure in these cases.

Effecting a Cure

A method which is frequently successful is the following: Connect the valve to the accumulator by means of flexible leads and hold it in the left hand so that the bowed side of the filament is upwards. Tap the bulb gently on the upper side to see whether it is possible to induce the filament to leave the grid.

If this has no result let the valve remain for some hours in the position suggested, with the filament heated to rather a high temperature. It will often be found that it tends to sag in the opposite direction and so frees itself from the grid.

J. H. R.

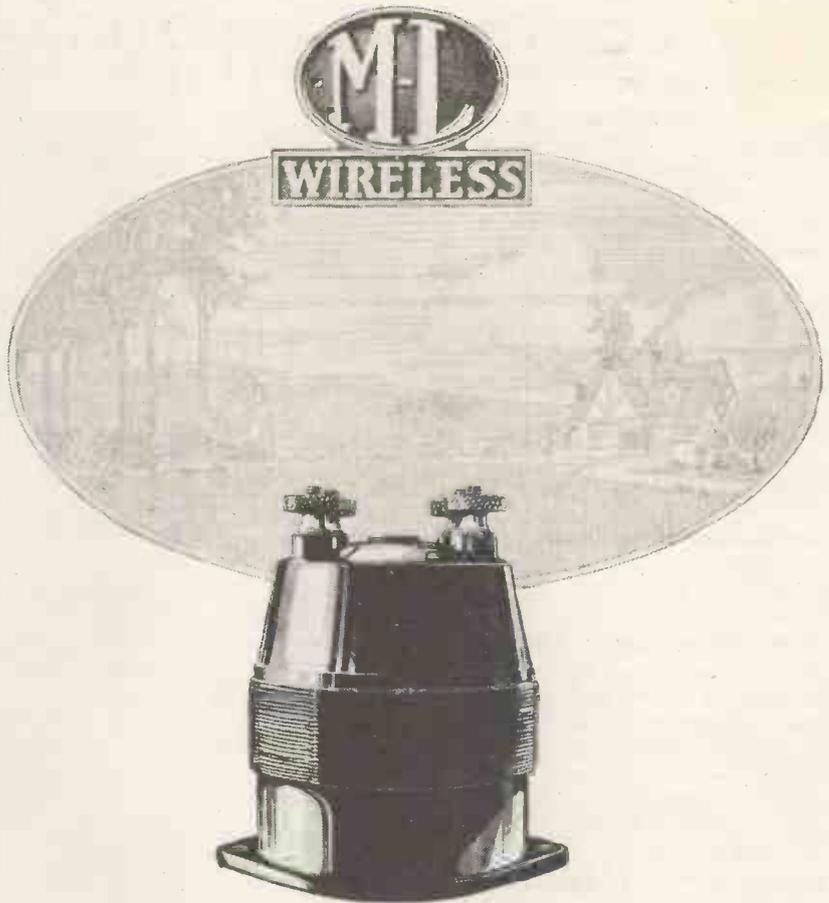
Becoming a Wireless Doctor (continued from page 284)

valves and H.T. battery and warning him to leave all the other controls severely alone. A goodly number of the more expensive sets installed in large mansions are connected up to a small frame aerial, and tuning on them is, of course, frightfully critical. Many owners of these sets spend hours trying to tune-in anything at all, at the same time disturbing other listeners-in by their violent oscillations.

A few minutes' instruction will usually suffice to give the owner a fair idea of how to tune-in correctly. In the majority of cases it will be found that people are only too willing to learn how to use their sets properly and to get the best results out of them. There is, of course, the usual type of theorist who knows (in theory) exactly what is wrong with his set and is usually annoyed because you diagnose the fault differently.

A. W. H.

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Verb. Sap.

WE have tried practically every transformer on the market and your transformers certainly are by far the best, both for ordinary use and for Power Amplification and, what is very important, they are the most convenient for mounting.

"Their chief advantages over others are strength, clearness of speech and music, and entire absence of howling even when placed very close to each other.

"In the hands of amateurs, they should also be splendid for their freedom from self-capacity effects."

In these words a prominent West London Wireless Firm gives its unsolicited opinion of the M-L Low Frequency Transformer. Their satisfaction can easily be shared by you—M-L Transformers only cost 25/- each, and the name "M-L Wireless" appears conspicuously on the container.

The 1:6 ratio is used for amplification after a crystal rectifier. The 1:4 ratio is used for single stage L-F Amplification. The 1:2.6 and 1:4 ratios are used respectively in the first and second stages of two-stage amplification.

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CONTINENTAL NOTES (Continued from page 308)

more. Does it matter? No, dance music is dance music all the world over and although their clumsy steps do not fit in with the fox-trots and blues, they waltz or polka to the merry strains. In the intervals, with exclamations such as "wundervoll" or "unerhoert," they press their faces through the opening to get a glimpse of the magic box and of the little lamps which dimly illuminate the darkness of the tent.

In Touch with the World

During the day we have plenty of transmissions which we can tap. The ether is vast and we poach on everybody's preserves. At any time we can pick up something, as there are so very many stations from which we can select items, and we turn to our receiver at all odd moments in the twenty-four hours. Although, to a slight degree, geographically isolated, we are always in touch with the world, and our news service is perhaps more exhaustive than if we were within easy reach of the morning, lunch, 6.30 or final editions—we can absolutely rely on two sources of information as to daily happenings in all European countries, namely LP (Koenigswusterhausen) and 5 X X (Daventry).

A Conscientious Announcer

Throughout the day Wolff's Bureau (Berlin) drones out, on 2,525 metres, news items for the benefit of the German Press. The announcer is a conscientious man, for all proper names are twice repeated, preceded by the warning "Achtung," and actually spelt out letter by letter in a similar way to that adopted by the telephone operators at home. We have almost learnt by rote the German equivalents "A for apple," "C for Charlie," "T for Tommy," and the College Youth expresses the opinion that listening to this news transmission reminds him of nothing so much as some of the rotten hours he has had with the German Master at school.

But 5 X X is always breathlessly awaited, and his face lights up as he hears the tuning signal, for shall we not hear the latest cricket scores?

Daventry's motto should be "Ubique." Take the 10.30 a.m.

weather forecast. It has been of great use to us and all our plans for outings have been based on the reports received. I made a point of getting it every day and the news soon got about. A local farmer came towards me one morning as I emerged from the tent. He touched his cap.

"And what says one to the weather in England?" he inquired. I gasped. "I dare not repeat the language," I replied, "but were I to do so I greatly fear that I should be misunderstood." This in my most precise German. "I believe the Herr has not grasped the question. With your lamps you can hear what weather prevails on the English coast, in the Channel, in the North Sea." (He called it the German Ocean, but I didn't trouble to contradict him.)

"What do the English forecast to-day?" I told him. "When you return you must tell them how useful the information has been found in this district. We are privileged—as the Englishman who lives at the house on the hill tells us, as we pass his door every evening. With this forecast and our knowledge of local conditions, we are well prepared for all emergencies. I thank you." He departed.

An Uncanny Fact

It seems uncanny that the local smallholders should receive their weather reports from London and that they should, as appeared to be the case, set the family alarm clock to the chimes of Big Ben. And yet—so it is. The opening of 5 X X, first at Chelmsford and later at Daventry, has not only served its purpose in the United Kingdom but has generously conferred benefits on innumerable inhabitants of scattered villages in foreign lands. Big Ben, to them, to-day, is a household word; it does not represent the chimes of a clock in the Victoria Tower but the voice of London. It has become to the foreigner as much an institution as Piccadilly Circus or le Square de Trafalgar.

Further, to the Frenchman, the German, the Belgian or the Swede, there is only one orchestra in London—the Savoy Bands. We must be a jolly, light-hearted, light-footed

nation, from what I hear on this side, as in the opinion of foreigners the only music we broadcast is that of the fox-trot, blues and one-step. When, apart from Spain—a night bird!—other nations have retired to rest—the Savoy comes into its own and from our shores, the sounds of the saxophone, double piano, banjo and the many other weird instruments which go to make up the orchestra, cross the Channel and North Sea to drift into the out-of-the-way houses in all parts of the European continent.

An international language? Esperanto, forsooth! Why, Big Ben and the Savoy Bands have languages of their own and are understood by all.

JAY COOTE.

RIPPLES

WIRELESS organisation is said to be upside down in Italy. Like this:—
Wireless organisation

ABBREVIATIONS play an enormous part in wireless communication, says a reader. Yes. We often tell our next door oscillator to go 2 L.

WITH the rapid growth of wireless, old maids are finding that cat-whiskers are far more useful to keep in the house than cats.

ELECTRIFIED railway lines are said to interfere with listening. And judging from the recent experience of the Southern Railway, they interfere with travelling, too.

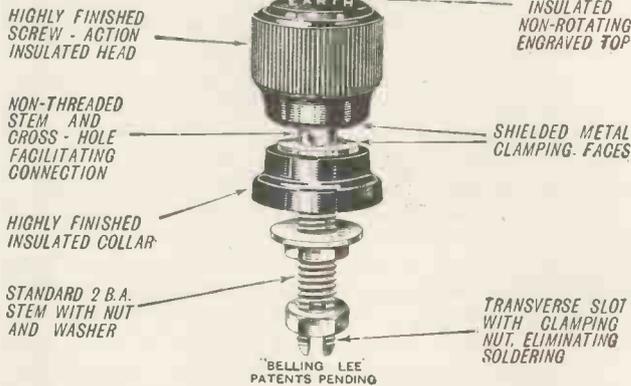
Now that we have had the exploits of Dick Turpin on the wireless, an educational course for budding tax collectors should be quite easy to arrange.

A STATION has been offering three guineas to the listener who discovers the greatest number of mistakes in a special programme. Lucky for them they don't make this offer in connection with their ordinary programmes.

IN some countries the majority of listeners have their sets coupled to the domestic electric supply main. In this country, with so many lectures in the programmes, it would be more appropriate to connect up with the gas main.

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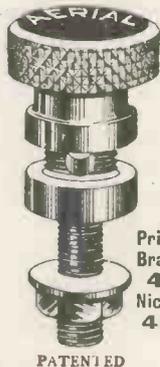
Aerial, Earth, Phones +, Phones -,
L.T. +, L.T. -, H.T. +, H.T. -,
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Metal
Chuck to
grip 14 to
44 gauge
wire or
flex.

Price:
Plug 4d.
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in an instant.
Tapped to screw
on to 2, 4, 5 and
6 B.A. threads;
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for joining wires.



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PRIDE OF CREATION is in most of us, but lack of technical knowledge and workshop facilities often deter the enthusiast who wishes to build his own wireless set. The Efesca One-hole fixing components are specially designed to facilitate the building of self-contained receiving instruments. Whether supplied as a complete outfit for assembling a set or as separate components for use in any popular circuits they are the most convenient and efficient obtainable.

4-Valve Home Constructor's Set (illustrated) comprising—

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- 4 only Rheostats.
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Expert Advice on Choosing Phones

FIRST of all, when buying phones, forget the importance of resistance. Be content with the usual 4,000-ohm phones. Because a pair of phones is marked 8,000 ohms do not rush blindly into the shop and get them simply because they are twice the usual resistance, thinking that, perhaps, signals will be twice as strong. They will not, and you will actually be dissatisfied in the long run. There is the added risk that the high-resistance phones are more delicate, and therefore more liable to be put out of adjustment, even to the extent of damaging the windings and rendering them useless. Any good phone of 4,000-ohms resistance is sufficiently sensitive and is, moreover, robust enough to stand a fair amount of rough usage.

Appearance and Efficiency

Now for the difference between the good and the bad phone. Appearance and efficiency do not always go

hand-in-hand, although the majority of makes usually combine these qualities proportionately. By far the most important points that can be ascertained about phones is the distance between the polepieces and the diaphragm, and the strength of the magnets.

The wise salesman will prohibit the removal of the earcaps, but at the same time will guarantee their sensitiveness in writing. Some salesmen "prove" the phones are in perfect condition by means of a battery connected to the leads, in which case a loud "click" is heard whether the diaphragm is correctly adjusted or not!

Once you have had "proof" that they are working perfectly, the matter is ended, and you cannot get them changed. Thus you are tempted to experiment with them until you get them right. To what degree you are likely to be successful is dependent upon your knowledge

of the principles and operation of the normal earpiece, and the only way to safeguard yourself against the phone that is not guaranteed personally by the salesman is to bear in mind that, primarily, the distance from the polepieces to the diaphragm must be the smallest measurement without actually touching. This means the smallest measurement that can be felt by means of gentle pressure upon the centre of the diaphragm when the earcap is screwed on tight. A slight movement will be noticed if all is well, the diaphragm touching the polepieces at the end of this movement.

Arching Diaphragm

Should the diaphragm seem to be arching and bending inwards in a springy manner then all is not well; the polepieces are far too low, and if there is no provision made (by rings or other means) for bringing

(Continued on page 314)

The Weekly that solves your Wireless Problems

Amateur Wireless

3^D

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Thursday

Take "Amateur Wireless" Each Week
and Get the Best Results from Your Set

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Exclusively devoted to the interests of Wireless Amateurs and essentially a practical paper. It is lavishly illustrated with photo reproductions and many explanatory drawings and diagrams. A great feature is Expert Replies to Readers' Questions. Other regular features, all fully illustrated, are — On Your Wavelength! (Chatty paragraphs by "Thermion"), Components You Can Rely Upon, Around the Showrooms, Progress and Invention, Latest News in Brief, Times and Wavelengths of Home and Foreign Stations, etc. etc.



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 Anode Volts..... 30-150
 Anode Impedance 10,000
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Cleartron—America's biggest selling independent wireless valve, is now manufactured at the Cleartron Works in Birmingham—Britain's newest and most recently equipped radio factory.

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**VASTLY INCREASED VOLUME
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Full technical data on request or sample valves sent post free, together with our Ironclad Guarantee, on receipt of remittance and name of nearest Dealer.

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12/6

AN EVERY PURPOSE VOLUME VALVE.

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Fil. Volts 1.5
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 Anode Volts 30-150
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12/6

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15/-

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AND BIRMINGHAM

Phones: REGENT 2231/2

Grams: CLEARTRON, WESTRAND, LONDON.

Expert Advice on Choosing Phones *(Continued from page 312)*

the diaphragm and polepieces together, then the phones should be left severely alone. Faulty mounting of the interior of any phone so that the polepieces are too low is an unforgivable fault, as there is no means open to other than the specialist to bring them up to the best position.

If they are mounted level or higher than the case of the phone, there is a simple and sure method of getting the correct adjustment by means of rings cut to the size of the rim of the case, made of paper, metal, or, in fact, any material that is flat and has a uniform thickness. The only knowledge required is that the diaphragm must only just perceptibly miss the polepieces when the earcap is screwed up tight. No doubt the specialist might make this adjustment a little more accurately owing to the facilities at his command, but for normal accuracy there is not likely to be any difficulty whatever.

Magnetism

Now we come to the magnetism. It is impossible, visually, to get any

idea as to the state of the magnets of a phone unless we call upon the aid of a compass, usually in the form of a galvanometer needle. With the help of this simple little instrument a rough idea may be formulated (very rough, because the needle will usually respond to a weak magnetic force).

What actually happens is this: Supposing our needle is swinging free and we hold an earpiece, say, 12 in. away, we shall see that the needle will swing round, and oscillate backwards and forwards, and will finally come to rest.

Testing Strength

Supposing we now turn the earpiece over, we shall see that the needle will swing right round and will come to rest again, but it will now be pointing in the opposite direction. This is due to the poles of the magnet in the phone attracting and repelling the magnetic force of the galvanometer needle.

A simple way of testing the comparative strengths of phones will be obvious if we measure the greatest

distance away that the phone will swing the galvanometer needle. This will, however, only give us the strength of the magnet intrinsically. It certainly does not follow that all the magnetism will be transmitted to the polepieces, as, if they should be mounted at the neutral points (as is often the case where ring magnets are used) there will be no magnetic pull upon the diaphragm at all.

We must, therefore, cut out the visual test for the magnetic properties of a phone. Instead, let us rely upon the pull of the magnets on the actual diaphragm in use. If the polepieces are well made and have perfectly flat tops, the average magnet will hold on the diaphragm until the latter will bend appreciably. The first-rate phone will hang on until there is a risk of damaging the diaphragm by bending. It will be as well to test with an old diaphragm.

J. W. M.

AN inventor has discovered how to light a house by wireless. But he is keeping it dark for the present.

A. MUNDAY, Ltd.

Electrical and Wireless Engineers.

59, WATLING STREET, E.C.4.

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Made from best Ebonite and beautifully finished. Very firmly constructed and absolutely leak-proof. Price 1s. 9d.

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A reliable and superior article which will add to the efficiency of any set. The body parts are made from the solid stick Ebonite (not moulded from composition), and all metal parts heavily nickel-plated. Finely fitted and finished.

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There's only one satisfactory solution—always have your accumulators ready charged, and when you think of chargers remember there is only one that will give complete satisfaction.

The **PHILIPS RECTIFIER** works off any A.C. supply, requires no supervision whatever, works silently, and automatically regulates the current supply.

There are no objectionable chemicals, no buzzing noises and you have in fact a most reliable battery feeder with an extraordinary low running cost.

Simple, convenient, efficient. It charges while you sleep.

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R.L.

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Notings on the Month's Progress

THE lower band of wavelengths between 200 and 600 metres is at present being used by approximately ninety European stations, whilst plans are being made to build forty others, making 130 short-wave centres in all. In addition there are some thirty more stations already in commission (or about to be erected) for broadcasting on the longer waves.

Under these circumstances it is obviously impossible to avoid considerable overlap and mutual interference. Present conditions are, however, worse than need be, and the International Committee propose to alleviate matters by altering the wavelengths allotted to certain stations, and more systematically grading the wavelengths used by others. This, as may be imagined, is no easy task, especially as it has been mutually agreed to leave the older and more important stations unaffected.

A tentative scheme of wavelength redistribution has now been submitted by the Geneva delegates to their respective Governments. Subject to the consent of the latter, the proposed alterations will first come into operation, by way of experiment, some time in September, and if they prove effective in reducing interference, will be kept permanently in force.

A Useful Valve

Satisfactory tests have been made in America with a new type of valve designed to work direct from electric light mains, whether carrying direct or alternating current. Two separate cathodes are used, the first being heated directly by the current from the mains, and the second by radiation from the first. One cathode is in the form of a tungsten wire, whilst the other is a cylindrical metal plate coated on the outside with a thermionically-active material so

that it emits electrons at a comparatively low temperature. The valve also contains the ordinary control grid and plate.

The two cathodes are separated by a vacuous space which constitutes a kind of auxiliary two-electrode valve, serving to rectify part of the main current. This rectified current is then used to feed the plate of the valve, so that no separate rectifier or H.T. battery is required apart from the current on the mains.

The only "extras" are, firstly, a small adapter fitted to the ordinary valve holder and provided with a five-prong socket to take the new valve; and secondly, a small filtering unit in the plate circuit to cut out any hum. The latter is not absolutely essential, but when it is employed the electric-light mains can also be used as a receiving aerial, in place of the ordinary garden-wire or indoor frame.

(Continued on page 318)



**A clear explanation
A startling prophecy**

Talks About Wireless

By SIR OLIVER LODGE

Who would not wish to read what the famous scientist has to say regarding the most wonderful and most entertaining phenomenon of the present time? Sir Oliver Lodge's book is at once authoritative and suggestive. It comprises not only a survey of wireless from the earliest discoveries down to existent conditions, but also arresting prophecies of possible future achievements.

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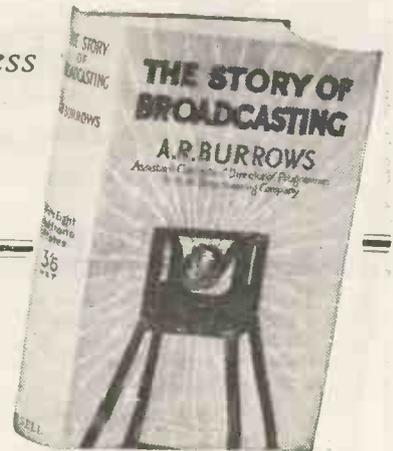
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miss!

By

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BURROWS

Asst. Controller
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The Story of Broadcasting

The theory of wireless, little known examples of its use in peace and war, wireless telephony, peeps into the control room, the amazing possibilities of broadcasting in the future, simply and delightfully recorded. With 8 pages of illustrations.

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Bing Pullman Express—scale model, powerful loco, tender, Pullman cars and set of rails. Length of train 42 ins. overall.

The finest clock work, electric and steam-driven models. Built to scale by engineers. You can get complete railways, with engines, rolling stock, tracks, stations, signals, tunnels, buffers, signal cabins, bridges, etc. Also the Bing Miniature Table Railway, rolling stock and separate parts. All Bing Trains are finished in correct L.M.S. or L.N.E.R. colours. Also stationary steam engines, magic lanterns and cinemas. Ask for them at any toy shop and see how surprisingly low priced they are.

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Look for this Brand Mark on all metal toys

Bing Toys are distinctively boxed in yellow boxes with black edges.

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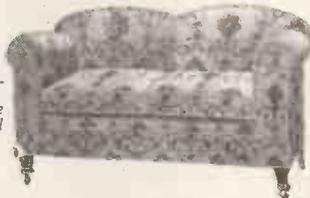
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Good Sound Furniture

ECONOMICAL and LONG-WEARING

CASH or EASY PAYMENTS.—Free and Safe Delivery to all parts.



If not approved of, can be returned at our expense, and any money paid will be refunded in full.



£2 down, and 17/6 monthly for 24 months. Cash price: 20 guineas.



The "Osborne" Suite of Settee (one end adjustable) and Two Easy Chairs. All of comfortable size—our standard reliable upholstery work, interior coppered steel springs—British Web—best canvas—fibre and wool—patent push-in Castors—Loose Down Cushions, covered in Tapestry or Corded Velvet, in pretty shades of Greys, Browns, Reds, or Golds. Patterns on application.

FREE Our Fully Illustrated Catalogue, together with Terms, etc. A perusal of this will save you Pounds in Furnishing.

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HERE at last is a clock which keeps accurate time, requires no attention, and no winding. No matter how many Slave Clocks you may install in your house, offices or works, each one will show the identical time.

The PRINCEPS ELECTRICAL CLOCK is different in principle to any other system in existence, and has solved the difficulties which have puzzled the minds of horologists throughout the centuries. Princeps Master Clocks cost from £10, and Slave Clocks from £2 : 5.

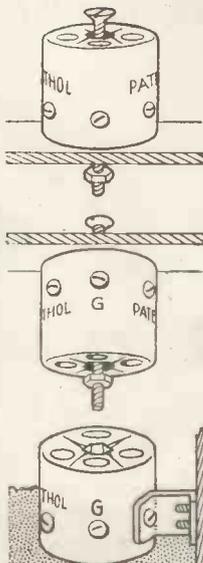
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VALVE HOLDER



for any circuit, any set, anywhere. As featured exclusively in the 7 Valve Super-Het, receiver described recently in the "Wireless Magazine" Its porcelain base gives perfect insulation. The four brass sockets fit loosely, and are almost entirely air-spaced. The connecting screws are brought out to the sides, reducing capacity effects to a minimum.

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A marvel of value at 1/3, complete with soldering tags and fixing bolt. Brass support for vertical panels 2d. extra.

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Jottings on the Month's Progress *(Continued from page 316)*

A Super-het Connector

Amateurs who wish to try the effect of supersonic amplification, and who happen to possess an ordinary valve receiver containing at least one stage of high-frequency amplification, may be interested to learn that M. Levy has recently placed on the French market a single-valve block adapted to enable a straight-circuit set to be worked on the super-heterodyne principle.

It should be mentioned that M. Levy claims to be the original inventor of this method of reception, so that the new device is well substantiated, and should enable the merits of the super-het circuit to be tried out by many amateurs who have previously fought shy of it on the ground of expense.

The converter consists of a one-valve panel, the single valve being adapted to generate local oscillations (of a slightly different frequency to that of the received signals) and, at the same time, to detect the super-

sonic or beat frequency resulting from the combination of these two oscillations. The input side of the converter is coupled directly to the aerial. The output or plate circuit comprises a high-frequency transformer tuned to a wavelength of 3,000 metres, this, of course, being the supersonic frequency.

The Plate Transformer

The secondary of the plate transformer is in turn connected across the grid and filament of the high-frequency valve on the standard set. It need hardly be said that the converter will not work if coupled directly to a detector valve. The presence of at least one high-frequency amplifier is absolutely necessary in order to get super-het results.

As a result of extensive tests the new installation has been found to give highly satisfactory results.

An enormous amount of experimental work in connection with the practical application of direction-finding to aircraft and marine navigation has been carried out for some time past at the Teddington laboratories. The Radio Research Board are now satisfied that the modern

type of D.F. equipment is quite accurate enough, with skilful handling, to be safely relied upon for navigating in foggy weather or under conditions of low visibility. In all probability such sets will soon be made a compulsory part of the equipment of every liner.

Another Problem

Another wireless problem to receive the careful attention of the N.P.L. is that of fading. Specially sensitive receiving sets have been installed in various centres throughout the country, and quantitative measurements taken of the strength of signal reception from specified stations under different climatic conditions, both by day and night. The results are carefully checked, tabulated, and compared, in order to ascertain the precise effect of various factors in different localities. It is hoped, in this way, to find some clue to the cause of fading and other curious vagaries of the ether waves.

B. A. R.

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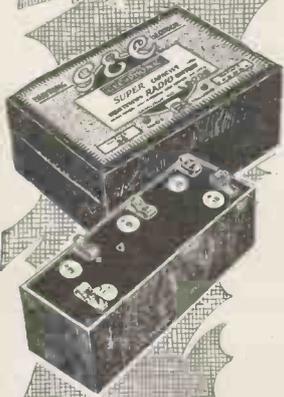
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