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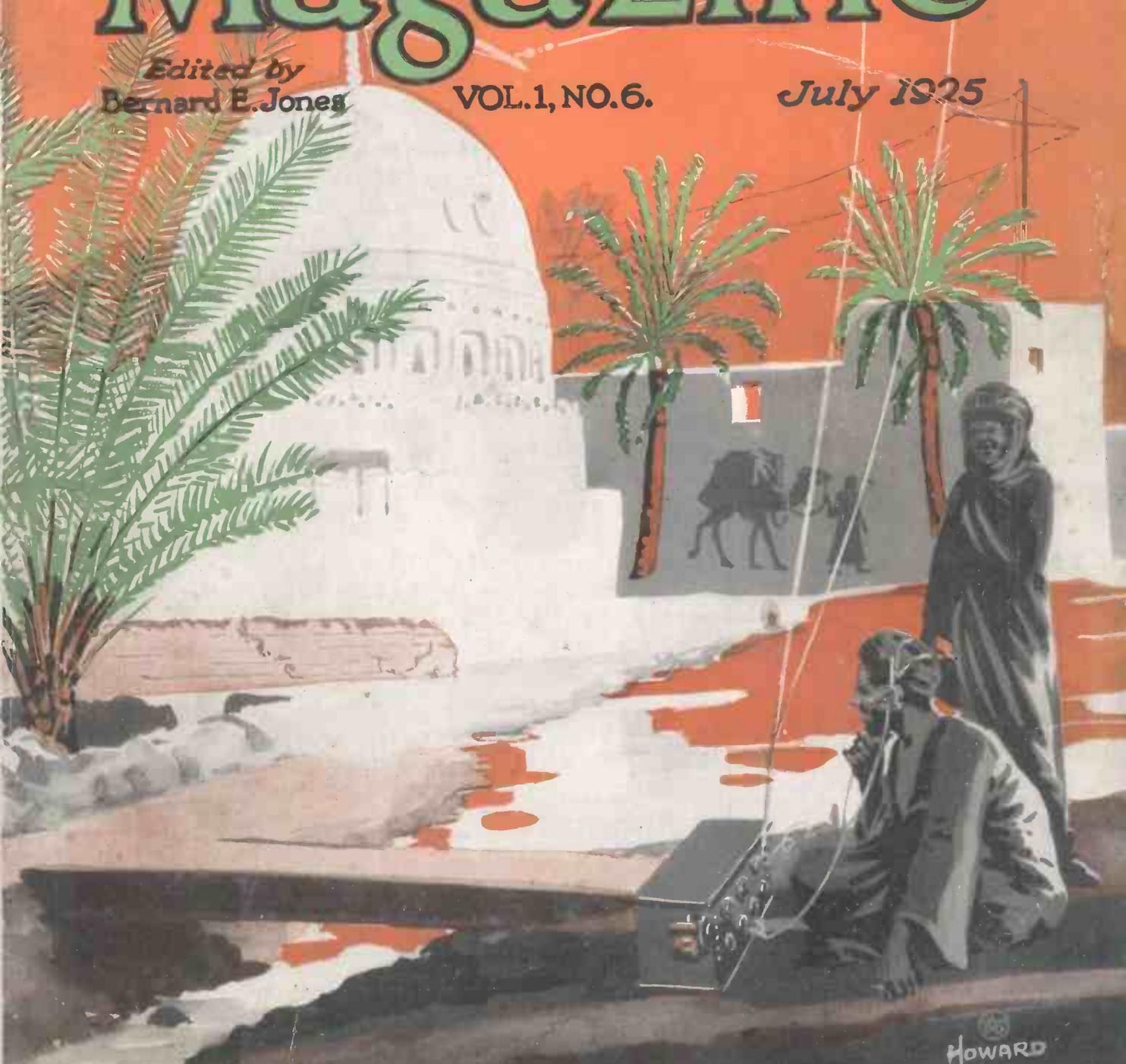


The Wireless Magazine

Edited by
Bernard E. Jones

VOL.1, NO.6.

July 1925



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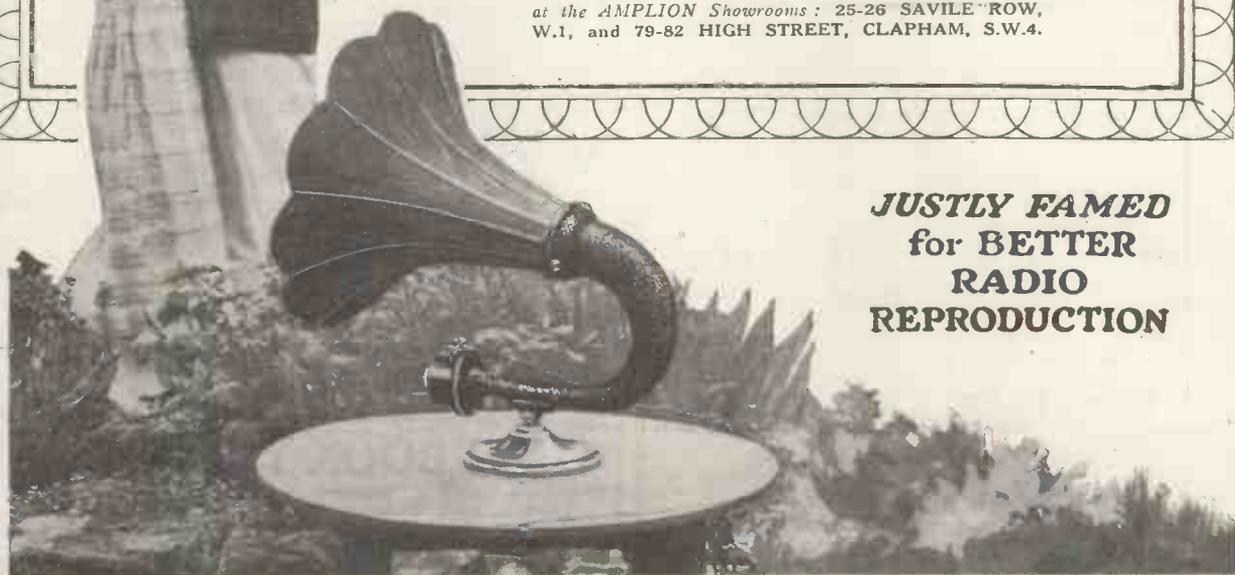
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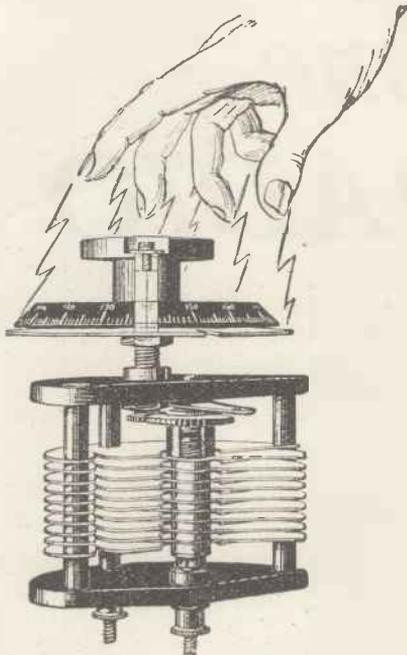
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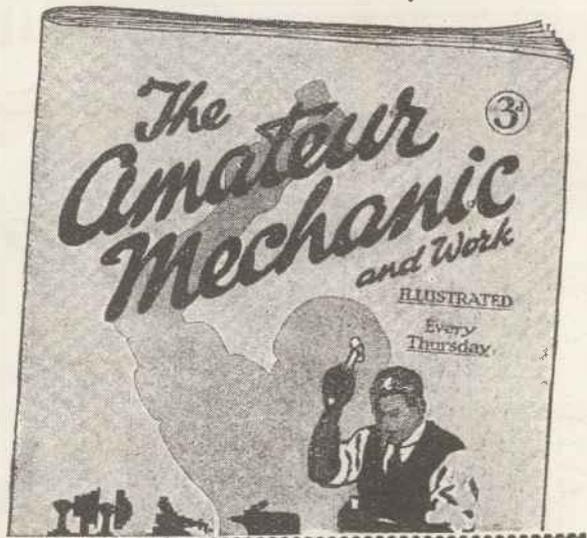
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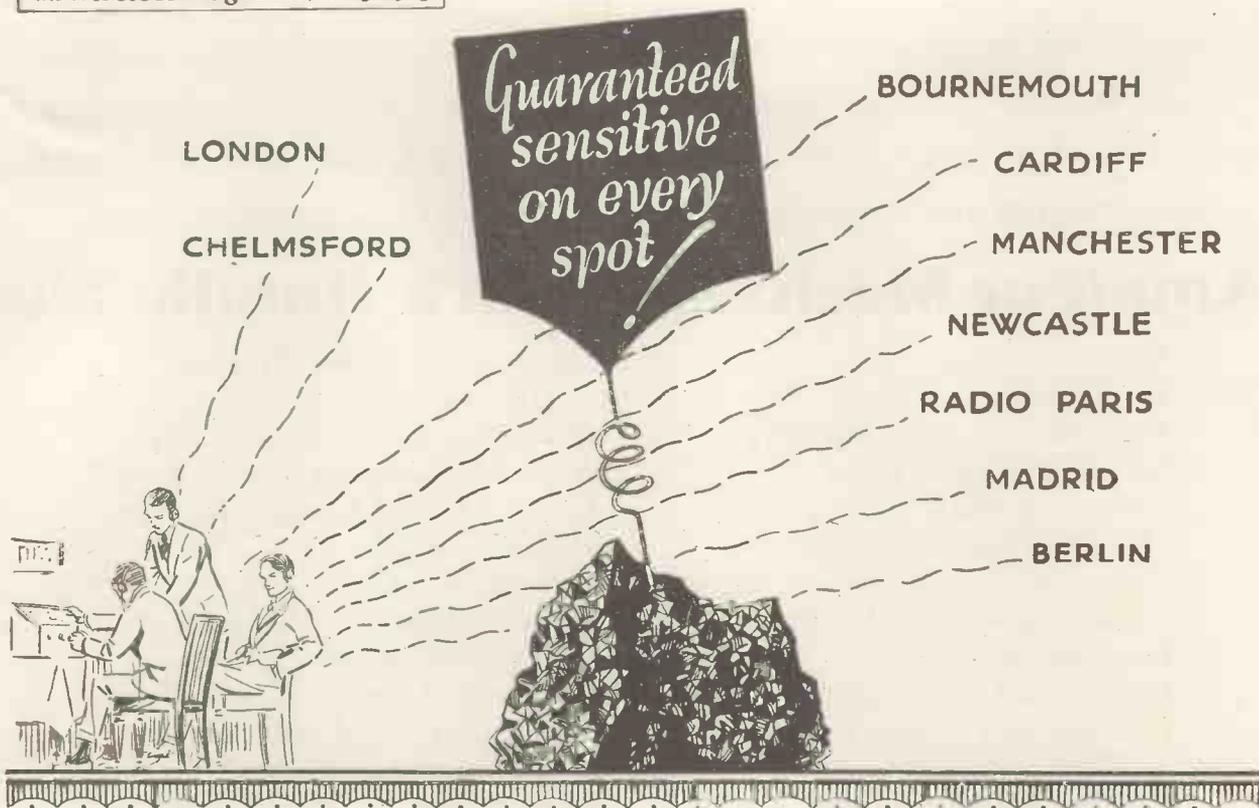
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The Wireless Magazine, July, 1925

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A squad from the Royal School of Army Signals working with a portable set. Their aerial is a jointed aluminium rod and copper-gauze mats are used as an "earth."

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.

If War Broke Out

What Would Happen To The Wireless Amateur



A Special Article by
Sir Basil Thomson, K.C.B.

A.M.R

IN 1914 we knew less about wireless telegraphy than we do now. Wireless amateurs could be counted in tens instead of thousands; we were uninformed about the methods of German espionage and there was some confusion in the public, and even the official, mind between the dangers of transmitting and receiving instruments.

Spies and Wireless

There were dark stories about German spies receiving messages with iron bedsteads in place of aerials, of German governesses with complete wireless apparatus concealed in wardrobes or behind fireplaces as in the imaginative spy play, *The Man who Stayed at Home*. One out of many of the counts against the perfectly innocent von Bülow was that his neighbours had heard the intermittent click of morse messages through his open windows, when, in fact, these proceeded from an ancient typewriter operated by his unskilled fingers. When spy mania was at its height during those early months, the military counter-

espionage authorities despatched a properly equipped car into the Eastern Counties to pick up unauthorised messages passing over the North Sea and locate the illicit station from which they emanated. It was an adventurous journey for the operators.

That very afternoon they were under lock and key in Essex and the Chief Constable reported that he had arrested two enemy spies equipped with a portable wireless plant. After a telegraphic explanation, they were set free, only to be arrested in the next county a few hours later. Then they refused to move without a Territorial officer in uniform as a guarantee, but on the following morning the police of yet another county reported by telegram that they had arrested three spies with wireless apparatus, one of them disguised in the uniform of a British officer.

Those who were lawfully in possession of transmitting apparatus during the war, the masters of merchant ships to wit, were not always wise in the use to which they put it.

When Captain Müller, of the *Emden*, was making the lives of merchant skippers a burden to them, a certain shipmaster made a clean breast of his intentions to a friend on the night before he sailed from South Shields with a cargo for South America.

"I mean to stand no nonsense from that fellow Müller," he said. "As soon as I have cleared the Channel I shall use my wireless to pick up news of him from other vessels and he won't catch me."

Overheard

As soon as he was in open water, his wireless began to bleat, "Where is Müller of the *Emden*?" For some hours he had no reply, and then his operator handed him the following message: "I am he. My latitude and longitude are (position given) and I hope to be with you at two o'clock." The poor old skipper's mouth dropped open and he fell heavily into his seat. Müller was true to his word. He put the Captain and crew into one of his other captures, relieved the bunkers of their coal, and sank the ship.

(Sir Basil Thomson was Assistant-Commissioner of the Metropolitan Police, 1913-19, and Director of the Special Branch, 1920-21.)

The Post Office has a complete list of those who are licensed to use receiving sets, and the number of unlicensed users is not believed to be large. Immediately on the declaration of a new war, no doubt amateurs will be called upon to dismantle their aeri-als and they will receive a domiciliary visit from a reserve officer, who will call to see that they have obeyed the order. To most of us this will entail no hardship, because we shall be too busy about other things to have time for listening-in, and if we did, we should hear nothing but dot-and-dash morse messages from ships, which would be quite uninteresting even if we could interpret them.

Secret Codes

The Admiralty messages will be sent in a cypher which defies interpretation. Those of us who have a scientific knowledge of wireless will offer their services to the Admiralty and the War Office, will be examined, put into uniform, and play an inconspicuous but important part in the war: the rest will pack away their toys until broadcasting begins again after peace has been signed, and, if they are of military age, will be engaged in occupations far more exciting than listening-in.

There remain to be considered the few who have never taken out licences, either from procrastination or intentional contempt for the law. The improvement in the indoor aerial has tended to increase the number of these, though even now it cannot be large. What will they do when the order for dismantling is issued?

They will receive no domiciliary visit because they will not be on the Post Office records, but some of them, mindful of the penalty of disobedience, will comply by dismantling their apparatus and will take comfort in the thought of the number of half-sovereigns they

have saved for their pockets in the past.

A few daring young people will "chance it," in the hope of picking up really interesting secret information to retail in confidence to their friends. They will pick up nothing that will be of any use to them, even if they are familiar with the morse code. If they are imaginative gossips this will not cramp their store.

Our experience during the war was that most of the wild stories current at London tea-tables were invented by people of this temperament—for example, the story of the grateful German who rewarded his English benefactress by this significant warning, "Beware of the tubes in April!"—a story which is said to have caused an appreciable drop in the traffic receipts.

We traced that story to the second mistress of a Board School, who said that she had had it from the charwoman who cleaned the school: that lady declared indignantly that she respected herself too much to say any such thing!

that no story was ever more fully proved by evidence, and yet, as there was not a word of truth in it, someone must have invented it. Whoever he (or she) was, he deserves the thanks of the country, for it put heart into many people at a very dark time.

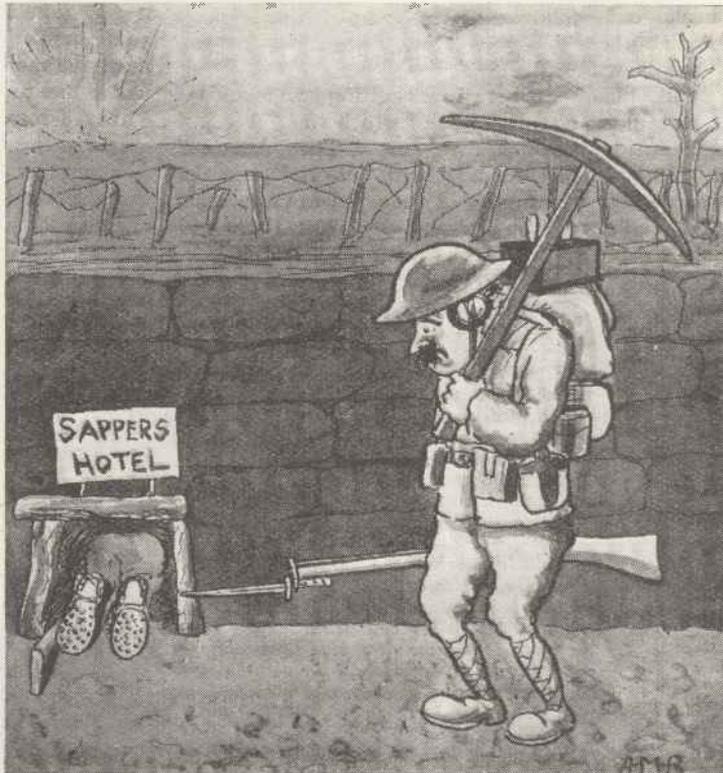
Wireless or Letter?

Not all the details of the story were artistic: he might, for instance, have omitted the picturesque detail of the Cossacks stamping snow out of their boots on a hot August day, but the story itself was as likely as it was picturesque. The important feature of that flight of imagination was that it reached the Germans, upon whom it had a very depressing effect. We do not know whether it reached them by wireless or by the more probable medium of a letter.

If it ever became politic to spread news far and wide during the war it was found that the surest method was to select from among your acquaintances of either sex a person who loved to be important, and to tell him the story under a solemn promise of secrecy. If your confidant was well chosen and had attended tea or dinner-parties that same day, the story, in an altered but recognisable form, would return to you also under the bond of secrecy within twenty-four hours in London, or forty-eight in the provinces. It will be so with the illicit listener-in, who will profess to know the morse alphabet and will read into any message a really sensational story.

It may seem strange, after such a preface, that I should be found advising wireless amateurs to make themselves proficient in morse, and yet if they are to be of any use in the wireless service of the country they cannot do without it.

From what we now know of the German spy methods, it is not at all



"An inconspicuous part in the war."

The story of the Russian troops passing through England during the first weeks of the war belongs to another category. I remember Mr. Asquith, as he then was, remarking

likely that spies in England will endeavour to send wireless reports across the water to their employers. What is much more likely is that the enemy will try to corrupt the wireless operators on neutral ships in order to get messages from them when they are lying in British ports. But the counter-espionage depart-

ments can be trusted to look after that source of leakage.

The amateur who can read rapid morse will be wanted for many other purposes connected with the provisioning of these islands, their protection from hostile aircraft and the location of enemy raiders and submarines.

Even in peace time, however, when morse messages are apt to break in upon our concert programmes at the most unwelcome moments, a knowledge of morse will at least bring some measure of compensation, for one can learn what the ships are talking about with so much persistence.

WHEN WAR DID BREAK OUT!

What Happened to the Editor

NO reader of THE WIRELESS MAGAZINE will read Sir Basil Thomson's article with greater interest than that with which I have just gone through it in manuscript form. You see, I was brought suddenly into touch with his activities in 1914, and I have a very vivid recollection of his handling of the wireless amateur in those days.

Closing Down Stations

When the Great War broke out Mr. Basil Thomson was Assistant-Commissioner of Police at New Scotland Yard, and he and his officers had to work night and day in coping with the special duties that war brought to them.

By virtue of the powers conferred on the Postmaster-General by the Wireless Telegraph Act of 1904, and by virtue also of emergency legislation, the police could close down every amateur wireless station in the country, and they did their work most thoroughly.

Being in possession of the names and addresses of the few wireless amateurs of the day, they were easily able to visit them and cause their apparatus to be sealed up and removed into official custody.

And Pulling Down Aerials

There remained those amateurs who were working without licence and other experimenters in possession of odd pieces of apparatus, but one or two salutary prosecutions "put the wind up" most of these, with the result that the majority of

them made voluntary disclosure, and the authorities promptly relieved them of their apparatus—not to return it, in many cases, until 1920 or even later.

Up and down the country the police were on the lookout for aerials, and whenever they found one its demolition was speedy and sure, and the temporary confiscation of the wireless apparatus soon effected. I say all this to give you the necessary "atmosphere" for what follows.

My Story

In 1914 I was editing two technical weeklies, one of which was "Work," now known as "The Amateur Mechanic." Now "Work" was the forerunner of the wireless periodicals of to-day, and by that time had

taught many hundreds of people to build crystal sets.

Mr. E. Redpath, a well-known member of the staff of a wireless contemporary, was "Work's" expert adviser on wireless matters and undertook the answering of wireless questions.

Under Arrest!

On the morning of September 22, 1914, I received a visit from Inspector Macnamara (who retired, if I remember rightly, a few years ago). He very courteously informed me that Mr. Basil Thomson would like to see me at New Scotland Yard. I remember now the glow of secret satisfaction on learning that so august an official as the Assistant-Commissioner of Police could find any use for a chat with me!

I cheerfully replied that I would take an early opportunity of calling on Mr. Thomson.

"Thank you," replied the inspector, "but you will come now. I have a car waiting in the yard for you."

I was not long in realising that I was actually, if not technically, under arrest!

The car was driven by an amateur motorist, extremely keen on his voluntary job, and who for weeks had been helping the police to round up suspected persons, and evidently was now under the impression that the inspector had got another one!

Received in State

At Scotland Yard I was received in state—that is to say, I was ushered into a room in which the Assistant-

LIGHTNING ADVICE

"Will you walk into my parlour?" said
Inductance to the spark
That alighted on my aerial in the storm
Just for a lark.

"You will find it quite the shortest
Route via waterpipe to earth;
And, perhaps, just to oblige, 'a conflag-
Ration you'll give birth.

"I should like to hear the solder sizzle
'Tween condenser vanes
And transformer windings, whine and whistle,
Howl with aches and pains.

I do yearn to see the dear blue light when
Valves go up in smoke,
And to know the silly chap who owns me now
Is stony-broke.

"If he had but listened to advice—they gave
It gratis, free—
Just to fix a little sparklet jump between
The A and E;

Then, when next you took a fancy to his 7-22—
No more frightening, dear old lightning, for
The gap would pass you through!"

C. T.

Commissioner sat at a desk (a copy of what was evidently his favourite paper, "Work," in front of him), and he was "supported" or guarded by an Army officer of staff distinction at his side and by a number of stalwart constables, who lined the walls. When Mr. Thomson interviewed wild editors he was evidently prepared for anything that might happen!

Question and Answer

Then ensued question and answer which I shall long remember. Was I the editor of "Work?" Yes. Was I really the editor? Oh, yes. Did I see everything that went into its pages? Everything. Or did the sub-editor do all the work? Not he.

I fear my reply—there was no time to prepare it—was not very convincing. All I could say was that I had simply not seen the matter from his point of view—in other words, I had not appreciated the very mischievous use to which such information could be put.

Turning to the staff officer, Mr. Thomson gravely inquired as to the possibility of trying me by court-martial! But I feel sure his tongue was in his cheek. At any rate he refrained from dragging in any reference to my being shot at dawn.

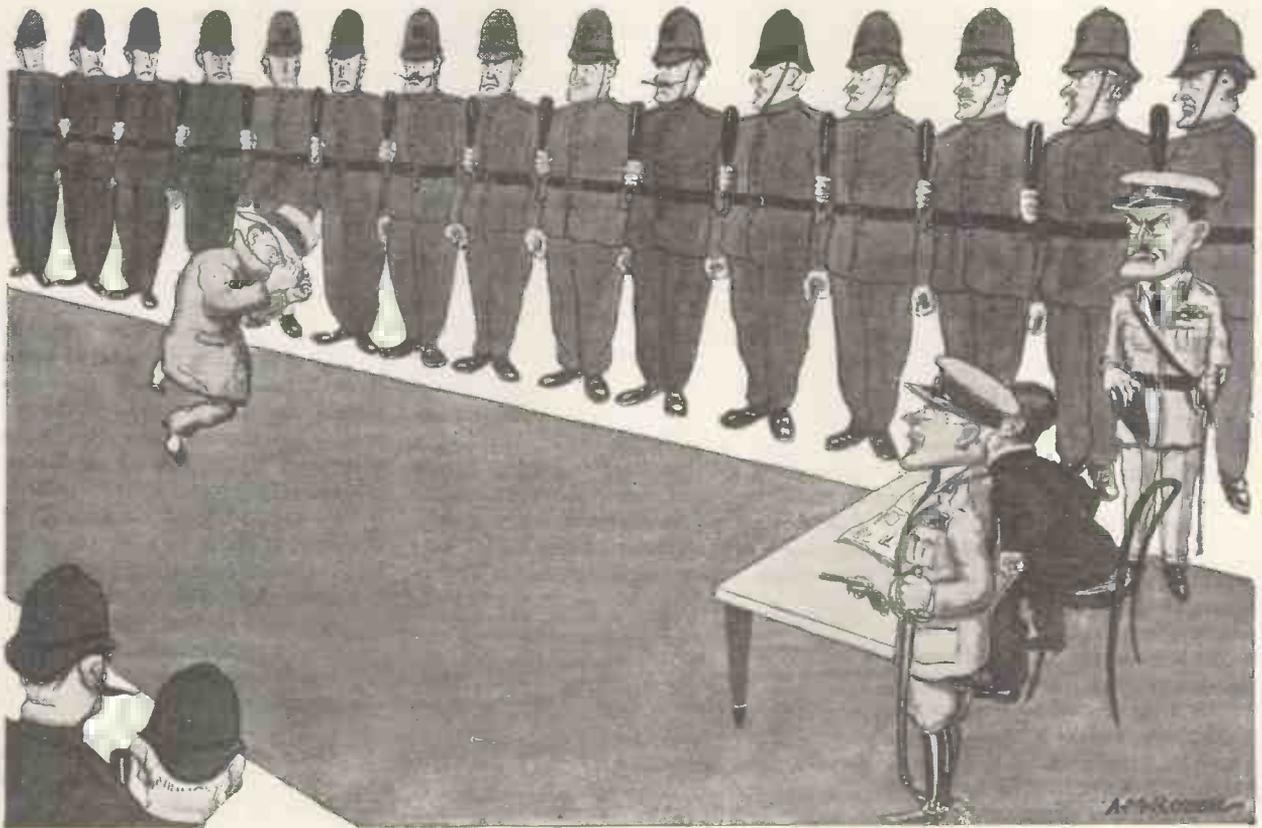
Ultimately, after a continued examination, I was permitted to return to my office, accompanied by the tenacious but ever-courteous Inspector Macnamara, to whom I

information on wireless telegraphy would be omitted from "Work" for the duration of the war—a promise which, of course, I most scrupulously observed.

And the incident fizzled out; there was no "cold, grey dawn" for me.

Fully Adequate Powers

So when Sir Pasil (he was knighted in 1919) tells what would happen to the amateur if world-war broke out now, I know that in spite of the enormous number of wireless sets in use to-day and of the cost of time and money that would be involved, the police would certainly be armed with fully adequate powers and, remembering my own experience,



"Evidently prepared for anything that might happen."

Did I myself make sure that everything in every page was in order before the pages went to press? I did.

"Well then, my officers have been up and down the country tearing down wireless aerials wherever they can see them. Will you tell me what you mean by publishing in your paper this week a reply to a question explaining how to erect a secret aerial inside a roof?"

gave the name and address of the querist and the address of the member of my advisory staff (poor Mr. Redpath!) who had answered the question.

And on the inspector's advice I wrote the Assistant-Commissioner a very charming letter, pointing out by the way that the booksellers were selling any number of simple manuals showing how to erect indoor aerials, but promising that all practical

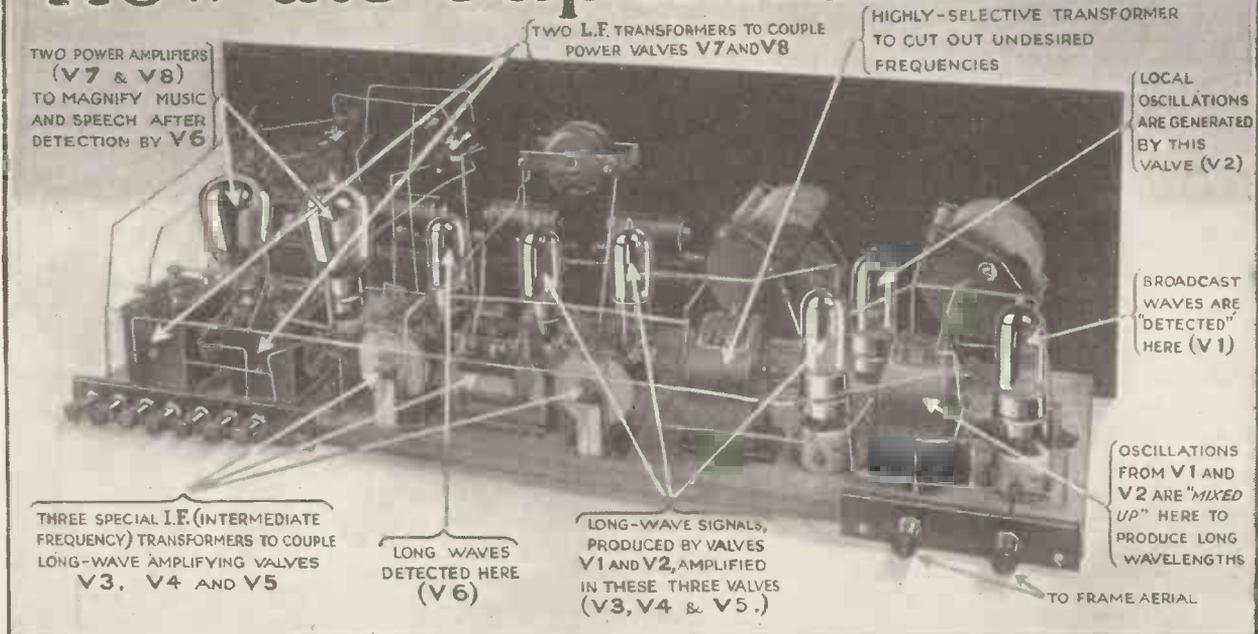
I have no doubt whatever that they would use them to the uttermost.

If they use them as courteously as they did in my case, then nobody will have much of which to complain.

B. E. J.

THERE is hardly a hospital without its wireless set nowadays. And a good many wireless sets could do with hospitals.

How the "Super Het" Works



THE other day I was talking to a man who owns a four-valve set and has a fairly good knowledge of how it works. He spoke glibly of incoming oscillations, tuned-anodes, power amplification, grid bias, and most of the jargon one hears about wireless.

After we had exhausted the possibilities of his set, I happened to mention the super-heterodyne. Immediately his face assumed a mask-like expression.

Further conversation elicited the fact that he had always regarded the "super het" as something uncanny, something far too complicated—as far above his comprehension as Einstein's theory.

So I proceeded to explain the workings of such a receiver and, for the benefit of all those who shy, like a frightened horse, at the mention of supersonic heterodyne reception, here is the explanation.

Controlling H.F. Amplification

Those of you who have had anything to do with short-wave high-frequency amplification employing, say, two stages, will know that serious losses occur and that the amplifier tends to burst into oscillation at the slightest provocation. Indeed, the control of three stages of H.F. amplification almost

amounts to an impossibility for the amateur.

On the other hand, high-frequency amplification of *higher* wavelengths is more efficient. The longer the wavelength (that is, the lower the frequency), the easier it becomes to amplify.

That is the sole reason for the existence of the "super het." In simple words, all that the "super het" does is change the low-wavelength (or high-frequency) oscillations immediately they are received at the aerial into much higher wavelength (or lower-

frequency) oscillations, after which they can be amplified by as many stages of amplification as desired.

How it Works

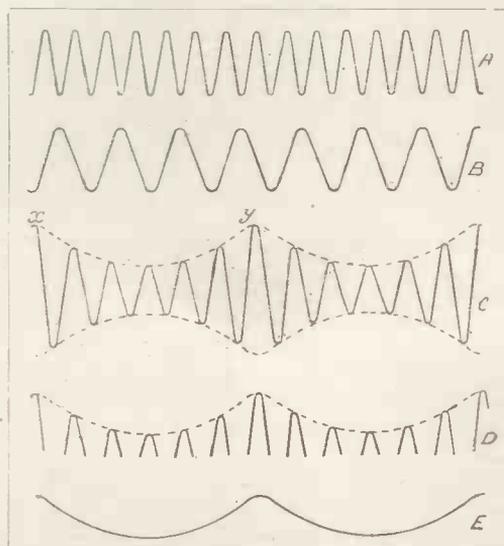
An idea of how this frequency change is made is illustrated below. Here A and B represent the waves picked up by a receiver from a broadcast station and the waves generated by a "local oscillator" respectively.

The term "local oscillator," by the way, is given to a simple oscillatory valve circuit, the plate and grid coils of which are coupled together so that the valve produces oscillations and thus acts as a low-power transmitter of continuous waves.

The frequency of the oscillations so produced is controlled by a variable condenser which tunes the grid coil.

As shown in the diagram, the two sets of waves A and B unite to form a third set of waves, C. Also the distance from *x* to *y* depends on the difference in wavelength between A and B. If the resultant oscillations, C, are now rectified we shall obtain a series of unidirectional impulses, as shown at D, the total effect of which is to give a new wave, E. This wave E is much longer than either A or B.

By suitably adjusting the oscil-



Graphic Representation of How a "Super Het" Works.

(Continued on page 615)

Getting the Greatest Profit from Broadcasting

OUR three-valve loud-speaker equipment works nearly full time. It sings to my partner while she attends to matters feminine in the flat, and she assures me it gives impetus and cheer to domestic duties as well as to jumper making. At night, the broadcast strains entertain us both when seated round the fire, each paying more attention to those particular items which interest us individually.

The "Winged Art"

Sometimes, when an eminent man like Sir Oliver Lodge, who possesses an individuality of peculiar interest to me, is speaking, as I do not possess an automatic recorder—for example a dictaphone adapted to wireless reception—then I have to bring into use once more the "winged art," an art once enjoyed to the full in my student days at lectures, and record on paper the mystic signs of Pitman. Alas! it brings back memories of days when I was less self-conscious, and would pull out my notebook at sermon time and take down, more or less in its entirety, some impassioned discourse delivered from the pulpit.

Now these joys can be repeated almost any evening I may choose with certain advantages, for I need not sally forth, but sit at my ease at my own fireside where I may listen to discourses on politics, science, or accounts of exploration or whatever delightful dish the British Broadcasting Company may be serving.

Reading from MS.

There is one disadvantage, however, for I imagine from the measured tone of the average speaker, he reads from MS. which, as every budding stenographer knows, is more difficult to report than a discourse from notes only.

A read speech is seldom delivered at less than 140 words per minute, but this affords the more expert student an added zest. I commend the idea to youthful votaries of the "winged art" who desire to get speed practice under ideal conditions of personal comfort, for in addition, no irritating coughs from an audi-

ence will disturb him and cause loss of words, though we have the wireless parallel in the oscillating fiend.

When items on the musical programme are to be found in my music cabinet, it is delightful to bring the music out and follow from the score the various "leit motifs," say of a Wagnerian opera, but a little disconcerting to find unexpected cuts here and there. Still, it proves quite exciting to discover to what place the orchestra has jumped.

Listener and Performer, Too

In the case of a recent broadcast performance of Liza Lehmann's "In a Persian Garden," it proved a great joy to find that my piano was exactly in tune with the music and the key the same, so that I was able to fill the dual role of being one of the invisible audience and a performer, too!

That this was of great personal value was evident in its affording me a salutary lesson in "Time." Accustomed as I am to solitary practice, I found in this case I was in the habit of committing grievous errors. I commend this idea also to

those lovers of music, situated as I am.

Broadcast Services

As an amateur organist, I find peculiar pleasure in following the Sunday evening services broadcast from St. Martin's-in-the-Fields. The acoustic properties of the Church must be exceptionally good, for a remarkably fine tone fills my room, and here again I accompany on the piano some of the chants and hymns, and, tell it not in Gath, attempt at times those little harmonic variations on the main theme so beloved by masters of the art.

Speaking generally of broadcast services, I hope it will not be considered out of place to remark on the novel situation created, of being able to applaud, or, if desired, comment unfavourably upon some of the spoken matter—a unique privilege—and all this at a time when one is perhaps in a posture distinctly undevotional. Here, in one's sitting-room, one feels safe from the awful calamity of having to answer an ecclesiastical charge of brawling in Church.

For "Difficult" Visitors

On the lighter side of broadcast profit-taking, my wife finds it of distinct value in the entertainment of certain types of visitors known as "bores." When they call, the loud-speaker is switched off and the phones substituted. Conversation, hitherto difficult to maintain, is now not only absolutely unnecessary, but inimical to successful reception, and it becomes the height of courtesy to refrain therefrom. Thus wireless steps into the breach and becomes the perfect hostess.

Unfortunately for us, as wireless reception grows less and less a novelty, other means will have to be found to entertain such types of callers.

Verily the applications of broadcast reception are manifold, and ever new, and through it we enter a wider world of entertainment and utility.

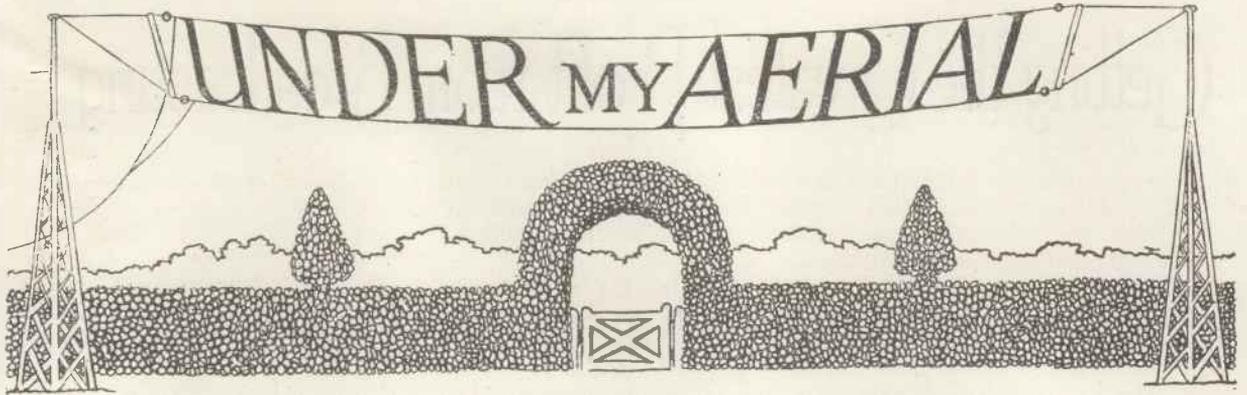
W. B. C.

AN INGENIOUS SLIDER



Note the smooth contact afforded by the arrangement of the spring.

SINCE the price of accessories came down, more and more aerials have been going up.



Wireless at the Seaside

IT is an amazing thing how the eye, of its own accord, will sometimes pick out a familiar word from a page of printed matter.

I have just been looking through the pages of a weekly periodical in which the very last word I should have expected to see was *wireless*. However, on glancing at a page of small advertisements, quite casually, my eye picked out the word *wireless*. There was no conscious effort on my part. The eye did it entirely of its own accord.

My thoughts were far enough away from wireless. In fact, they were on the engaging subject as to where I should spend my summer holiday this year.

After my eye had registered the familiar word, I looked more closely into the context and I found that the word appeared in a small four-line advertisement. I think the advertisement is sufficiently interesting to repeat. It ran:—

Board residence. Wireless. Gas



A Crowd of Enthusiasts

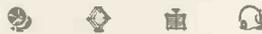
fires in bedrooms. Electric light. Moderate terms.

What do you think of that now, wireless being given first place in such a list of tempting allurements for the would-be holiday-maker?

I wonder what it would be like to be one of a crowd of wireless enthusiasts listening in to a boarding-house receiving set on a wet evening. It seems to me as if the only safe course for the proprietor or proprietress would be to install the set in a wire cage similar to that in which the cashier in an American

bank is installed. The set would then be well protected from the large number of fingers itching to get at its knobs and dials.

When I go to the seaside this summer, I shall take a small portable receiving set with me, so as to be quite independent of the boarding-house set. But I should rather like to stay with people who offer wireless as an inducement to would-be visitors.



Queer Interference

One of my new wireless friends has recently had a curious experience with his three-valve receiving set. The earth lead connected to my friend's set consists of a thick wire soldered on to a water pipe in the well known fashion.

This water pipe, however, forms part of a water-supply system which is connected to an electric pump used to pump water from a well to a tank at the top of the house.

Ever since my friend has had his wireless set, he has been bothered by sudden stoppages of signals. In the middle of a broadcast concert, the set, which had been performing splendidly for hours perhaps, would suddenly cease to function.

On each occasion of a sudden stoppage of signals, the set was examined carefully, but no fault could be found with it. Just as suddenly as the set stopped receiving telephony, so would it start receiving again.

Various opinions were sought as to the reason for these curious stoppages and re-commencements of signals, but no satisfactory explanation was forthcoming. Consultations took place with the local wireless experts, and the only result was that those experts went down considerably in my friend's estimation.

Finally, my friend himself solved the mystery. The stoppage of signals took place when the electric pump was set into action and signals were not heard again until the pump was stopped.

How an electric pump connected in the earth lead of a wireless set can put a complete stop to reception of telephony on various wavelengths is beyond me to explain. I wonder if you could give an explanation.

If it should happen that you are troubled at any time with the same kind of interference, I would advise your doing what my friend has done. He has put a notice on the offending pump. That notice reads:

This pump must not be used during the hours of broadcast.



Platinum

One of the outstanding features on the Stock Exchange a month ago was the boom in the shares of



Outstanding Features.

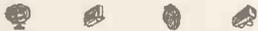
those South African companies upon whose lands platinum has been found recently.

I have been wondering whether the manufacture of such large numbers of wireless valves is in any way connected with this increased interest in the rare metal platinum.

Every wireless valve contains within it four short pieces of platinum wire fused into the lower part of the glass stem of the valve. These short pieces of platinum wire form the connections between the anode, grid, and filament supports inside

the valve and the four corresponding wires leading into the valve from the four pins.

Platinum is used in the wireless valve in this way because it fuses into glass so well that the "fusing" is airtight. The amount of platinum used in the manufacture of one wireless valve is only small of course, but when we consider the great number of wireless valves now being turned out daily, we cannot fail to realise that to find the platinum required for all these valves must severely tax the world's limited supply of this very rare metal.



Thunder and Lightning

I have just had a most interesting talk with my meteorological friend on the subject of thunderstorms and lightning.

"How many thunderstorms are there each year over the whole earth?" I asked him.

"Quite a lot," he replied.

"Yes, I know. But what is the exact number?"

"I can't say offhand, but I can find the figures if you will wait a minute."

My meteorological friend took down a grey-backed book from his bookshelf. I am afraid I did not see the title of the book, but my eye caught the word *ionisation* on the paper cover and there were other equally formidable scientific words.

"Here we are," said my meteorological friend, as he turned the pages over rapidly, "these are the very latest figures. I only had them a day or two ago. The earth experiences about sixteen million thunderstorms a year."

"Sixteen million?" I ejaculated.

"Yes, sir, sixteen million."

"Odd, isn't it?"

"No, even."

"Don't be facetious. How many does that work out at a day or per diem?"

"Forty-four thousand."

"Great Jupiter! How many thunderstorms are there going on at any moment?"

"If you reckon a thunderstorm

to last, on the average, for an hour, there are, at any moment, about eighteen hundred thunderstorms taking place in different parts of the world."

"It's a good thing we get less than the average in this part of the world, don't you think?"

"We do pretty well. Taking a



"Forty-four thousand a day."

circle of six hundred miles radius from London as centre, there are, in that circle, about sixty-eight thousand thunderstorms a year."

"How many lightning flashes are there?" I then asked.

"The number of lightning flashes works out at one a minute in winter and about eleven a minute in summer."

So now you know why you may expect to hear pretty well of atmospheric in your wireless receiver. The wonder to me is how we manage to hear anything but atmospheric with so much thunder and lightning about.

International Congress

One of the recommendations made by the recent International Wireless

will not travel in the dark. At any rate, the table of wavelengths given here does not go below 35 metres.

A second interesting point is the wireless importance of the regions named according to their allotted wavelength bands. To Europe is allotted a total wavelength band of 29 metres. To the United States the total allocation is 14 metres, to Canada and Newfoundland the total allocation is only 9½ metres, while to the rest of the world only 13½ metres are allocated.

These wavelengths are not, of course, in any sense official. They are recommendations of an international congress of amateur transmitters.



Short Waves

What is going to be the ultimate result of all this wonderful short-wave work in wireless? I don't know what you think about it, but I, for one, would not like to hazard a guess.

The most extraordinary thing, of course, about these very short waves is the amazing distances they travel in daylight. I have been wondering if these long-distance daylight records for short waves can be reconciled with the existence of the Heaviside layer in the upper atmosphere.

When Marconi discovered twenty-three years ago that a ship crossing the Atlantic could receive wireless signals much better at night than in the daytime, the Heaviside theory had to be considerably revised.

Are our short-wave amateur transmitters going to make a further revision of the Heaviside theory necessary? I wonder!

To those of us who have been interested in wireless from pre-broadcasting days, it is a point of interest to recall how our "short waves" are continually getting shorter.

At one time, a short-wave receiver was one by which signals on wavelengths under six hundred metres could be received. After the broadcasting and relay stations had been established, we began to look upon short waves as those below

Proposed International Wavelengths for Amateur Transmissions

Above 50 metres.		Below 50 metres.	
Wavelength range in metres.	Region.	Wavelength range in metres.	Region.
70-75	Europe	35-37½	Rest of world
75-85	United States	37½-41½	United States
85-96	Rest of world	41½-46	Canada and Newfoundland
95-115	Europe	43-47	Europe
115-120	Canada and Newfoundland		

Congress at Paris was that wavelengths should be assigned to amateur transmitters according to the above table.

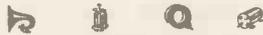
There are several most interesting features in the recommendations. Not the least interesting is that the Congress evidently took it for granted that John L. Reinartz and other American wireless experimenters were right in their claim that waves of less than 30 metres

three hundred metres. Within the last year or so our short waves have dropped below a hundred metres.

The most astounding results in short-wave work recently have been achieved on wavelengths round about twenty metres.

If our short-wave experts get down to ten metres, their waves will be comparable in length to sound waves, for sound waves vary in length from less than an inch to a dozen yards or more.

Sound waves, however, are air waves and not ether waves. The other ether waves—light waves, heat waves and X-rays—are waves so short that they have to be measured in millionths of a metre or less.



A Licence Problem

It has been computed that there are at the present time nearly a million and a half wireless receiving licences in force.

The annual revenue from these licences works out at such a substantial figure as to cause proposals to be made for the reduction of the yearly cost of our listening-in licences.

By far the most interesting of the proposals made with regard to reductions in our yearly licence fees is that users of crystal sets should pay less than at present, users of one-valve sets should pay the same, while users of sets containing more than one valve should pay a certain sum more per valve.

Rather a scheme, isn't it?

The only objection I have seen lodged against the scheme so far is that, if it were carried out, the Post Office authorities, to be consistent, would have to grade dog licences according to breed or lack of breed in our dogs.

Personally I think that the grading of dog licences according to the type and the family history (if any) of the dog is a reform far more needed than the grading of our wireless licences according to the type of receiving set.

There need be no more difficulty in classifying dogs than in classifying wireless sets. My plan would be to let the neighbours of the owner of the dog classify the animal.

Let me explain more fully.

One of my neighbours has an extremely foolish mongrel terrier

which howls every time I put my loud-speaker in the garden. I should enjoy making it my duty to grade that lowest of mongrels in the highest of classes for taxation purposes.



That lowest of mongrels.

poses. What do you think about it all?



A Little Bit of Algebra

In how many different ways can you arrange the valves in the valve holders on a multi-valve set?

The above question so intrigued me the other evening that I sought the help of a mathematical friend. I call him a mathematical friend because he worked through, or pretended to work through, a book on higher algebra at school, whereas I came to a "dead end" at the chapter on quadratics, or was it surds?

"First of all," said my mathematical expert, "with a one-valve receiver there is only one way."

"Wonderful!" I remarked.

"With a two-valve set, however," he went on, "there are two ways: either valve may be in the first holder, the other one being, of course, in the second valve holder."

"Magnificent!" I remarked.

"With a three-valve set," went on the man of much mathematics, "er . . . By the way, does anybody ever make up a three-valve set?"

"Rather," I replied; "come on now, get on with the doings."

"With a three-valve set there are three times two times one possible arrangements of the valves in the holders."

"Three times two times one? Rather a lot of times that, isn't it?" I asked.

"Only six," was the reply.



"Three times two times one."

"Could you set it all down on paper?" I asked.

"Certainly, my dear boy," he replied. "Let us call the valves A, B, and C, and the valve holders 1, 2, and 3. The possible arrangements are:

	First	Second	Third
Valve holder	I 2 3	I 2 3	I 2 3
Valve	A B C	A C B	B C A
	Fourth	Fifth	Sixth
Valve holder	I 2 3	I 2 3	I 2 3
Valve	B A C	C A B	C B A

"There you are, six of them, and all different."

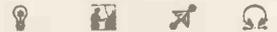
"What about a four-valve set?" I then asked.

"There would be four times three times two times one possible arrangements," was the reply.

"What an awful lot," I remarked.

"Only twenty-four all told, my boy."

So now you know, and if you want to try all the possible arrangements of the four valves in a four-valve set one evening, by the time you have tried them all you will be in nice time to listen-in for America.



Phonetic Spelling

You remember how, in the getting-up of attractive and tempting advertisements, use is sometimes made of a free and easy phonetic spelling for the most important word or words in the advertisement. Has it ever struck you that wireless advertisements are particularly free from that kind of thing?

Occasionally we see a faint-hearted attempt at this phonetic spelling in our wireless advertisements, but, generally speaking, our wireless advertisers are wise enough to call a spade a spade in their advertisements and leave it at that.

Whether words spelt in a catchy, phonetic fashion in an advertisement give that advertisement more pulling power than it otherwise would have had, is a point on which I should not like to express an opinion. I am certain, though, that smart phonetic spelling in wireless advertisements would never appeal to me.

Even in America, the home of "simplified spelling," wireless advertisers do not make any great use of the phonetic art in writing their advertisements. We might have expected that, in the American wireless periodicals, there would have been quite a system of simplified phonetic spelling for the familiar words of wireless.

I have just worked through two of the current numbers of American wireless magazines and I think that the best, or worst perhaps, example of phonetic spelling I could find was

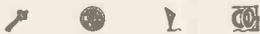
the word *fonekushion*. Now I do wonder if that American advertiser does more business in "fonekushions" than he would do in phone cushions or in phone pads.

Dear Sir
We hav spell
fonelibly for years
yones Jak & Filip



Phonetic Spelling.

A list of phonetically-spelt words I drew up from the two American magazines was not a very formidable one. Here it is. (I wonder if you will be able to identify all the words?) Soder, Cirkit, Ezitoon, Readem binding posts (terminals), Dyne-a-might (set), Harmoniks, Loloss, Melotone, Katalog.



Geneva's Problem

It will be an interesting matter to see how the new International Wireless Bureau, established at the beautiful Swiss town of Geneva, will set about the problem of the allocation of European wavelengths from time to time.

Will this Wireless Bureau in the near future find it necessary to try to prevent the establishment of further broadcasting stations in Europe? Will the Bureau have to take the line of encouraging each European country to build only a very limited number of high-power long-range stations, and, at the same time, offer no objections to the building of an unlimited number of low-power short-range stations, such low-power stations to have a range restricted approximately to the countries in which they are built?

One could make many interesting speculations as to the manner in which Geneva will attempt to solve the problem of a possible congestion in the European ether.

It is inevitable that we should



Five Hundred Stations in the U.S.

compare the problem Geneva has to solve with a similar problem which still awaits solution in America. According to an official count by the B.B.C., there are 59 main European broadcasting stations on the European broadcast wavelength band of

250 to 600 metres. In the United States there are over five hundred broadcasting stations in operation.

On the face of it then, Geneva's problem appears to be a simpler one than the corresponding American problem, which no one seems to have attempted to solve. The problem which has to be solved at Geneva is, however, an international one. The American problem is a national one.



New Valves

The way in which our valve manufacturers are continually turning out new and more efficient valves is really most admirable.

We are all of us familiar with the fact that, inside the valve, there are a filament, a grid and a plate. It

FREE ANSWERS TO YOUR QUESTIONS

We want to do as much as we possibly can to make wireless simpler and bring it within the reach of everybody.

Many of the difficulties are more apparent than real and can easily be overcome.

If you are in doubt on any point let us know and we will advise you—quite free of charge. Just address your problem to:

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

not forgetting to enclose a stamped addressed envelope and the coupon on page 695.

is in varying the size, shape and relative positions of these three electrodes that the research engineer finds so much to occupy his time.

Manufacturers of valves appear to be more inclined than ever these days to depart from the almost standard type of valve having a straight filament, a spiral grid and a cylindrical plate.

I have recently been looking over a set of drawings illustrating a new American valve in which the filament is in shape an inverted V. The grid in this valve is a "plate" of metal having two slits in it which also form an inverted V. The filament is suspended in such a way as to pass through these slits in the grid.

A curious feature of the "grid plate" is that the slits in it have

serrated or "saw-toothed" edges. The real plate consists of two parts which fit one on either side of the grid and filament.

This particular valve is an im-



The Grid and the Plate!

portant venture in valve manufacture, since it has a very low internal capacity, roughly a third of that of an ordinary valve, a feature that makes the new valve very suitable for use as a high-frequency amplifier.



Trees and Wireless

Trees in a garden are all very well when you are simply considering the view from the sitting-room window, but they are a real nuisance when there are aerials to be erected.

My aerial lead-in comes down very near to an elderberry tree, and I noticed recently that one branch of this tree was touching the down-lead wire. One fine afternoon last week, being determined to do some kind of a wireless job out of doors, I made up my mind to cut off the end of the branch which was touching my down-lead.

Looking round amongst my spare stores, I saw a good strong spreader eight feet long.

Into the end of this spreader I drove a stout nail. With the spreader in my hand I mounted a step-ladder which I had placed under the elderberry tree. After one or two bad shots, I managed to hook the nail in the spreader to the end of the branch I wanted to get at. Very carefully, I pulled the spreader down and the branch with it. The branch bent very nicely, and I ultimately got hold of the



Determined to do a wireless job.

end of it. Then, with my pocket knife, I cut away a couple of feet from the end of the branch.

Are reception results better for the lopping of the elderberry tree? I am afraid I cannot tell you, but *theoretically* they are. HALYARD.

An Attaché-case One-valver

Cheap to Build and Simple to Operate.



COMPLETE in an ordinary leather attaché case, the portable receiving set here described gives good headphone reception up to 20 miles from a main broadcasting station, using a simple aerial 60 to 100 feet long.

This may be a length of insulated wire slung over a tree branch; the earth may be made by sticking a brass rod into moist soil or the bed of a pond or stream.

The ultra-audio type of circuit is used; this gives good results on either low- or high-wavelength stations, providing a coil having a suitable number of turns is used.

The components required for the construction of the set are as follows:

16-inch leather attaché case, 3 1/2 in. deep inside by 10 in. wide.

Sufficient 1/4-in. mahogany to construct the container lid (as shown by the diagram) and also the baseboard, 8 in. by 3 1/2 in.

Ebonite panel, 8 in. by 3 in. by 1/16 in. thick.

Piece of ebonite 3 in. by 1 1/2 in. by 3/16 in. thick (for the battery-terminal mounting strip).

Utility .0003-microfarad variable condenser with incorporated vernier.

Microstat filament re-

sistance (Wates Bros.).

Bretwood variable grid leak.

8 Belling-Lee marked terminals (aerial, earth, phones, H.T. +, H.T. -, L.T. +, and L.T. -).

Aermonic valve holder.

Ebonite washer 1 1/2 in. diameter (1/8 in. to centre hole) for clamping coil to baseboard.

.0003-microfarad fixed condenser (Dubilier).

Valve window to

fit container lid (see diagram on right below).

9 flash lamp batteries (for making up the H.T. battery).

4 1/2-volt box battery (Ever-Ready or Siemens).

Marconi-Osram DE3 or similar valve.

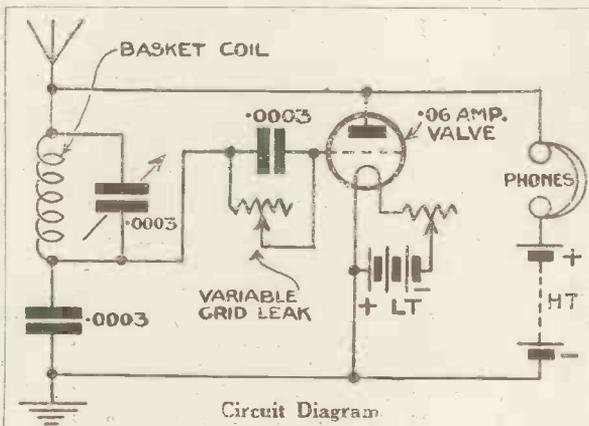
2 small brass angle brackets for fixing panel to baseboard.

Quantity of wood screws and 6 B.A. bolts and nuts for constructing container, fixing lid and securing panel to baseboard.

Basket coil (60 turns duplex wound).

2 yds. No. 18-gauge tinned copper wire.

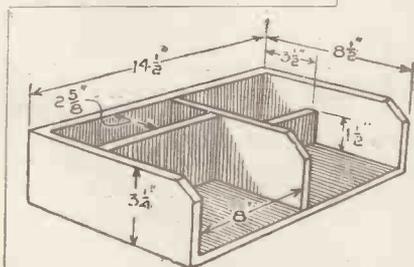
1 yd. insulated flex for battery connections.



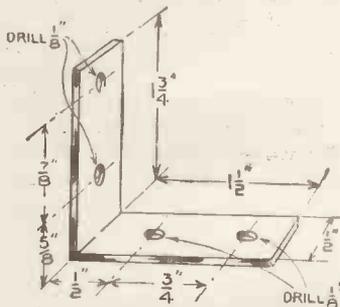
Circuit Diagram

Constructional Details

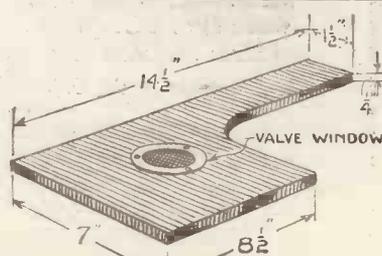
After drilling, the surfaces of the ebonite panel should be emery-



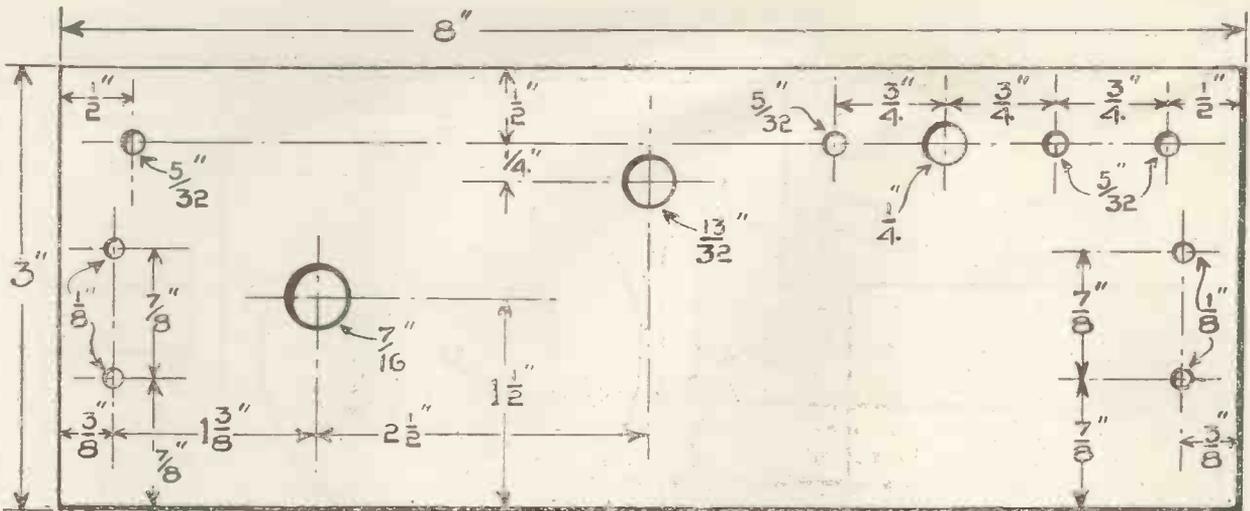
Containing Case.



Panel-supporting Bracket.



Lid for Container.



Layout of Panel.

clothed and oiled, unless the material is of the guaranteed type.

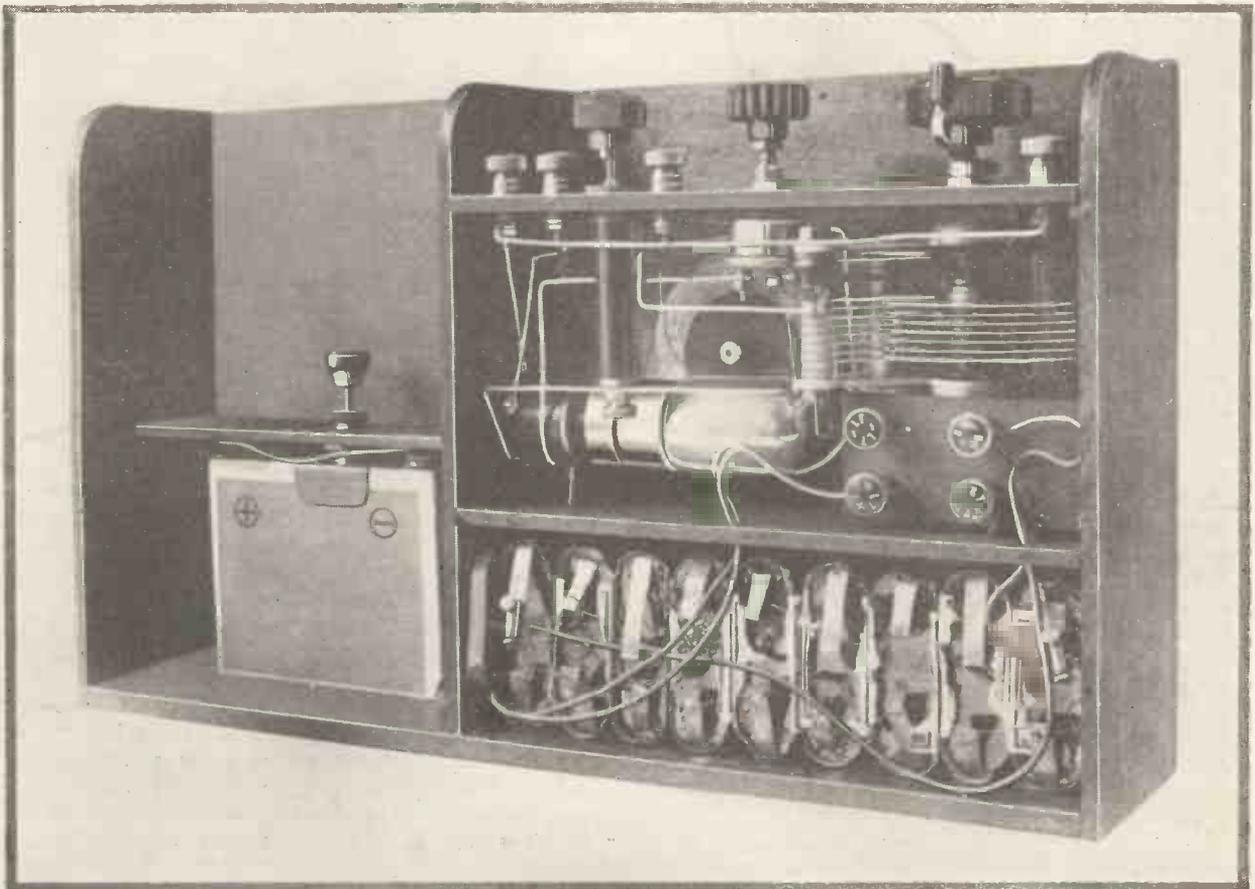
After fixing the panel to the baseboard, the components may be mounted in position and wired up as shown in the wiring diagram (see page 602).

The ebonite strip holding the battery terminals is mounted on a

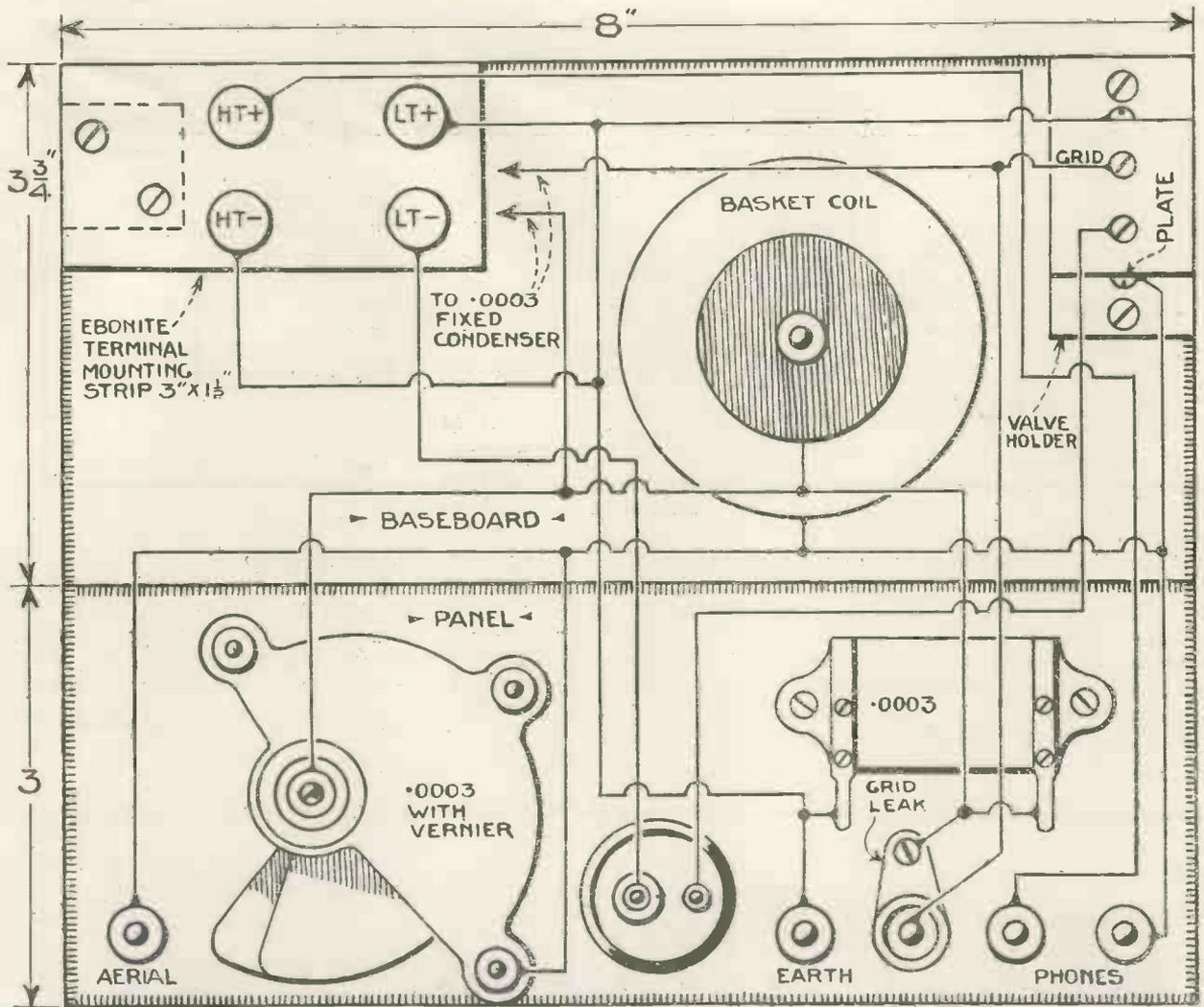
piece of hardwood, $\frac{7}{8}$ in. by $\frac{7}{8}$ in. by $1\frac{1}{2}$ in. long, in order to clear the .0003-microfarad condenser which is mounted in the rear left-hand corner of the baseboard, while the tuning coil is clamped to the baseboard by means of a 6 B.A. screw and an ebonite washer $1\frac{1}{2}$ in. diameter.

Connecting-up

Connections to the H.T. and L.T. batteries are made by means of thin rubber flex passing through holes in the partitions of the container. The nine flashlamp batteries should, of course, be soldered up in series, giving a total H.T. voltage of approximately 40 volts.



General View of Set, showing Positions of Components.



Wiring Diagram of Attaché-case One-valver.

Owing to the compactness of the receiver, it may be found that a shallow recess is required in the underside of the lid in order to clear the tips of the variable condenser plates when these are revolved—a small flat woodworking chisel will be found a convenient tool with which to carry out the operation.

To test the set before taking it out into the country, a small indoor aerial should be used—the earth lead being taken to a length of brass rod buried in the garden.

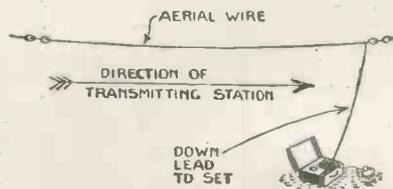
For ordinary broadcast reception, fit a basket coil of about 60 turns to the set in its correct position in the circuit and, with the phones over the ears, light up the valve filament; signals may then be brought in by manipulation of the tuning condenser.

Care should be taken not to let the set oscillate, or signals will be distorted and interference with neigh-

boring listeners' reception possibly caused.

In the Country

When the set is used out in the country a spot preferably near a stream or pond should be selected, as it will then be possible to obtain



Directional Aerial.

a good "earth" by forcing a metal rod into the soft bed of the pond or stream.

An isolated tree—or, if this is not convenient, a tree on the edge of a wood—will provide the means for erecting an aerial, but if no trees

are available quite good results may be obtained by laying the insulated aerial wire along the top of a high hedge or wooden fence.

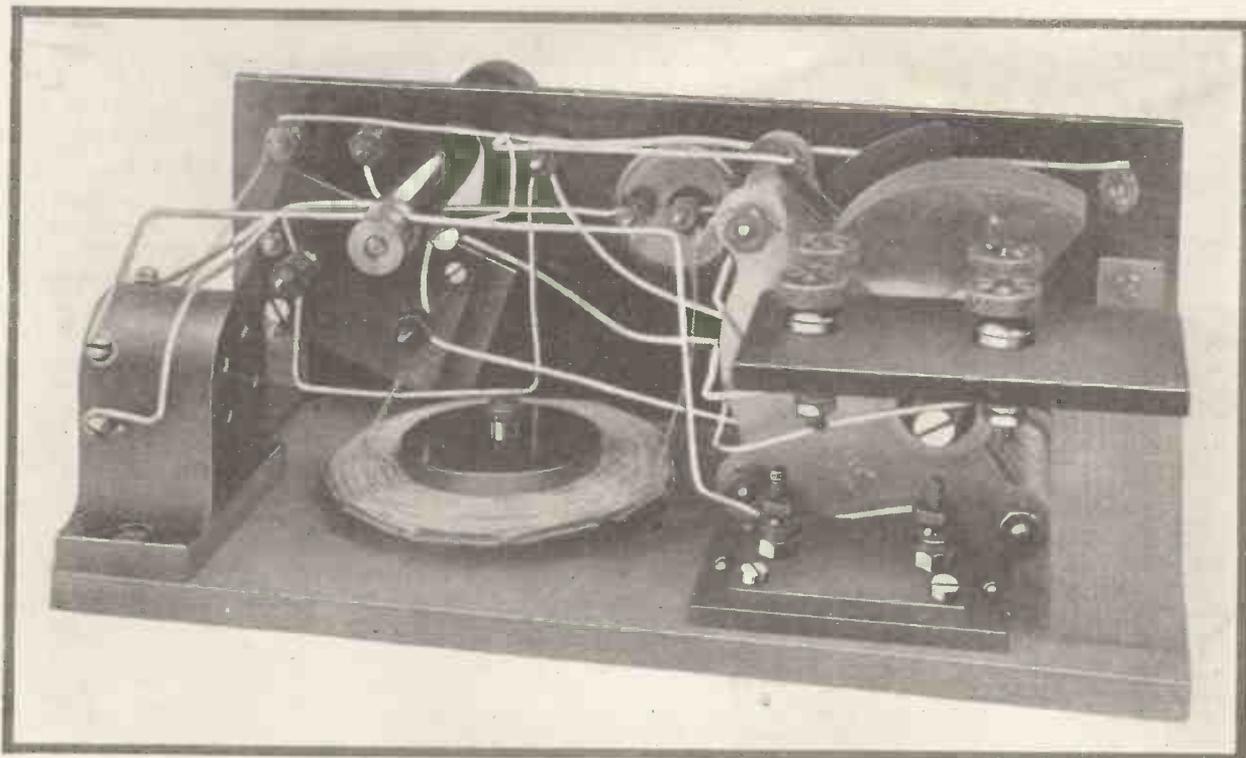
For best results the free end of the aerial should point away from the transmitting station, as shown diagrammatically on this page.

Good results may be obtained when boating by erecting a small T aerial between two bamboo poles, fixed one at each end of the boat. A bare wire should, of course, be allowed to trail in the water to form the "earth" lead to the receiver.

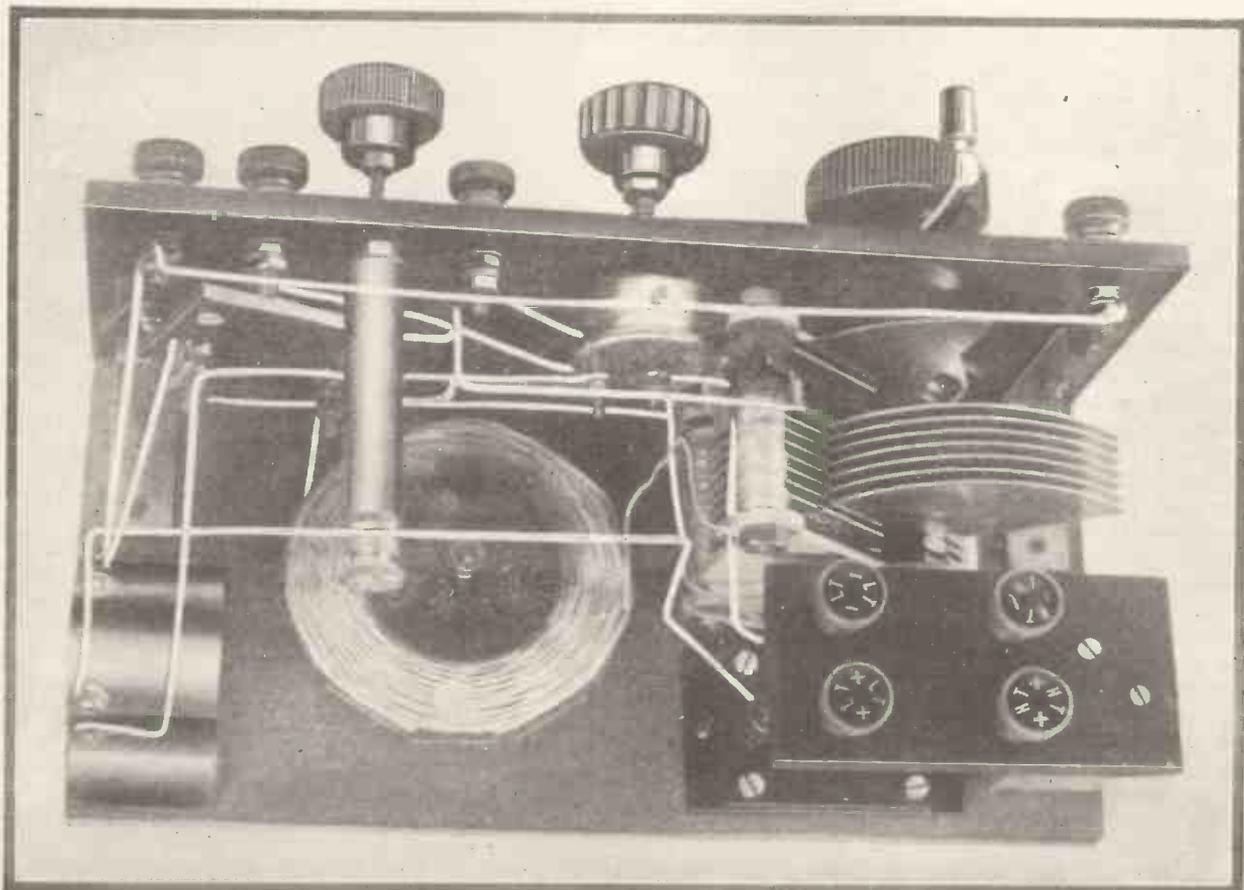
Some interesting experiments may be made by erecting two aerials or an aerial and a counterpoise and comparing results with those given when a proper lead to earth is employed.

Useful additions to one's wireless knowledge may be made in this way, especially if no facilities are available at home for such experiments.

R. N. W.



Wiring of the Attaché-case One-valver.



Another View of the Wiring.

Extended Leads for the Loud-speaker

THE sitting room in which my wireless set has been installed the last few months resembles, for the moment, a low-loss coil. There is very little solid dielectric in the field. In other words, the room, pending a visit from the painters, is devoid of furniture. My wireless set and the table on which it stands are the only things left in the room.

Unfurnished

Now a room without furniture is a decided asset when you require a wireless workshop, but such a room is not to be recommended for listening-in in comfort. I tried a loud-speaker in the empty room, but I did not like the effect at all. Even with the phones I fancied there was the same curious effect of exaggerated emptiness.

The worst feature of the empty room, however, was the noise some of my visitors made as they walked across the bare floor. I am perfectly sure that some footsteps caused a rattling noise in my loud-speaker.

You will probably wonder why I did not move my set to another room. I could have done so, but such a course would have meant slight alterations to my aerial, and I am rather anxious to leave well alone as far as my aerial is concerned just now.

Move the Set?

Then why did I not take aerial and earth leads from the earthing switch in the bare room to some other more habitable room? Have you ever done such a thing? If you have, I am quite sure you would not recommend me or anyone else to do it. I am equally sure that you would recommend me rather to leave the set where it is and to provide long leads from the set to a loud-speaker placed in some other sitting-room in the house.

My set, then, remains in the room desolate. My loud-speaker has been installed in a fully-furnished room some distance away. From the loud-speaker terminals on the set I have taken a length of electric lighting flex to the loud-speaker. This flex is of the usual type—two insulated leads twisted together.

I have recently carried out an interesting experiment with this long lead of double flex, an experiment which, I think, illustrates very clearly the possibility of losses in a wireless receiving set and its connections. The experiment was as follows:

Placing a pair of phones on my head, when the set was working the loud-speaker well in the distant room, I pushed one of the phone cord tags in between the two twisted leads of the flex which connected the set to the loud-speaker. To my great amazement, I heard extremely well in the phones.

Better than Ever

At first I allowed the second phone cord tag to hang freely, but, on holding this second tag in my hand, I heard better than ever in the phones.

This little experiment caused me to think rather critically of the manner in which I had fixed up my long loud-speaker lead. I had put up this lead in a hurry. My rough-and-ready method had been to drive

a few small nails here and there in the picture rail and the door frames along the proposed track of the flex lead. Then I had just hooked the two-lead flex over these nails, one lead of the flex being on one side of the nail and the other lead on the other side.

Continuing my experiment with the aid of a step-ladder, I tried placing a phone cord tag on each one of the nails in turn, starting with the one nearest the set. I could distinctly hear in the phones by making contact with one of the phone cord tags and a nail. As I got nearer and nearer to the loud-speaker, I found it more and more difficult to tell whether I was hearing through the phones or hearing the loud-speaker.

Leakage

All this set me thinking. I reasoned that there must be some small loss at each one of the nails over which the flex had been placed. Accordingly, I set about making good these losses. Near each one of the nails I attached a small piece of string to the flex, the string being passed round the two leads of the flex and not in between them. I then formed a loop of the small piece of string and placed that loop over the nail. I did this at each nail, the loops of string allowing the flex to hang a good two inches from the nail.

Improved Results

It seemed to me that this new arrangement improved my loud-speaker reception considerably. Certainly, after I had re-hung my connecting flex in the manner indicated, I obtained the best loud-speaker reception that I have yet obtained. Not only was the strength of the received telephony apparently greater, but the purity of tone was noticeably better.

Apart from improved reception from the B.B.C. stations, I picked up Radio-Paris better than ever I have picked him up before. So clear was he that I heard every word he said, and I even recognized three of those words—and that is something of a record for me, I can assure you.

HALYARD.

DO YOU WANT TO BUY A SET?

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

Tell us how much, roughly, you wish to spend; where you are situated; what stations you wish to receive, whether only the local station or others as well; whether you intend to use headphones or a loud-speaker; and we will advise you as to the general lines of sets that will answer your purpose. (It should be noted that this service does not extend to the choice of components.)

Send your enquiry with coupon (p. 695) and stamped addressed envelope to—

"Buyers' Advice Bureau."

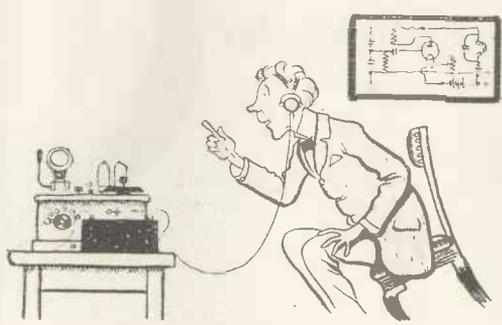
THE WIRELESS MAGAZINE,
La Belle Sauvage, E.C.4.

That Super Set—

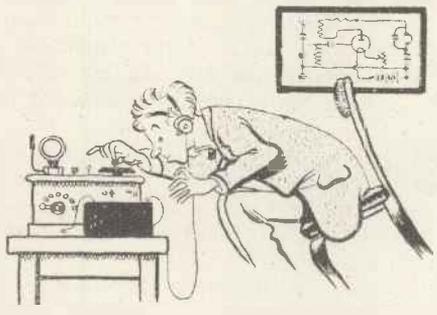
By
RENÉ BULL



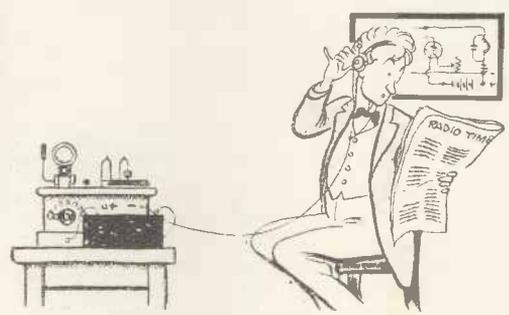
ITS OSCILLATING, I OUGHT TO BE GETTING SOMETHING.



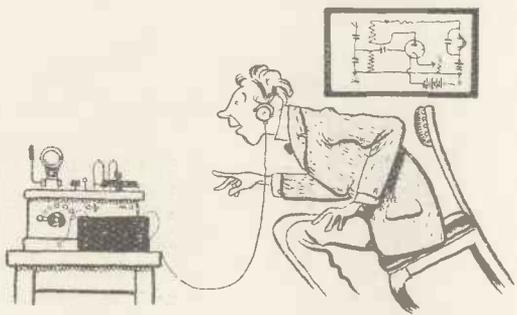
..... I BELIEVE ITS BIRMINGHAM



..... OR IS IT CARDIFF ?



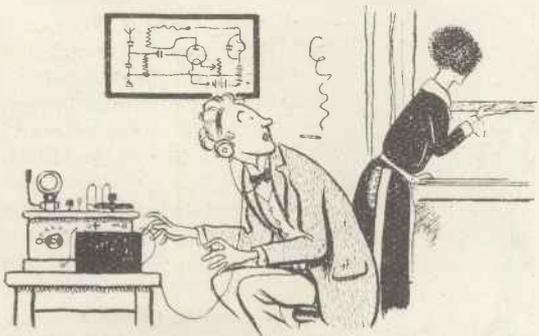
....NO! IT CANT BE CARDIFF THERE'S NOTHING ON THERE..



..... I'VE GOT IT ! ITS ABERDEEN



... AT LAST ! QUITE DISTINCT I HEAR NEWCASTLE CALLING



.... WHAT ARE YOU DOING DARLING ?



!!!!!!!

The Loudness of the Loud-speaker

And How That Loudness is Distributed

A Special Article by Dr. E.E. Fournier D'Albe



THE problem of measuring loudness seems a fairly easy one. Most of us can judge whether one sound is louder than another, especially if the sounds are of the same character.

Comparing Loudness

But if we want to judge of the comparative loudness of two different notes, or compare the loudness of a dog's bark with the chirp of a cricket, we encounter many difficulties, mainly due to the different sensitiveness of the human ear to different notes.

Lord Rayleigh, in 1907, found great differences in our appreciation of different notes of the same intrinsic energy.

If the condensation of the air wave produced by sounding the middle C (256 vibrations per second) is expressed by 16, the octave above that note will only require a condensation 10 to strike our ear with the same loudness, whereas the octave below will require a condensation as high as 32.

The actual displacement of the air molecules is astonishingly small. In the very faintest audible sound it only amounts to the thickness of a single molecule, of which 250 million go to the inch.

Even in the very loudest sounds, such as that produced by the eruption of Krakatoa in 1883, the displacement never exceeds a millimetre.

Energy and Vibration

It should be remembered that the energy of an elastic vibration increases as the square of the displacement. For instance, it takes four times the amount of work to pull a stretched string sideways by two millimetres as it does to pull it sideways by one millimetre, and when the string vibrates its energy of vibration is four times as great in the former case.

The energy of sound—in other words, its physical or objective loudness—varies, therefore, enormously. The Krakatoa eruption was 100 million

million times louder than the faintest sound which the human ear can perceive.

Measuring Loudness

The loudness of a telephone receiver sounding a single note can be measured by attaching a small mirror to the diaphragm in such a way that the mirror oscillates with every vibration of the diaphragm.

The oscillations are photographed on a moving film, and the amplitude of the wave figure on the film is a measure of the loudness, which is proportional to the square of the amplitude.

It is more difficult to measure the loudness of a sound conveyed through the air, but the writer has successfully applied the method described by him in No. 1 of the WIRELESS MAGAZINE.

It consists in receiving the note to be measured on a compound resonator tuned to the same pitch, and noting the displacement of the spot of light reflected by the mirror attached to the reed of the resonator.

By putting the resonator at different points in front, behind, and beside the loud-speaker, the field of sound can be mapped out without relying in any way upon the ear, which is notoriously incapable of "measuring" the loudness of sounds.

Results

The results of some of these measurements are shown in the diagrams. They are seen to be very different in the two types of loud-speaker chosen.

The pleated-paper loud-speaker (Figs. 1 and 2) shows a fairly even distribution of the sound over a wide area, both in front and behind the paper.

The length of the stems of the notes indicates the amplitude of the sound waves, in other words, the relative displacement of the air molecules.

We may notice a curious dead zone in the plane of the paper, due

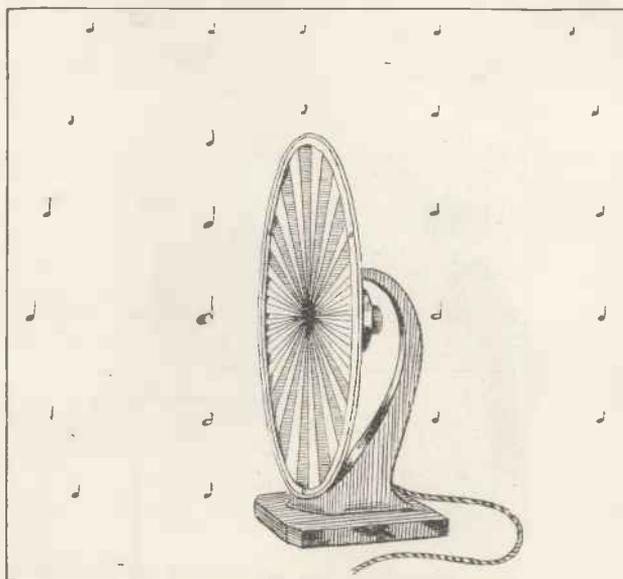


Fig. 1.—Relative Sizes of Notes Indicating Distribution of Sound from Hornless Loud-speaker.

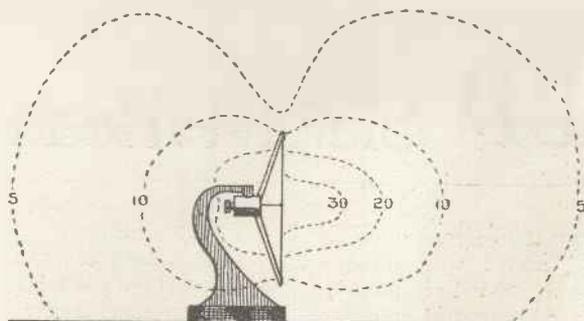


Fig. 2.—Graphic Representation of Distribution of Sound from Hornless Loud-speaker.

to the interference of the sound-waves from the front and back.

Horned Instrument

In the horned instrument (Figs. 3 and 4), on the other hand, there is a great concentration of sound at the mouth of the horn, with a decided falling off outside the cone traced out by the flare.

There is comparatively little sound outside this cone, especially if there is no echo from surrounding walls.

The concentration of the horned loud-speaker becomes more accentuated as the pitch of the note increases.

These measurements were made by connecting the loud-speakers with an oscillating valve set howling to the note B flat (838 per second, diapason normal).

The pitch of the note was varied by altering the high resistance in parallel with the secondary of the interval transformer.

The greater concentration in the mouth of the horn on raising the pitch is easily accounted for by the fact that short sound waves cast clearer "shadows," having less aptitude for bending round corners.

The figures given are no guide to the volume of sound obtainable from the two instruments respectively. That depends upon the various adjustments of the receiving set and upon the pitch of the notes received.

In the experiments under discussion it was found that the pleated-paper loud-speaker emphasised the notes ranging about the middle C, but the other favoured the range

of notes nearly an octave above.

On putting the two instruments in parallel on the same set, and transmitting a jumble of notes together, the effect was strikingly varied by switching over from one to the other.

The numbers in Figs. 2 and 4 indicate the amplitudes of vibration of the resonator reed. To obtain the scale of loudness,

would not vary with the distance at all.

This case is realised to some extent in the pleated-paper loud-speaker.

Two Main Types

Every conceivable loud-speaker must approximate to one or other of the types discussed. But its practical effect will depend largely upon the conditions under which it is used.

In a room with highly reflecting walls, for instance, the horn will become quite ineffective for concentrating the sound, as the walls will disperse it in all directions by reflection.

In the open air, on the other hand, the sound will be heard about three times as far in front of the horned loud-speaker as it will be heard behind it.



Fig. 3.—Relative Sizes of Notes Indicate Distribution of Sound from Horned Loud-speaker.

these figures will have to be squared.

At a considerable distance from any source of sound we may expect the inverse-square law of loudness to hold good rigidly.

If the source of sound were a line of great length instead of a point, the loudness would vary inversely as the distance from the line, and not as the square of the distance.

Finally, if the source of sound were a larger surface, the loudness near the surface

ONE advantage of the broadcasting of sermons is that the supposed listener can go to sleep without in the least hurting the parson's feelings.

Two lonely Britons in America have written to say that the sound of Big Ben, which they hear on the wireless, makes them homesick. Possibly it reminds them of that good old English institution known as opening time.

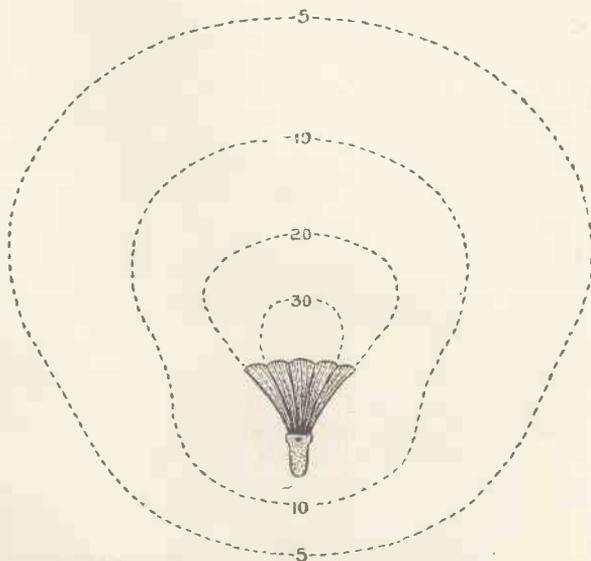


Fig. 4.—Graphic Representation of Distribution of Sound from Horned Loud-speaker.

WIRELESS IN BED by Sleigh P. Head

PERHAPS it is because I had a long illness two years ago; perhaps it is because the other members of my family are by nature talkative; perhaps it is because my loud-speaker prefers to function at some distance from the set; perhaps it is because of all these things combined; in any case, the place in which I most completely enjoy wireless is—my bed!

A Good Way

One of the B.B.C. uncles (C. A. Lewis, I believe) has declared that the best way to enjoy wireless is to switch off the lights and sit in an easy chair by the fire. Well, that isn't a bad way—in the winter—though I'm not prepared to admit that it is the *best* way.

If you are all alone, or better still if only "Dearest" is with you, it's quite an excellent way. You can nestle down and listen, while the music conjures up visions in the red heart of the fire—at all events until the fellow up the lane barges in on your private bliss with the aid of his reaction coil. But if you happen to have youngsters, and they happen to be around, they are liable to fidget and talk and to demand at frequent intervals when you are going to put the light on again because they can't see what they're not doing. And if there are any other grown-up people in the family they may not object to being unable to read the evening paper, but they are almost certain to yawn and cough and strike matches and hum and whistle and poke the fire at all the wrong moments and make it abundantly clear that the only visions *they* see in the red heart of the fire are of things that must be described and discussed straightway.

Going to Bed

Also to sit round the fire in the dark in the summer time with the temperature at 75 degrees in the shade and broad daylight outdoors is neither easy nor free-and-easy. But one can always go to bed.

As a matter of fact I was in bed when first I became acquainted with wireless. I was recovering, slowly

but none too surely, from the before-mentioned long illness, and I was lying in bed on the lawn on a hot August afternoon when a thoughtful friend came through a gap in the hedge from the house next door and said:

"What you want, old son, is some music—and you're going to have it!"

Whereupon he proceeded to disappear and reappear through the gap in the hedge every other minute for the better part of an hour, struggling with peasticks and wire and props and wire and pails of water and wire and a variety of other things which at that time were entirely new and strange to me; and altogether he seemed so busy, so determined, so mysterious, and so painstaking that he almost took away my own pain. And in the fullness of time I lay there with a headphone pressing rather uncomfortably against my throbbing head and the sound of a concert from 2 L O in my ears.

Lost Souls

The concert was good, but the aerial was not, nor was my friend's two-valve set; and sometimes the shrieks and howls which engulfed the music reminded me most unpleasantly of lost souls and that other shore to which my illness had so very nearly conveyed me.

"Good, isn't it?" cried my wireless physician from time to time, as he beamed upon me in self-satisfaction from the other headphone.

"Splendid," I murmured gratefully. "Except for those awful shrieks."

"They're oscillations," he explained.

"Then I must have oscillated a lot myself when I was in hospital," I told him, "for I used to hear them without any wireless assistance. I remember——"

But what I remembered I prefer to forget; and anyhow it's quite another story. The point is that I started listening in bed, and that I still prefer to listen there. But not with headphones.

In due course I recovered my health and acquired a four-valve set and a

loud-speaker; and although it (nearly) always gives me pleasure to give the other members of the family pleasure, it was not long before I wanted to take the loud-speaker up to my bedroom, partly so that I could go to bed at bedtime instead of staying up till midnight, and partly so that I could occasionally listen to the transmissions without having to listen at the same time to the humming accompaniments and running commentaries of my father-in-law and to the persistent interruptions of the youngsters.

Moving the Aerial

In the first instance, knowing little of the ways of wireless, I released the down-lead from the lead-in tube, hooked it in at the bedroom window with a walking stick, carried the set upstairs with all its accessories and connected up on a table near the bed, running an earth wire from the set to the pipe that feeds the cistern that fills the kitchen boiler. But the set didn't really approve of these tactics, and the result was not really good. Added to which it was quite a lengthy business changing from upstairs to downstairs, and vice versa.

It then occurred to me that perhaps one oughtn't to fool about with the aerial, which is a very touchy contrivance, but that one might, perhaps, fool about with the phone leads, since L.F. currents will travel over a wire for almost any distance. So I attached a long piece of phone flex to the set and draped it up the staircase (where two of the youngsters promptly fell over it) to the loud-speaker.

Cold Work

That night the Savoy Bands sounded really excellent. But I caught a cold as a result of getting out of a warm bed and going downstairs in my pyjamas to disconnect when all was over.

I carried wheezy tidings of my success to an enthusiastic friend, who immediately proceeded to make holes in all the walls of his house and to equip every bedroom with a headphone. This friend now declares that wireless in bed is an absolute

dream, though it is usually followed by a nightmare in which he fancies he is striving vainly to cut off the "juice."

Valves on All Night!

He tells me that on three nights out of the seven the whole family retire to their beds and their head-phones at 10 p.m. and the valves are left on all night! Each member of the family is supposed to take it in turn to descend to the sitting-room and disconnect, but paterfamilias is the only hero who ever does his duty, and he is constantly complaining to the others of their negligence. But sometimes even he is delinquent.

"It's so delightful to go to sleep to music," he confesses. "I should say that it's the most perfect cure for insomnia in the world."

There are phone wires and terminals in nearly every room of our house now; and when we go to bed we more or less regularly take the loud-speaker with us. For some reason beyond my comprehension the tonal quality of the B.B.C. transmissions in the bedroom where I repose is incomparably better than in the room where the set reposes, and for some reason equally beyond my comprehension music falls more sweetly upon pillowed ears than upon those that are sitting up to take notice.

Lying Down

We may think what we like of some of the programmes—and some of us, apparently, think very little of some of them—but, believe me, in the literal sense, if in no other, the best way to take all that the B.B.C. have to offer is—lying down!

There is also a mental side to one's satisfaction—the gratifying knowledge that all those entertaining people at 2 L O, and elsewhere, are up and about and busy on one's behalf—that they are far from home and bed. And though I have no wish to stress the point, there seems to be something vaguely yet deliciously indecorous about attending a concert in bed—especially when the concert is really taking place in a public building. But, above all things, the transmission is practically perfect, the conditions under which one listens are ideal.

The one drawback is that eventual journey downstairs to disconnect, and the disturbing anticipation of

(Continued at foot of next column)

How to Keep a Log Book

A LOG-BOOK is practically essential to the wireless amateur, and it is as well to consider the following two points before starting one:—

(1) Is the completed book to be accurate in its information to such

in the following section given below of a page taken at random from the writer's log-book for 1924.

It will be seen that there are eleven columns which together contain all the information about the stations shown that is necessary. If

AUGUST 1924.

Day.	Date	Time.	Call.	Station.	Wavelength.
Thursday	14	3.30 p.m.	5I T	Birmingham	475 metres
Thursday	14	4.0 p.m.	5W A	Cardiff	353 metres
Thursday	14	4.5 p.m.	2L O	London	365 metres

Pairs Phones.	Valves used.	Strength.	Clarity.	Remarks.
One	Rectifier	Good	Moderate	
One	Rectifier	Very good	Very good	

SITUATION OF SET: DROITWICH, WORCESTER.

an extent that in future years it will be possible to refer to it to settle difficulties which may arise with regard to times of transmission, wavelength, etc.? Or

(2) Is it merely to be a simple record of the various stations received on certain dates?

An example of the first is shown

(Continued from preceding column)

that journey—if one doesn't happen to be blessed with a sweet-tempered helpmate.

But one of these fine days—or nights—no doubt someone will devise an ingenious method by which one may switch off both the high-tension and the filament currents without leaving the sheets.

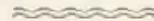
Meanwhile, if you haven't yet tried wireless in bed, take a warm dressing-gown, a pair of felt slippers, and my advice—and I can assure you that even if you accept as gospel all that I have said in its favour you will still be most agreeably surprised!

still more are desired it is an easy matter to put them in, though it will be found that there are few things not included in the example.

The second is much simpler altogether and will cause little trouble in compiling it. Only five columns are necessary, "day," "date," "call," "station," "wavelength," while the latter may be omitted if still more abbreviation is wanted.

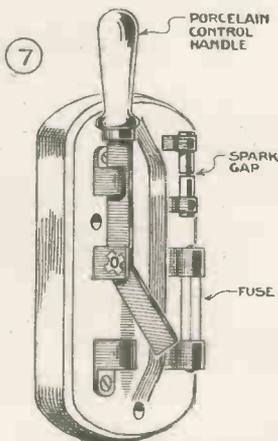
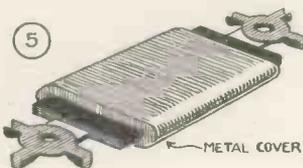
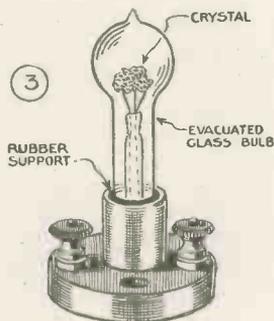
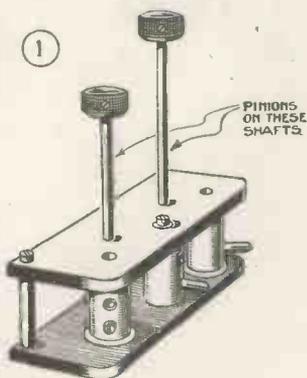
There are still a few points to be considered about both types. All the columns should be filled in accurately and neatly. They should contain as few words as possible, and above all they *must* be entered at the time of reception.

M. D. M.



CAPT. ECKERSLEY says that the trouble with the short waves is that they are fickle. We invite our shingled readers to express their opinion on this pronouncement. At the same time, we hope they won't get their hair off about it.

Novelties & New Apparatus of the Month



ON this page we give a selection of the latest components to be put on the market, together with brief descriptions of their chief points of interest:

1.—In the Yesly coil holder, made by Engineering Supplies, Ltd., of 235A, Blackfriars Road, S.E.1, adjustment is carried out by means of geared wheels. The adjusting arms of the three-coil model are of different lengths, to facilitate tuning-in operations.

2.—One-half of the Radio Bead contains a small glass roller that takes out kinks in flexible wire when this is passed through the device, which is made by Win Patents, Ltd., of Bridgeway House, Hammer-smith, W.6.

3.—Crystals soon lose their sensitivity when exposed to the atmosphere, and for this reason Crinvac, Ltd., of 15, Kingston Road, Wimbledon, S.W.19, have made a detector in which the crystal is placed in an evacuated bulb.

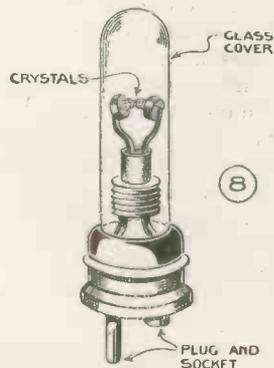
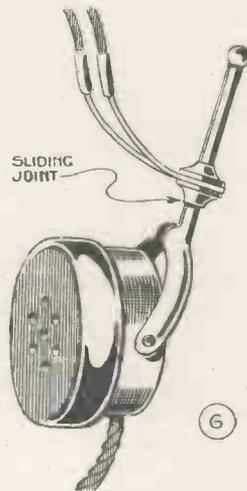
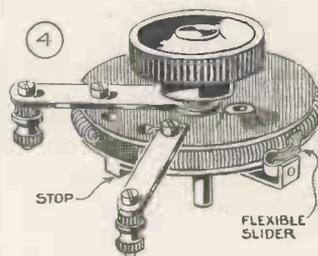
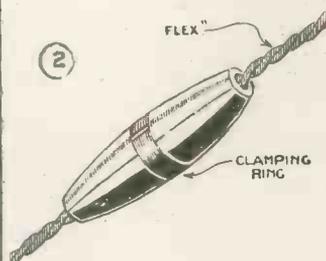
4.—Lightness of contact of the adjusting arm on the resistance element is a feature of the filament rheostat made by the Edison Swan Electric Co., Ltd., of Ponders End, Middlesex.

5.—Igranic-Freshman condensers, made by the Igranic Electric Co., Ltd., of 147, Queen Victoria Street, E.C.4, are made up with brass plates and mica dielectric. The condensers are embedded in wax and pressed into a metal case, which makes them impervious to moisture.

6.—The earpiece-supporting brackets of Lilliput phones, made by the Sterling Telephone and Electric Co., Ltd., of 210-212, Tottenham Court Road, W.1, are made of pressed metal.

7.—The Alembic lightning switch is supplied by J. Millet, of 22, Farringdon Avenue, E.C.4.

8.—Made by the Paramount Wireless Co., Ltd., of 42-43, Cranbourn Street, W.C.2, this detector consists of a perikon combination enclosed in a glass tube.





WHEN THE STAGE ARTISTE FACES THE MICROPHONE

A Special Article by Helena Millais

THE first question an actor or actress asks a fellow artiste who broadcasts is: "What is it like . . . don't you miss the audience?"

Of course one misses the audience; a *seen* audience is the inspiration of the actor. In broadcasting one is apt to forget there is an audience at all (and *what* an audience; no theatre could hold it).

What is it like to broadcast? It isn't like anything, unless it be telephoning or making a gramophone record.

"Feeling" of the Studio

The "feeling" of the stage is to "let go," to "give out," to compel, to be sweeping and mobile; the "feeling" of the studio is to repress, to be self-contained, to be silent, except when actually broadcasting, and even then you are working in tiny compass.

Stages are open and light, wide and colourful. Studios are draped and muffled, mysterious lights come and go, people creep about and talk in whispers or smile furtively at each other, and outside the studio door, when a red light is burning, people gather and stand, as though "the body's upstairs."

The whole atmosphere in the vicinity of a studio during transmission is suppression; all this is chilling to stage artistes, it represses them just when they wish to expand to their work.

The stage helps you to work; you go to your dressing-room, you change, you "make up," you hear the noises of the theatre, you go out to meet your audience with all your forces

arrayed and "tuned up." But in the studio one feels unarmed, if not unready.

The ultimate end is the same; you have to please your audience. In a theatre your audience means some hundreds of people; broadcasting means an audience all over the country, and in other countries as well; an item given in Bournemouth may bring a letter of thanks from Gibraltar.

Stage work and wireless are closely allied, and yet so very different. One of the difficulties and fascinations of the latter is the fact that people of every age, type and class are listening, and they are listening in cold blood, not as in the theatre, with others, all ready and waiting to be entertained, but seated at home, perhaps feeling very casually interested in what they are about to hear; some in rich and comfortable surroundings, others in poor little kitchens with lots of extraneous things going on around, making it difficult for them to concentrate at all.

So the artiste has not only to do his or her work without help, but has to compel the attention, by voice alone, and to make listen to song or story an audience in Mayfair, in Bethnal Green, in remote farmhouses and on the high seas.

Visible Applause

The stage artiste goes off the stage with applause ringing, the people are *there* waiting to show appreciation; the broadcaster finishes to silence, and after the nerve strain of work one is apt to feel cheated somehow.

The stage holds out the greatest attraction, but there is a very definite appeal and interest about wireless. One gets appreciation by letter, and it is charming to know that one

has friends all over the place who know you and love you, and who have only heard your voice.

To be successful on the stage one needs looks, health, education, technical knowledge and, above all, the instinct to act.

An entertainer must have stage presence, knowledge, good material and instinct; broadcasting needs only a voice and diction, and, of course, good material. A perfect voice is a wonderful thing; to be able to speak beautiful words beautifully, with the right expression and the right emphasis, and to get all the music out of the language, is a great joy! In humour, there is the pleasure of a well-timed joke or the crispness of a witty remark, to say nothing of the singing voice.

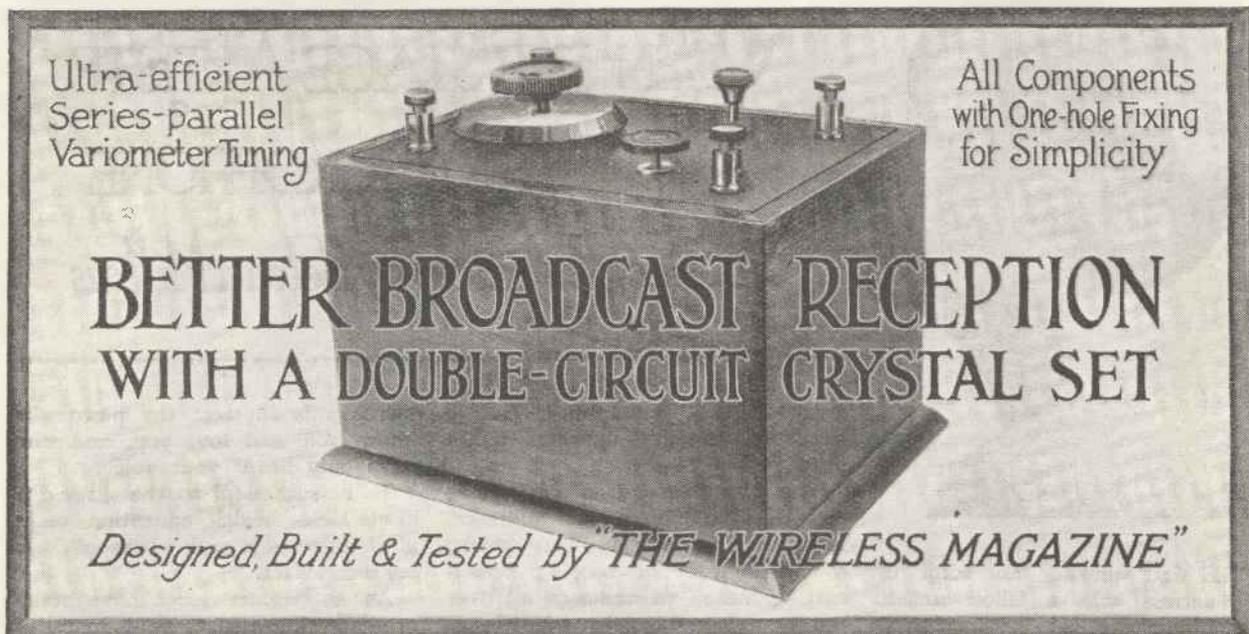
Better by Wireless

People hear voices better over the microphone than when they see you, because they concentrate more; whereas in the theatre other senses are acute, particularly sight.

In a picture theatre the ears are resting (if one can use that expression), and sight is the dominant sense; with wireless, the eyes rest and the ears do all the work—the B.B.C. is "educating" our ears as they have never been "educated" before.

To the stage artiste with a true love of the theatre, wireless must be a disappointment, because it leaves half the abilities unused, as film acting is disappointing because the voice is unused; but each branch of the work has its own interest, and with wireless one never knows where one will stop. There is no limit to its capabilities; we must wait and . . . No, I will spare you.

Helena Millais



TOO much stress cannot be laid on the fact that the efficiency of a receiver depends a great deal on the tuning coil and condenser.

The lower the resistance and capacity in a tuner the better it will be.

Extra Efficiency

A common method of obtaining an extra efficient tuner is to connect two coils in parallel (approximately halving both the resistance and the inductance) and tuning them with

a variable condenser in the ordinary way.

By using a variometer in which the rotor and stator windings could be put in parallel or in series at will, we were able to reduce the resistance and could also carry out the operation of tuning without the use of a variable condenser.

The windings of the variometer, when placed in parallel, tune to the lower broadcast band of wavelengths, while in series the tuning range extends to about 600 metres, for the reception of shipping, etc.

To construct the set the following components are required:

Ebonite panel, 7 in. by 5 in. (American Hard Rubber Co.).

Variometer (Ediswan).

Crystal detector (H. Molback).

Push-pull 5 point switch (Lissen).

Fixed condenser, 0.001 microfarad.

4 Terminals.

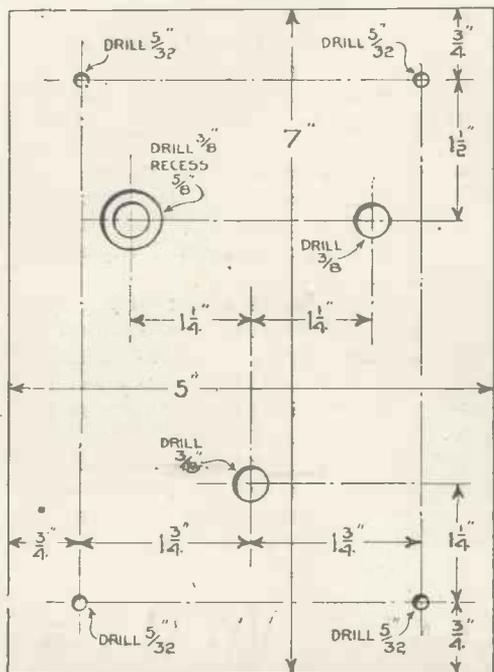
Tinned - copper wire (square section).

All the components used are of the one-hole fixing type, which greatly facilitates the construction of the receiver.

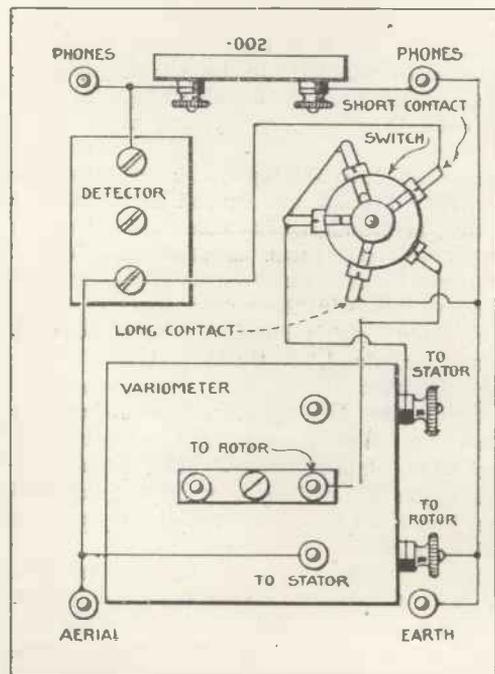
The crystal detector can be mounted underneath the panel, or on the top, as shown in the photographs.

Semi-permanent Detector

As this detector is of the semi-fixed perikon type, it will not require frequent readjustment. It will probably be found that the fixing screw is too short to allow the detector to be fixed to ebonite of the thickness recommended, but this may be overcome by countersinking the



Layout of Panel.



Wiring Diagram.

hole on the underside of the panel through which the detector is fixed.

The detector can then be mounted, the ebonite holder fitting inside the countersunk hole and being fixed with the nickel-plated collar which screws on from the top of the panel.

Before mounting the variometer the strips of metal which are used for switching the rotor and stator windings in series or parallel should be removed.

Wiring

The wiring of the set is carried out with No. 16 gauge square-section tinned-copper wire and the switch should be wired up first.

All connections are soldered, except those on the variometer and crystal detector, where large terminals are provided and a good contact can be made without the use of solder.

Knowing the trouble that is generally experienced by the constructor in fixing down small components, the fixed condenser in this set, which is connected across the phone terminals, is not screwed down to the

of the box $\frac{3}{16}$ in. from the top so as to allow the panel to lie flush with the top.

When finished the cabinet may be varnished or french polished.

The operation of this receiver is the same as that of an ordinary variometer crystal set. When the switch is pushed in, the variometer windings are in series, and when it is pulled out, they are in parallel.

The wavelength range covered by this receiver is from 210 metres to 640 metres when used in conjunction with an ordinary P.M.G. aerial.

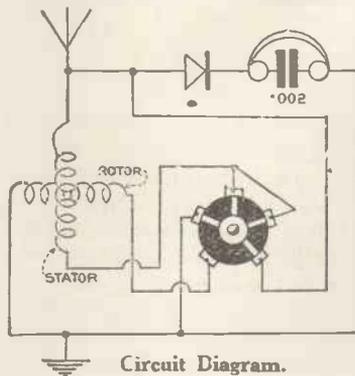
Wavelength Range

With the windings in parallel the maximum wavelength is 370 metres, and with the windings in series the minimum wavelength is 277 metres.

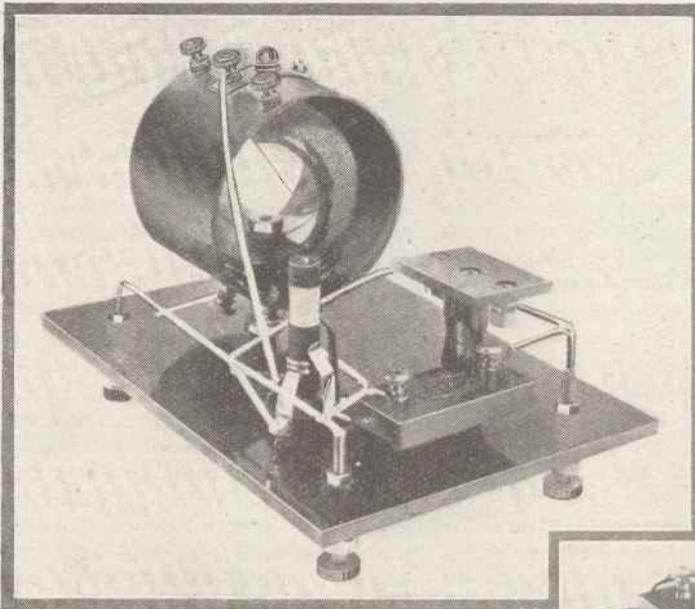
Results with this receiver have been very satisfactory.

At one mile from 2 L O an increase in strength over a standard set was not very noticeable, but at six miles an increase was quite apparent.

The set would be useful for those who live at a greater distance from a main broadcasting station than that usually laid down for reception on a crystal set.



Circuit Diagram.



Underneath of Panel.

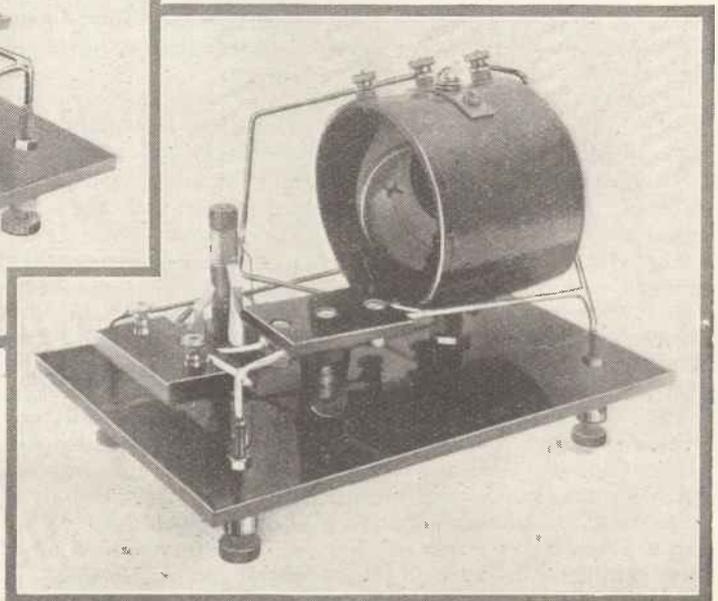
panel, but simply suspended by the wires which are connected to it. This method of fixing saves the drilling of holes in the panel.

A cabinet for the receiver can be constructed from $\frac{3}{8}$ in. oak or mahogany. Five pieces are required: two, $5\frac{3}{4}$ in. by 5 in., two 7 in. by 5 in. and one $6\frac{1}{4}$ in. by $8\frac{1}{2}$ in. for the base.

The cabinet can be screwed or dovetailed together, according to the skill of the constructor.

When completed the inside measurements should be 7 in. by 5 in.

Four small pieces of triangular-shaped wood are now required for fillets, these being glued in each corner



Another View of the Wiring.

THE sort of candour we like:—The experimenter who boasted that his set was a "howling" success.

BIG BEN has been heard in Borneo, 8,523 miles away. If sergeant-majors had hearts, this would be enough to break them

In Praise of Two Volts

MANY friends of mine are still trudging wearily week by week to the charging station, lugging 3-cell accumulators with them for a re-fill. Most of them have a pair of these weighty concerns, one of which is in use whilst the other is undergoing recharge.

The Weary Walk

The weary walk to the station is later followed by a still more weary return journey, for the battery seems to get heavier at every step. It was my hatred of this business of carrying accumulators, which, though they may weigh 40 lbs. at starting, feel as if they would turn the scale at quite 400 lbs. by the time the journey is over, that induced me to try dull-emitter valves.

That was nearly three years ago now, and, though I have used, and still do use, bright-emitters occasionally, almost the whole of my wireless work has been done since with valves so economical in their requirements that visits to the charging station take place eight or nine times a year instead of fifty-two as in the bad old days.

Dear Days

I began to use valves very soon after the end of the war. There were then very few types available for the amateur; such as there were were bright-emitters, and the cheapest of them cost, if I remember aright, seventeen shillings and sixpence.

The average valve in those days consumed .75 ampere at a filament potential of rather more than 4 volts. They were very good, so far as they went, and they came as a revelation to those who had been brought up on the crystal, the electrolytic detector, and, in still earlier days, the coherer. But they were terribly expensive to install and to use. In those days I used to pay four shillings to have my accumulator charged, and four times 52 works out to 208 shillings, or £10 8s. a year!

And there was a further point. Valves, when new, used the amount of current that I have mentioned, normally about .75 ampere; but

they soon aged, and when they had been in use for a few months many of them devoured a whole ampere apiece. The set which I had in use three and a-half years ago was a four-valver whose ammeter showed that very nearly 4 amperes were flowing in the low-tension circuits.

To stand a drain of this kind the accumulator must be a very good one, and even if it is it will suffer through sheer overwork. I once bought a cheap accumulator, in a moment of misguided economy,

In this article our contributor explains the advantages of the recently developed two-volt valve that has attained such great popularity.

Now that the days of portable sets are with us, these valves deserve all the more attention.

which at the end of six weeks had its plates so distorted that their pressure caused the celluloid case to give, allowing the contents to leak with disastrous results on to a new carpet.

The Best Valves

I have tried dull-emitter valves of all kinds and, as the result of as much experience with them as probably any wireless enthusiast can have had, I have come to the conclusion that the most satisfactory valves from every point of view are the two-volters, by which I mean those rated to consume from .25 to .4 ampere at about 1.8 volts. Other classes of dull-emitters are very good indeed in their own ways.

If, for example, you wish to construct a super-heterodyne set containing nine or ten valves, which is the number required for really good results, it is probably best to use, in the majority of holders at any rate, valves of the "06" class, owing to their very small current consumption. These valves, too, are the only ones which can be operated satisfactorily in multivalve portable sets, for there are no others which require much less than .2 ampere

apiece, and no dry cell, unless it is of comparatively enormous size and weight, can supply more than about this amount of current for any length of time continuously.

Anti-capacity Dull-emitters

Then there are those excellent little anti-capacity dull-emitters, the D.E.V. and the D.E.Q., which require .2 ampere at 3 volts. These are in all respects as good as bright-emitters; they are long lived and they are most economical. But there is the same objection to them as there is to the "06" valves—their high initial cost. An expensive valve is just as easily dropped as a cheap one!

The 2-volt dull-emitter has been wonderfully developed in the last year or two. When I first used them the only type available was the L.T.1, later renamed the D.E.R. So far as I can remember, these cost £2 10s. apiece, which was a pretty serious consideration, especially if you contemplated anything more ambitious than a single-valve set.

L.T. 1's

Further, there was nothing to be had but the general-purpose valve, which had to do duty in all parts of the set. The original L.T.1 gave very good service indeed, and I still possess one or two of them in good working order. With these valves, however, it was impossible to use more than a single stage of low-frequency amplification if you were at all particular about distortion. They were not designed for dealing with large fluctuations of grid voltage.

Even if you piled up the plate volts to a figure much beyond their proper allowance there was only a very small straight portion of the characteristic curve to the left of the line, so that if you tried to use two low-frequency stages in a large set, the working point was taken alternately up into the region where it caused grid current and down on to the lower bend.

I shall never forget the day when I increased my original four-valve set to five by adding a second stage of

note magnification. I expected loud and clear speech or music. There was no broadcasting in those days, so I tried out the set by tuning in that old friend of many of us, the operator at Croydon. Never have I heard anything more appalling! He appeared to be speaking through a thick blanket, and hardly a word was distinguishable. That evening, when some amateur was transmitting gramophone records, matters were even worse. In fairness to the L.T.I it must be said that at that time there were few, if any, bright-emitters which would do any better.

Specialised Forms

To-day the 2-volt valve is obtainable in three specialised forms. We have a valve designed particularly for high-frequency amplification, a remarkably efficient note magnifier for the first stage and a power valve for the second.

There is as yet no specialised rectifier, but in spite of this rectification is performed, and performed very well indeed, either by the valve designed as a high-frequency amplifier or by that intended primarily for use as a first note magnifier. These little valves bring enormous advantages to those who use them, and a very important consideration is that their cost has been coming down bit by bit for some time until at present it has reached a fairly reasonable figure. The H.F. and the first L.F. type run to 14s. each, while the power amplifier costs 18s. 6d.

Comparisons

Take the case of a five-valve set using a power valve in the last holder.

The first four valves will require .3 ampere apiece or 1.2 amperes. The power amplifier will consume .4 ampere, bringing up the total for the set to 1.6 amperes.

To work such a set the accumulator needed is a single cell with an actual capacity of, say, 80 hours. Such a battery will cost originally about one-third the amount of that required to work a bright-emitter set of the same size. It should give 50 hours work, but to be on the safe side you may take its life on one charge to be 42 hours.

This means that if you use your set for two hours every day your accumulator will last three weeks. With a bright-emitter set of the same size a 6-volt accumulator of this capacity would last at the out-

side for ten days. Thus the 2-volt accumulator requires to be charged about seventeen times during the year, while the 6-volter must pay thirty-six visits to the charging station.

Finance

If we take it that the cost on each occasion is respectively 2s. and 3s., we find that the 2-volt battery runs its owner into an expenditure of £1 14s. a year, whilst the other costs £5 8s. The saving on this head alone is £3 14s., which is about the cost of five 2-volt dull-emitters. Thus, in less than a year and a-half, the entire outlay upon a set of five dull-emitters would have been saved.

And it must not be forgotten that since its filament is heated only to about one-third the temperature of that of the bright-emitter, the dull-emitter valve of the 2-volt class is very long-lived. My own experience is that these valves last at least one-

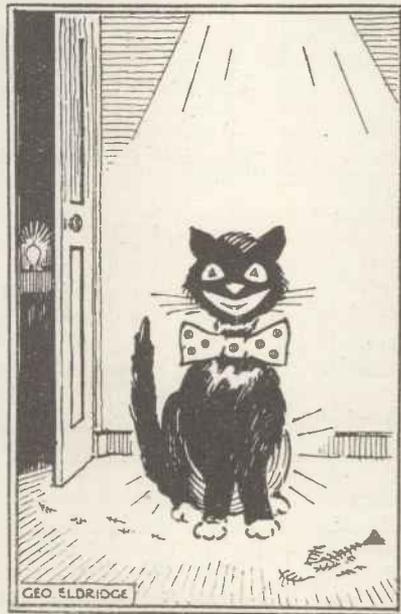
Not Microphonic

The 2-volt dull-emitters are no more microphonic than bright-emitter valves; they are just as easy to work with and they give equally good results so far as range and signal strength are concerned. In the early days of the dull-emitter valve one objection to their use was that they were liable to be rather inconstant. Improved manufacturing processes have eliminated this undesirable quality, and the 2-volt valve of to-day, provided that it is well treated, will give consistently good working throughout its life.

The great point to remember when you are using dull-emitters of this kind is that their filaments must never be overheated. If you run them too brightly you are almost certain to impair their dull-emitting properties, if, indeed, you do not destroy them altogether.

J. H. R.

CAT-ISFACTION!



"I do like those broadcast plays with the lights out."

and-a-half times as long as bright-emitters of good quality. Further, the smaller the strain which you put upon your accumulator, the longer will its plates remain in good condition. One which I have at the present time has been in continual use for more than two years without a sign of sulphating or sediment.

How the "Super Het" Works

(Continued from page 594)

lator valve we can make it produce oscillations which, when combined with the incoming oscillations, produce a resultant wavelength which has a value usually between 2,000 and 10,000 metres. This long wavelength may then be amplified by several stages of amplification, after which it is detected, music and speech being obtained just as we might have done from the original received oscillations from the broadcast station.

One or two stages of low-frequency amplification may be added in the ordinary way. D. C. R.

TRAMS are said to be a cause of distortion. And of contortion, too, if the strap-hanger is allowed to have his say.

THERE is good reason for believing that the shingled Miss 1925 will return to her original wavelength before long.

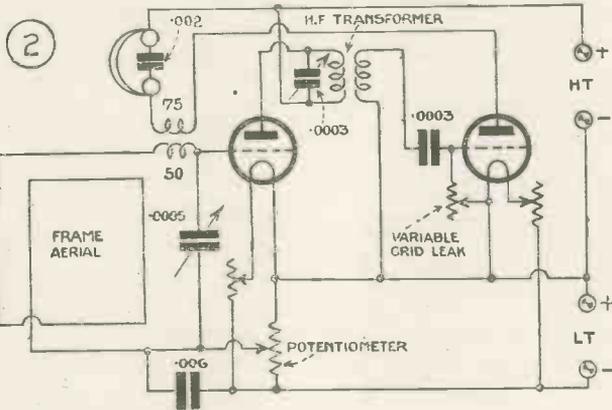
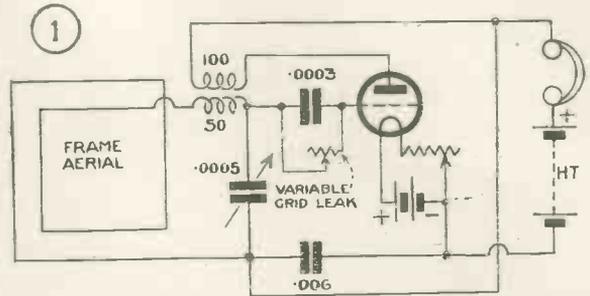
IT is said that there will be a big demand for wireless experts in the next war. We hope that oscillation fiends will be sent out in the first draft.

SUPER-WIRELESS sets are now on the market at enormous prices. This effort on the part of the trade to cater for seaside landladies is commendable.

Circuits for Portable Valve Sets

1 (right).—A modified Flewelling super-regenerative circuit. Reaction is obtained by means of a 100-turn coil coupled to a 50-turn coil included in the aerial circuit.

An ordinary two-coil holder may be used for adjusting the coils, or a variocoupler may be employed where compactness is desired; in this case the rotor should be wound with approximately 100 turns of wire (forming the reaction coil) and the stator with 50 turns for the aerial-coupling coil.



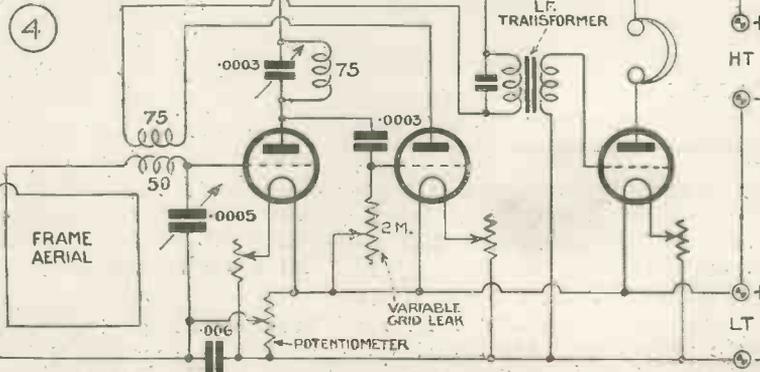
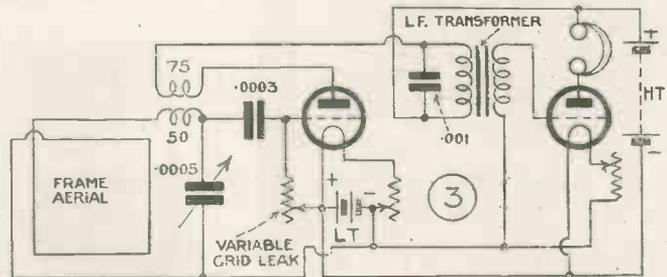
2 (left).—A two-valve circuit in which the first valve acts as a high-frequency amplifier and the second as the detector. Two honey-comb or basket coils or a variocoupler may be used for obtaining reaction.

A potentiometer having a resistance of between 300 and 400 ohms is provided for controlling the grid potential of the H.F. valve. For ordinary broadcast reception the H.F. transformer may be wound with 70 turns of No. 36 gauge wire on each coil, the primary being tuned by means of a .0003-microfarad variable condenser.

3 (right).—A two-valve circuit in which the first valve acts as the detector, while the second valve amplifies at low frequency.

This circuit, though easier to handle, is not so useful for long-distance reception as No. 2.

The figures against the coils in these circuits indicate the number of turns required for broadcast reception

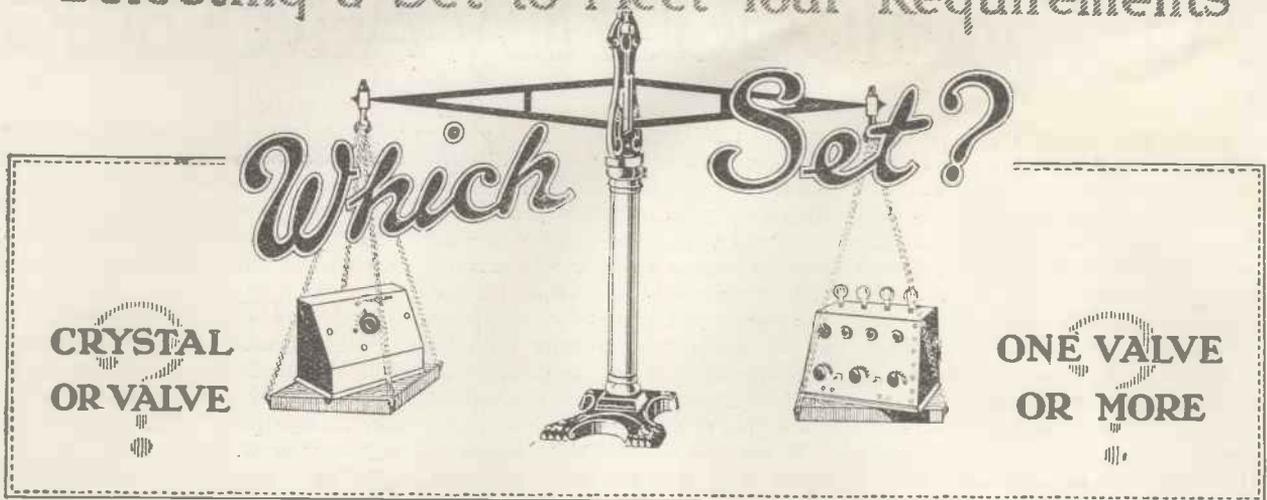


4 (left).—An efficient three-valve circuit. The first valve amplifies at high frequency, the second valve is the detector, while the last valve amplifies at low frequency.

A potentiometer is fitted for adjusting the grid potential of the H.F. valve.

A suitable frame aerial for any of these circuits consists of 8 turns of No. 22 enamelled copper wire, spaced $\frac{1}{4}$ in. apart wound on a square frame having 3 ft. sides.

Selecting a Set to Meet Your Requirements



THE growth in the number of circuits since the advent of broadcasting has been so rapid that the amateur taking up wireless for the first time is oft-times in a dilemma when he seeks for an answer to that perplexing question, "Which set shall I buy?"

The soliciting of advice from acquaintances "well up in wireless" does not help him much and only serves to aggravate the problem, for they talk so glibly of reflexes, high- and low-frequencies, reaction and numerous other wireless intricacies, that the poor beginner is left more bewildered than ever.

What the man trying to choose a set wants is not talks on such scientific subjects as oscillation and reaction, but some idea of what he may expect from any particular set or circuit. The object of this article is to enlighten him on this point.

What Do You Want?

Before attempting to choose a set, the beginner must make up his mind as to what he wants the set to do. It would be folly to purchase a set designed to bring in all B.B.C. stations on a loud-speaker if he merely desired reception from the local station on headphones.

Having definitely settled this point, he is ready to proceed with his choice.

Where the distance to the local station does not exceed about 15 miles, and where it is only desired to receive that station on headphones, the simple crystal set has much to commend itself.

Despite the great progress made

with valve sets, few of them approach the crystal set for purity of reproduction, and this is one of the main reasons why this type of receiver enjoys the vogue it does.

The range of 15 miles laid down for a crystal set applies, of course, to ordinary broadcasting stations. The range in the case of relay stations is about 5 miles. In the case of the high-power station the range is very greatly increased, and on more than one occasion signals from this station have been received on a simple crystal over a distance of 100 miles.

It is probable that before the new entrant has had the crystal set long he will want to operate a loud-speaker. Such a set may easily be adapted for work with a loud-speaker by connecting to the output (or phone) terminals a two-valve L.F. amplifier.

The addition of such an amplifier introduces the listener to maintenance costs, for the use of valves necessitates the use of an accumulator and H.T. battery, both of which require attention, the former about every few weeks and the latter about every six or nine months. With the crystal set alone maintenance charges are practically nil.

If the beginner yearns for results beyond the possibilities of a crystal set, his attention must be directed to valve sets. Such sets comprise any number of valves from one to eight, but four is about the maximum number likely to be required by the beginner for some time. We will take the sets in order, from one to four valves.

"Reaction"

Most valve sets make use of that mystifying "reaction" which is really only a method of further amplifying the received signals. A one-valve set without reaction has a range of approximately 20 to 30 miles, and is, therefore, little better than a crystal set. With reaction, the range of a one-valver jumps to 100 miles, and with a good aerial and earth system even this figure may be exceeded.

(It is no uncommon occurrence to receive signals from a station 1,000 miles away with a one-valve receiver, but this cannot be guaranteed.)

A two-valve set generally consists of either one stage of high- or low-frequency amplification with the usual detector valve.

If high-frequency amplification is employed any increase will be in the range of the set rather than in the volume of the signals, for high-frequency amplification is used solely to bring in or magnify the signals of those stations which, without it, would be inaudible.

If any increase in the strength of the signals is desired, use should be made of low-frequency amplification. The rule is: High-frequency amplification for range and low-frequency amplification for volume.

If the local station is not too far away quite passable results may be obtained on a loud-speaker with a two-valve set comprising detector and one stage of L.F. amplification.

In most cases, however, it will be found that two such amplifiers are required for working a loud-speaker.

(Continued at foot of next page)

A High-frequency Adventure

ONE night recently, I had the most profitable evening I have had for many a long month. The sum total of my evening's work was that I made two valves do more than the work three had been doing, that I made a wireless friend for life, and that I made a firm convert to my pet belief that high-frequency amplification is a thing of the past as far as the reception of British broadcasting in England is concerned. Not a bad night's work considering that I started at eight and finished before nine-thirty.

It came about in this way. Early the previous afternoon, I had a note from a listener-in unknown to me asking me to have a look at his set and advise him what to do about it. In the note, my new correspondent described his set as an "O.K." set, which he had made himself. The name of the set puzzled me considerably, but when I got round to my correspondent's house in the evening it was explained to me that the letters "O.K." signified "One Knob," and that the three-valve set was a one-knob set.

Knobs!

I could scarcely refrain from smiling when I began to look over the *one-knob* set. There was a knob to turn the aerial tuning condenser, a knob on the coil-holder to rotate the reaction coil, three filament rheostat knobs, a knob to a variable grid leak and a knob to a variable anode resistance. I made it a seven-knob set, and on remarking accordingly to my new acquaintance, he replied:

"Ah! but you don't *count* the knobs on the set, you know. The idea is that it is a one-knob set because you need only turn one knob at a time." Seems all right to me.

Well! We left it at that, and we began to go over the set. There were three valves, a high-frequency amplifying valve, detector valve, and a low-frequency amplifying valve. For the low wavelengths a tapped anode coil made of resistance wire was provided as high-frequency coupling, and, for the high wavelengths, this coupling consisted of the variable

anode resistance. On all wavelengths, results were decidedly inferior to those usually obtainable with a single-valve set with reaction.

It was very clear to me that the high-frequency valve was not functioning properly in the set, so I asked the owner of the one-knob set if he would allow me to take out the high-frequency valve and make the set into a two-valve set. He agreed readily.

I removed the high-frequency valve, and, with the help of a small piece of wire and a couple of pieces of a broken match, I connected the grid and plate sockets of the high-frequency valve-holder together, and, also, connected the aerial to this same piece of wire. The set was thus transformed into a two-valve set, detector and low-frequency amplifier. The results then obtained

with the set were many times better than had been obtained previously with the three valves. Not only that, but my new friend, for the first time in his wireless life, heard Radio-Paris when Chelmsford was working.

No More H.F.!

When I was about to depart, I said that I had better remove the piece of wire I had used to make the change from a three-valve set to a two-valve set.

"Not a bit of it," said my new friend, "leave it as it is. I prefer your two-valver to my O.K. three-valver. No more high-frequency amplification for me, thank you. I believe every word you say that high-frequency amplification is quite out of it for broadcast telephony in these days of constantly-improving transmission." F. B. K.

Which Set?

(Continued from preceding page)

It should be noted that the addition of a loud-speaker cuts down to some extent the range of a set. For instance, while a two-valve set, employing one stage of low-frequency (and detector), may tune-in several stations on headphones, it may be fairly difficult to bring in even the local station on the loud-speaker.

This is due to the fact that much stronger signals are required to actuate a loud-speaker diaphragm than to actuate the diaphragms of headphones.

All B.B.C. Stations

For those who require reception from all B.B.C. stations on a loud-speaker, the ideal set is, perhaps, a four-valver, comprising one H.F., detector and two L.F. With such a set one has all the range necessary, together with ample volume.

In practice it will be found that the range does not stop at the B.B.C. stations, but extends to many continental ones.

The three-valver, employing one stage each of high- and low-frequency amplification, with the usual detector, will give approximately the same range as a two-valver, comprising detector and one H.F., but there

will be a considerable increase in the volume of the signals due to the L.F. amplifier.

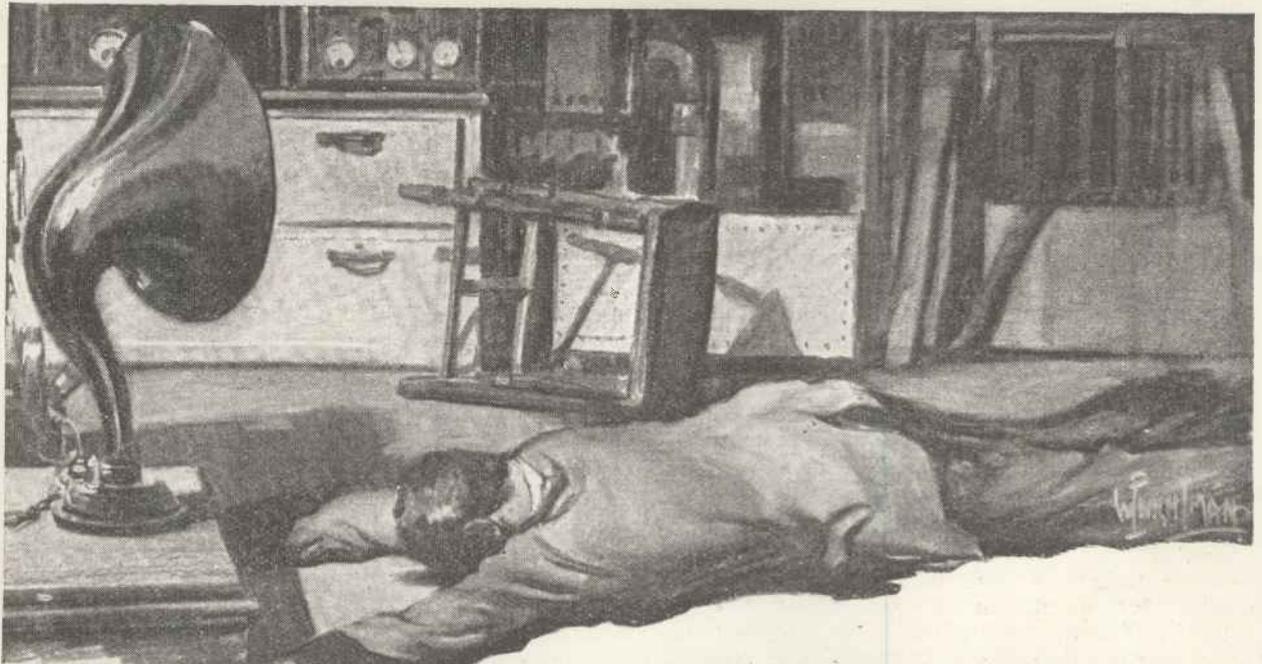
Reflex Sets

So far we have not touched on reflex sets—those receivers that are credited with such wonderful performances.

In a reflex set the valve is made to serve as a high- and low-frequency amplifier, with, generally, a crystal as detector. This extra call on the valve makes the set somewhat "tricky" to operate, and unless the beginner knows something of such sets he is likely to make himself a nuisance to all other listeners in his neighbourhood by causing the set to oscillate unduly.

In capable hands the reflex set is certainly an efficient instrument, and where expense is a consideration, it has much to commend itself.

As to the different makes of sets the beginner is advised to obtain catalogues from any of the manufacturers whose names appear among the advertisements in THE WIRELESS MAGAZINE. All of these may be relied upon to give him good service, and his final choice need only be a matter of personal taste. T. E.



A Story
by Lieut.-Com. H.W. Shove,
D.S.O. R.N.
Illustrated by W.E. WIGHTMAN.

On 27 Metres

"HULLO, Durley!" exclaimed the heart specialist, as he entered the club smoking-room. "It isn't often we see you in town."

"Oh, I've been up several days now," replied the "nerve" man. "Been on the look-out for you, but you don't seem to use the club much nowadays. Too busy, I suppose?"

"Well, yes. Not practice though. Perhaps I'm qualifying for your professional attentions. The fact is, I've become what our American friends would describe as a 'radio fan.' Most absorbing hobby. I wonder you don't go in for it. Be a godsend down on Dartmoor, both for you and your patients, I should think."

The other smiled.

"I did a good deal of it up to a few months ago," he said, "but I gave it up."

"Gave it up, man! Gave up wireless! Why?"

"Well, it's a longish yarn, and it concerns what I can only describe as the biggest professional failure of my career. But, if you care to sit down

"Marenger lay unconscious, face downwards upon the floor, his arms outstretched towards the loud-speaker."

and have a whisky and soda, I'll tell it you."

When they were satisfactorily settled, he began.

"You remember Clarissa Hyde?" he asked.

"The prima-donna who died a couple of years ago? Who doesn't?"

"Well, perhaps you know that her husband, Barclay Marenger, was the son of an exceedingly wealthy, self-made man, who had had him educated as a musician, though he hadn't an ounce of talent?"

"I didn't know that."

"Oh, yes. Barclay Marenger had probably the most complete theoretical knowledge of music, with the poorest powers, either as an executant or a composer, of any man in Europe. That was why he was so passionately devoted to natural talent; in short, to Clarissa Hyde. Her premature death knocked him all to pieces. So finally his friends sent him down to me at Crag Tor. That

was some months after his wife's death."

"At first, he was rather an anxiety to me. All the amusements we had to offer were shooting and rambling on the moor. Country life had never been in his line, and I began to be rather puzzled as to how to provide him with the necessary mental occupation. I was relieved when, one evening, he presented himself with a look of interest in his eyes.

"Good evening, Marenger," I said, as usual, 'how are we this evening? More cheerful, it seems.'

"Perhaps I am, doctor," he replied; 'the fact is I've had an idea suggested to me to-day. I was reading an article in a wireless paper that young Collins left about. The writer had a theory that ether waves are indestructible, so that every signal ever made still exists, travelling on into space for ever. Do you think that is true?'

"Well," I said, 'I'm not very much of a physicist. But I don't see why not. Light seems to travel on for ever, and I suppose other ether waves do the same.'

ON 27 METRES: A Story by Lieut.-Com. H. W. Shove, D.S.O., R.N.

"That's what this chap says. Then you *do* think it's true?"

"Yes, I suppose so. But look here, Marenger, why does it excite you so to think of it? For I can see you're quite unstrung over it."

"Oh, don't you see, doctor!' he broke out. 'Don't you understand what it means to me? Clarissa sang for the broadcasting people two or three times. And, if this is true, those songs are still there, could still be heard if one got the right apparatus!'

"He gesticulated somewhat wildly. I sought to calm him.

"But there isn't such an apparatus,' I said. 'The whole thing's only a theory. I understand that these waves travel with the speed of light, and that it is physically impossible to exceed that speed. Therefore they couldn't ever be detected again on earth. Don't let your mind dwell on it, Marenger. It's worse than a wild goose chase.'

"But he was not to be put off.

"But they don't *know*,' he said; 'nobody knows really. Anyway, doctor, may I read up this wireless stuff and experiment here?'

"I hesitated. There was obvious danger. Marenger's reason was not so securely seated as to be able to stand an unlimited amount of thinking along such lines. Still, I knew that wireless experimenting might well afford a channel through which his energies might find a healthy outlet. I decided to risk it.

"All right,' I said. 'I think wireless study might be a good thing for you. But I must insist that you begin on conventional lines. Try not to think of what we've just been talking, till you've mastered the groundwork. Then perhaps you will know whether there is any chance of developing the apparatus you have in mind. Now let us get on with the ordinary suggestion treatment.'

"The thing proved a godsend. As I had hoped, Marenger's mind, once it had found this occupation became rapidly absorbed in it. He was an intelligent man and of a scientific turn. And his great knowledge of the theory of music and sound stood him in good stead. Right at the start he realised the crude imperfection of the reproduction which satisfies too many enthusiasts. And I was very pleased to note that he

concentrated on improvements in this direction, before attempting long-distance reception or even hinting that his original chimerical notion was still his ultimate goal.

"I heard so much about wireless, and Marenger's pure reproduction experiments gave such excellent results, that eventually I succumbed to the fascination of the hobby. Soon my establishment upon the moor became a veritable physical laboratory. Marenger was, by now, practically normal, and I had ceased to treat him specifically. He still insisted on paying me fees as a patient, but his position had really become that of my partner in research.

"It was shortly after we had obtained our transmitting licence and installed our apparatus in the new, specially built hut, on the summit of the Tor, that I was rudely awakened to the real state of Marenger's mind.

"One evening, after my nightly talk with my resident patients, I climbed the Tor, intent on "making a night of it," with our new short-wave receiver. Marenger had gone up some half an hour before. As I approached the hut I could see, through the uncurtained window, the brightly lit interior. The receiver stood on the table, just inside the window, but, to my surprise, there was no sign of Marenger. Puzzled and with a foreboding of something wrong, I entered.

"Marenger lay unconscious, face downwards upon the floor, his arms outstretched towards the loud-speaker. The valves still glowed, faint mush and occasional atmospheric still issued from the horn. I did not wait to switch the set off. I raised Marenger, and with some difficulty brought him round, and eventually got him home. At first I thought it was a heart attack, but presently he went off into delirium, and, from his ravings, I gathered that he had heard Clarissa Hyde's voice, brought in by the new receiver on a wave of 27 metres (the shortest we could tune to). He very narrowly escaped a bad go of brain fever, and it was several days before he became anything like rational.

"Of course, I guessed at once what must really have happened. Some amateur, by an unfortunate

trick of fate, had transmitted a gramophone record of one of Clarissa Hyde's songs. I, endeavoured to persuade Marenger that this theory was correct. At first he raised the objection that the songs he had heard, though they had been broadcast, had never been so recorded. But this was susceptible of the explanation that an unauthorised record might have been taken by some listener. This he was prepared to admit, though grudgingly, and he gave me a good deal of trouble through his keenness to resume the experiments in order to probe the mystery. This I refused to allow in his present shaken condition.

"I listened frequently myself, with the object of ascertaining, if possible, the identity of the transmitter and warning him to avoid the Clarissa Hyde records in future. For a couple of weeks nothing came in. Then, one evening, quite suddenly and without any preliminary, a telephony transmission on 27 metres commenced. It began right in the middle of a song, as if the transmitter had been switched on, and the gramophone started without reference to the position of the needle on the record. I had heard Clarissa Hyde two or three times, and the voice was undoubtedly hers. After a couple of verses the song ceased, as suddenly as it had begun. No call sign or other speech or music followed. I had almost given up hope of anything further that night, when another song began, abruptly as before. But this time my amazement was such that I almost doubted my own mental equilibrium. For the song was one which had only been published a month or two before, long after the death of Clarissa Hyde! Yet it was still unmistakably her voice. Spellbound, I listened to the end. The music ceased, again without any indication of its origin, and this time it ceased for the evening.

"I did not, of course, inform Marenger of what had occurred, and I was more than ever adamant against the resumption of his own experiments. It was a week later, and my difficulties with him were becoming acute, when I stumbled on the clue to the mystery. While visiting a patient in an out-of-the-way part of the moor, I noticed

that wireless had recently been installed, and congratulated the owner on the colour he was thus bringing into a somewhat drab existence.

"'Aye,' said the old farmer, 'tis wunnerful. A've meant vor tu 'ave 'un a long time, but 'twasn't avore Cap'n Twist put up 'is little 'ut and started his 'speriments as theer was anyone vor tu show me 'ow.'

"'Captain Twist?' I asked with interest, for I had not heard of him. 'Where does he live?'

"'Up tu No Man's Crag. 'E be an old sailor wot spends all 'is toime a tryin' new soorts o' wireless. 'E sends messages vrom one little 'ut,

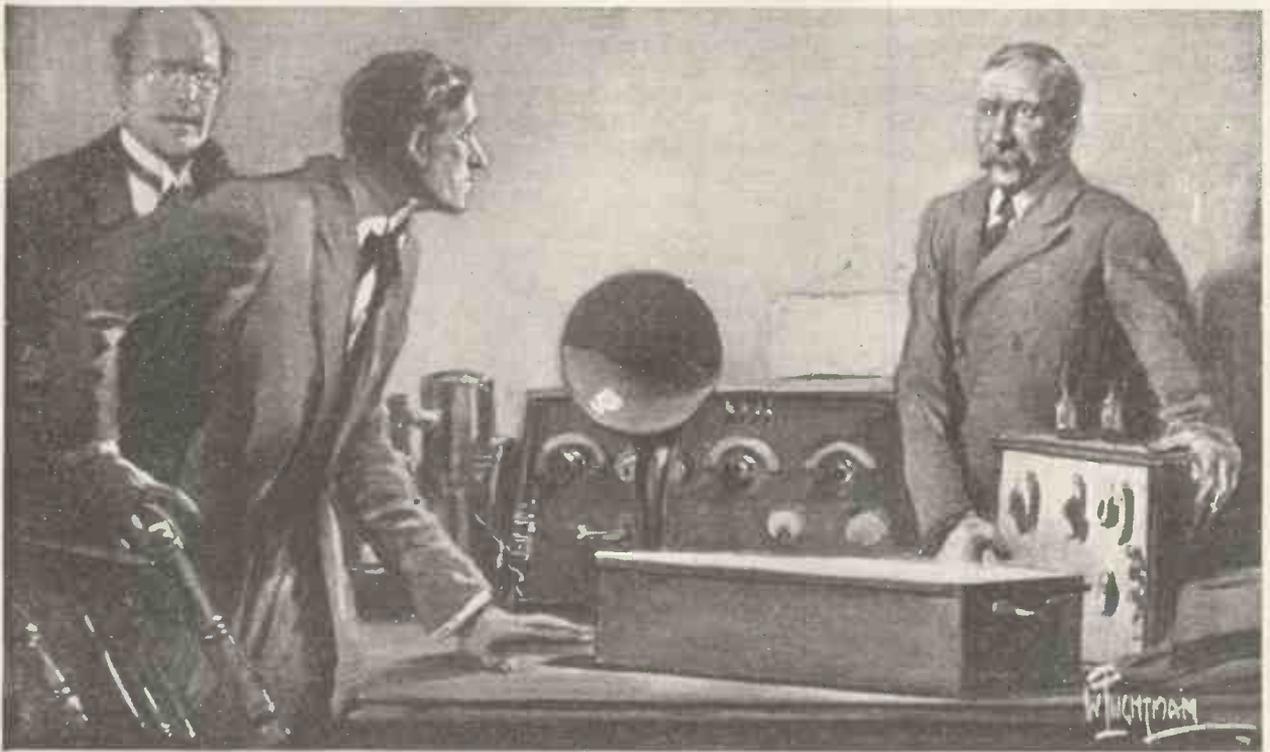
mental station. The Captain proved to be a man of about forty-five, burly and ruddy faced, looking far more of the bluff sailor than of the scientific investigator. Though he was reticent at first, I managed, as a brother amateur, to gain his confidence and eventually to persuade him to accept an invitation to dinner for the following evening. I ascertained that he was, in fact, transmitting on 27 metres, and that he was specialising in some improvements in telephony modulation. I told him of our interception of what were obviously his signals. He seemed deeply interested, but distressed at the unlooked-for effect on Marenger. But when I began to

"He would say no more then, but, during the drive to Crag Tor, he inquired if Marenger were to be of the party at dinner. I replied that he was, for I had invited him specially in order to make the two acquainted.

"'In that case,' said Captain Twist, 'I think I ought to ask you whether you think it would be safe to disclose the truth, the perfectly natural, scientific truth, about how he came to hear his wife's voice, to Mr. Marenger.'

"I told him that I thought it would not only be safe, but highly beneficial, if it were done carefully and with due preparation.

"There were only the three of us



There was a crash, as Marenger's chair overturned. His face white and drawn, he stood gripping the table

and another old sailor, wot used vor tu be under 'im in the Navy, 'e listens vor'm in another.'

"I determined to investigate this Captain Twist, who was evidently an unlicensed transmitter, compelled by the ridiculous post-office regulations thus to bury himself in the wilds and conduct his experiments on low power in the hope of not being overheard. I found the hut without difficulty. It was a similar wooden shanty to the one we used, but Captain Twist was evidently not afraid of roughing it, for the hut served him and his assistant as living quarters as well as experi-

fish for an explanation, he shut up like a clam.

"'Perhaps I'll tell you to-morrow night,' he said. 'I mustn't give things away prematurely. But there's nothing supernatural about it.' He laughed as I took leave of him.

"When I drove over on the following evening, to fetch him as arranged, the Captain produced a large, heavy case which he asked permission to bring with him.

"'I have decided,' he said, 'to explain the mystery. And this case contains the apparatus necessary for a demonstration.'

at dinner. Marenger and the Captain got on splendidly together. It appeared that they had not only wireless but a deep theoretical knowledge of music in common. On this latter subject they very soon got out of my depth, and, by the time the coffee was served, I was entirely at sea as to what they were talking about. But suddenly a remark of the Captain's riveted my attention. He had evidently brought the conversation round to the explanation which I knew, though Marenger as yet did not, was to be the chief interest of the evening.

(Continued at foot of next page),

BY using the full-size templates given away each month with THE WIRELESS MAGAZINE, the marking out of panels with its attendant risk to the unskilled of making mistakes which may spoil the appearance of the complete set



may be entirely eliminated, and work which formerly took several hours to complete can be carried out in a quarter of the time by anyone possessing a centre-punch, a hammer, and a hand-drill, complete with the necessary twist drills.

The photograph shows a convenient method of applying the template to the panel, which should, of course, be of the length and breadth specified, before commencing drilling operations.

To use the template, trim it to the same size as the panel and, with the aid of paper-clips of the "bull dog" pattern, fasten on each corner so

that the template is held securely in the correct position on the panel. Place the panel complete with print and clips. With centre-punch and hammer mark through the print on to the panel the position of every hole required. When this has been done, remove the print and clips and drill the panel with drills of the sizes specified, which in most cases will be $\frac{1}{8}$ in. for wood-screw holes for fixing the panel to the containing box or case, $\frac{5}{32}$ in. for terminals, valve holders and component clamping screws, and $\frac{3}{8}$ in. for one-hole-fixing components, such as variable condensers, rheostats, grid leaks, etc.

Where extra large holes are called for, such as in the case of valve windows, the best method is to drill a ring of $\frac{5}{32}$ -in. holes just inside the circle and finish the edge of the hole off by means of a small half-round coarse file.

Countersinking should preferably be carried out by a proper countersinking tool obtainable from an engineer's supply stores. If, however, the expense entailed is too great, a twist drill larger than the hole itself may be used.

The head of the screw to be fitted will not, however, in this case exactly fit the countersink, with the result that an unprofessional appearance will result, owing to the fact that the angle of the screw head is less than that included by the cutting edges of a standard twist drill. In any case, a countersinking tool is a cheap item. R. W. W.

ON 27 METRES

(Continued from preceding page)

"So you see," he was saying, "it is all a matter of the harmonics and the overtones. By a suitable combination of the frequencies it is quite possible to reproduce any voice one may desire. All that is necessary is a careful analysis and an accurate converting mechanism. That once worked out, I, who have no singing voice whatever, by merely taking care not to make technical blunders in my own natural modulation, could be made to appear as if singing with the voice of a prima donna."

"I looked anxiously at Marenger. But his face showed nothing but an absorbed scientific interest. The Captain crossed to a side table and began to unstrap his case.

"I have brought along a modulator which I have worked out," he said, "and, with Dr. Durley's permission, I will now proceed to show you." He looked at me questioningly.

"What voice do you propose to use, Captain?" I asked.

"Well, I have, as yet, only succeeded in analysing and fully tuning my apparatus to one voice," he said. "I must mention that before the demonstration begins, and

express the hope that it will not cause pain to Mr. Marenger."

"There was a crash, as Marenger's chair overturned. His face white and drawn, he stood gripping the table, staring at Captain Twist, as the truth dawned upon him.

"You mean that your infernal machine will make you sing with Clarissa's voice?" he gasped, after a tense pause. The Captain nodded, looking anxious.

"Marenger's face worked convulsively. I could see that the explanation had been a disastrous mistake. I rose, putting out my hand to grasp Marenger's arm, to calm him. But I was too late. Like a tiger, he sprang, at one bound, clear over the dinner table, and upon the unprepared Captain.

"It's hellish!" he screamed. "It's sacrilege!"

"He seized the Captain by the throat, bore him to the floor. Then, before I realised what was afoot or could intervene, he had picked up the heavy case from the side table and dashed it full into the upturned, unprotected face. A tinkle of breaking glass (valves, presumably) mingled with the dull thud of its

impact on the flesh. Three times did Marenger bring that deadly weapon down with all his force, before I could seize his arms, fling him violently across the room, where his head came into contact with the sharp edge of the sideboard. He collapsed, stunned, and I bent over the Captain. He was stone dead. Like a wreck lapped by a slowly rising tide—but of blood—lay the remains of his wonderful modulator."

* * * *

"I don't wonder you gave up experimenting," said the heart specialist. "But what became of Marenger?"

"Oh, he died in Broadmoor, six months later," replied the "nerve" man. "Care for a game of a hundred up?"

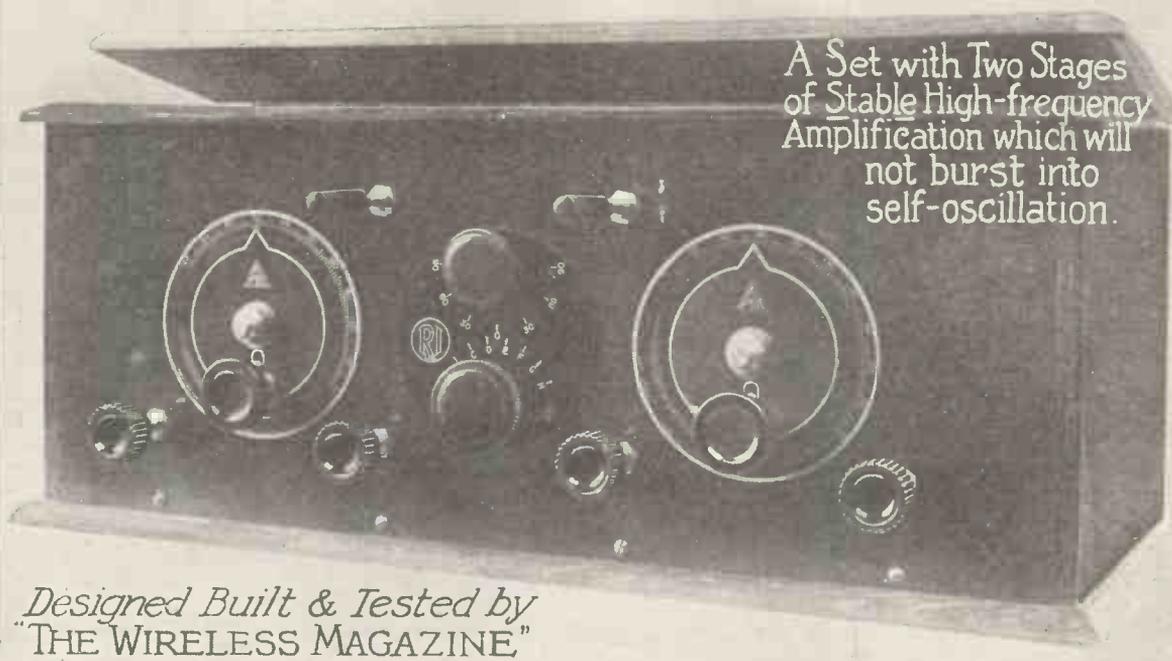


"SILENT fellowship" was recently put on the ether from Cardiff. We understand that mothers' meetings in other parts of the country are somewhat envious.

"THEY must not be hackneyed," says a London cabman discussing in the Press the kind of items that the listener wants. And yet he himself makes his living out of "hackneyed" performances every day.

A Four-valve Neutrodyne Receiver

A Set with Two Stages of Stable High-frequency Amplification which will not burst into self-oscillation.



Designed Built & Tested by
"THE WIRELESS MAGAZINE"

ONE of the great bugbears of H.F. amplification is to be found in the grid-to-plate capacity existing in the valve. Although this capacity is comparatively small, it is sufficient to allow the transference of energy from the plate circuit to the grid circuit, producing the resultant phenomenon known as self-oscillation.

Several methods of controlling or eliminating this tendency to self-oscillate are in use. Chief among these are to be found the potentiometer and neutrodyne methods.

Neutrodyne Principle

In the construction of this four-valve receiver, which employs two stages of H.F. amplification, it was decided to use the neutrodyne principle, by which all grid-to-plate capacity in the H.F. valves is neutralised.

By the neutrodyne principle the grid is operated at a fully negative potential with the result that the valve is working on the most suitable part of its curve for pure and efficient amplification.

Referring to the circuit diagram (p. 625) it will be seen that the primary of an H.F. transformer is included in the plate circuit of each of the H.F. valves. The secondary of each transformer has one end connected through a very small condenser to the grid of the valve and the other end to — L.T., which is at H.F. earth potential.

A back-coupling effect is obtained through the neutrodyne condenser *opposite in phase* to that of the valve plate-to-grid capacity. Thus the two effects neutralise each other without loss in efficiency. Great stability is obtained in this way.

The stabilising or neutrodyne condenser should have a capacity of about twice that existing between the plate and grid. As the capacity of this condenser is critical it is usually made variable, several types being on the market.

A long handle should be fitted to each neutrodyne condenser in order to minimise hand-capacity effects.

The maximum wavelength to which the receiver will tune is approximately 4,000 metres. This is accom-

plished by the special tuner made by Radio Instruments, Ltd., which comprises a single-layer coil wound with a large number of turns of wire tapped at intervals.

An automatic dead-end eliminating device is incorporated in the tapping switch. Reaction is obtained by means of a small coil controlled by bevel gears from the front of the panel. A variable condenser of .001-microfarad capacity is connected in parallel to the aerial tuning coil. This condenser, of the square-law type, is seen on the left side of the panel looking from the front.

The tuning coil is in the centre of the panel, while the dual .0003-microfarad condenser is seen on the right. On the top of the panel are mounted the two Gambrell neutrodyne condensers; the four filament rheostats are arranged along the bottom of the panel.

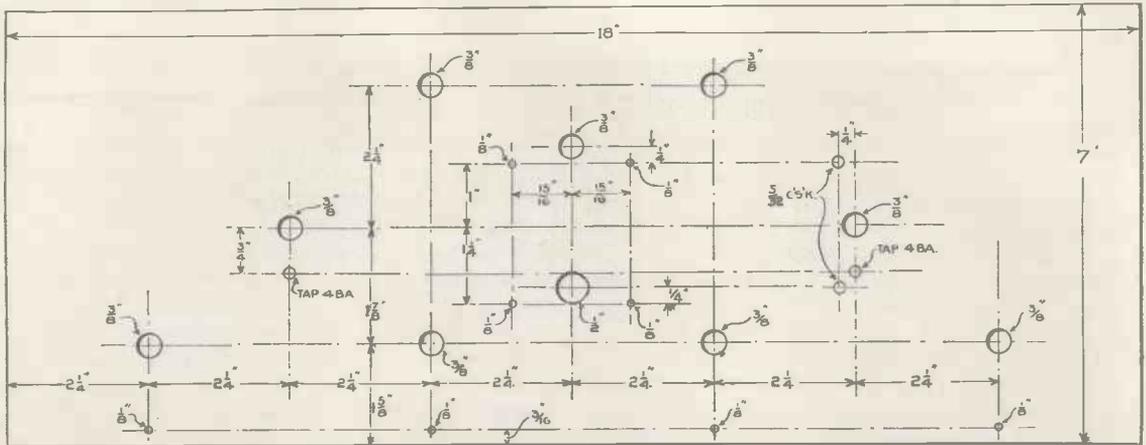
List of Components Used

In the original set the following components were used:

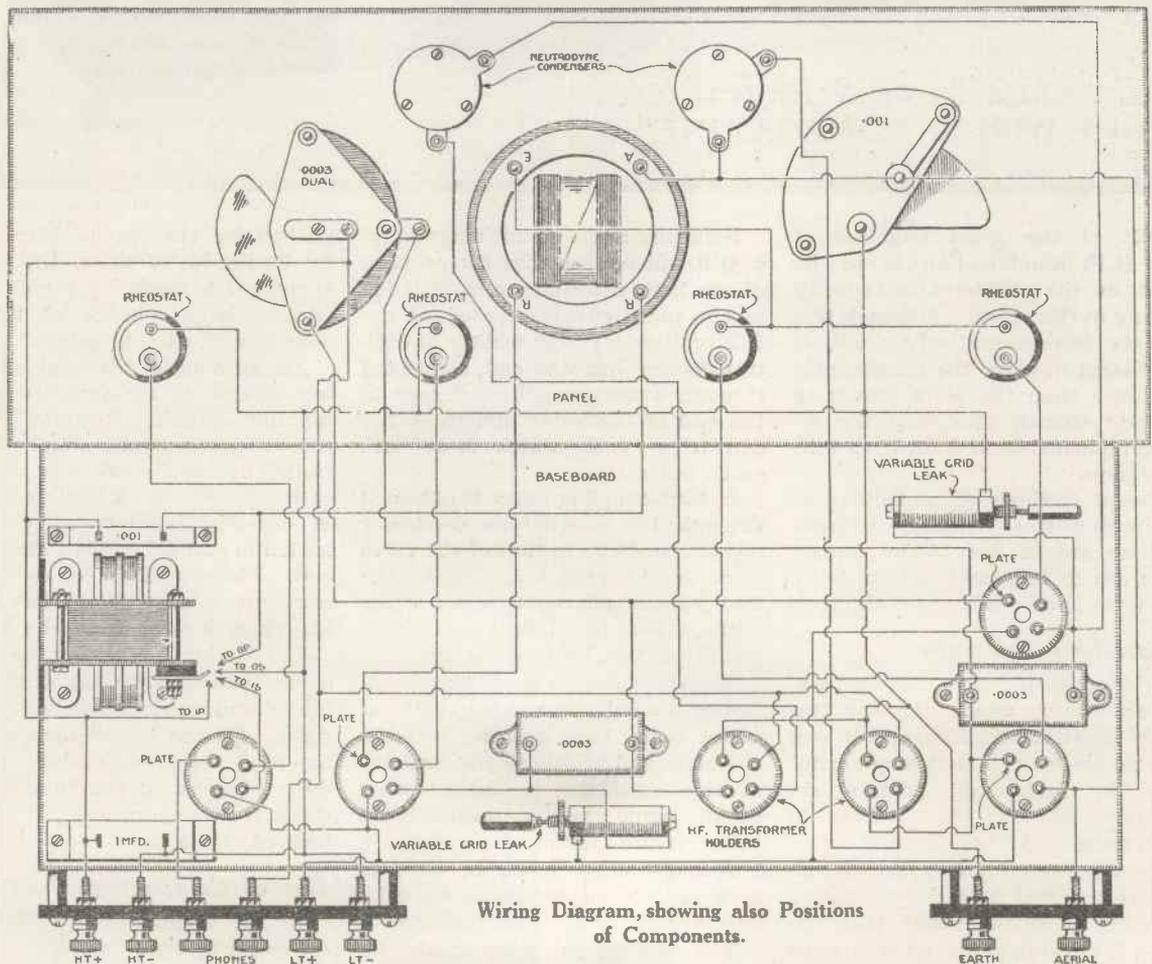
Radion ebonite panel, 7 in. by 18 in. (American Hard Rubber Co.)

A FOUR-VALVE NEUTRODYNE RECEIVER

A Set with Two Stages of Stable High-Frequency Amplification which will not burst into self-oscillation.



Layout of Panel.



Wiring Diagram, showing also Positions of Components.

Aerial tuning reactance (Radio Instruments).

.001-microfarad variable condenser (Ormond).

.0003-microfarad dual variable condenser (McMichaels).

4 filament rheostats (Wates).

2 neutrodyne condensers (Gambrell).

6 valve sockets (Peto-Scott).

2 variable grid leaks (Lissen).

2 .0003-microfarad fixed condensers (Atlas).

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

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

L.F. transformer (W. G. Pye and Co., Cambridge).

8 terminals (Belling-Lee).

Ebonite terminal strip, 6 in. by 1 in.

Ebonite terminal strip, 3 in. by 1 in.

2 condenser dials (Apex).

Oak cabinet with baseboard (Cameo).

Cabinet

The most popular, and indeed one of the most pleasing forms of cabinet, is the American type, having a vertical panel. This type is especially suitable for such a set as described here.

A dimensioned sketch of such a cabinet is given here, this being thought sufficient for its construction by the amateur carpenter. A similar and very excellent cabinet may be obtained from The Carrington Manufacturing Co., of 18-20, Norman's Buildings, Mitchell Street, Central Street, London, E.C.1, who have made one up especially for this set. The cabinet is supplied complete with baseboard.

Altogether twenty-two holes have to be drilled in the panel. Thanks to the ingenious design of the tuner no holes are required for the contact studs, these being arranged together with the switch arm on the instrument itself behind the panel. A drilling diagram is given opposite.

It is advisable to mark out the centres of the holes to be drilled on

a piece of paper cut to the exact size of the panel. Lay this piece of paper flat on the panel and mark through with a sharp steel point. Holes are then drilled at these marks to the sizes indicated on the drilling diagram.

All the components except those that have been described as being mounted on the panel are attached to

round-section wire and has sufficient rigidity to prevent one wire from sagging and touching another.

Attention should be first paid to the filament-lighting circuit, after which should come the plate circuits. Last, in order of wiring, comes the grid circuit.

Grid Wiring

Care should be taken that wires from the grids do not run close to those from the plates of the valves, otherwise the internal valve grid-to-plate capacity may be increased *externally* to such an extent that the neutrodyne condensers are rendered useless.

The two terminals on the right, looking at the back of the cabinet, are for the aerial and

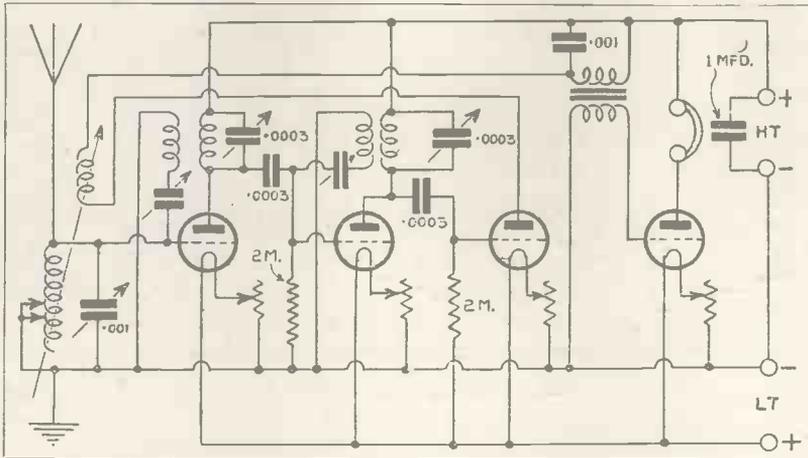
earth connections. The other six terminals on the left are as follows (reading from right to left): H.T. +, H.T. -, phones -, phones +, L.T. + and L.T. -.

When wiring up the dual condenser remember that the two sets of moving vanes are electrically connected together and their common terminal is connected to H.T. +. On the other hand, the two sets of fixed vanes are electrically separated and each set of vanes is connected to one end of the primary windings of each of the H.F. transformers.

A new low-frequency transformer made by W. G. Pye, of Granta Works, Montague Road, Cambridge, has been used as a coupling between the detector and L.F. amplifying valves. These transformers are of entirely new design, giving an even amplification over a range of frequencies from 250 to 4,000 cycles.

The turn ratio of the transformer is 4 to 1, and it used in conjunction with an R valve will give a total amplification (valve plus transformer) of 30.

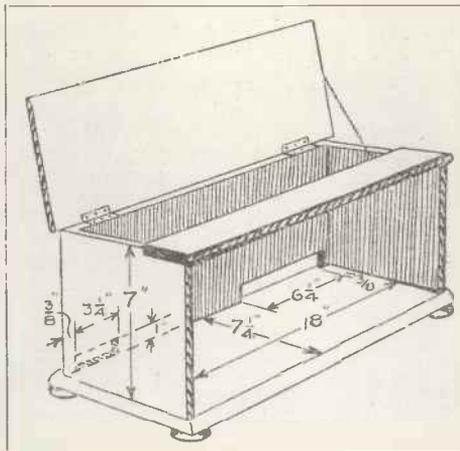
We have tested these transformers with great success, in that they give perfect distortionless reproduction. As most amateurs are aware, the low-frequency transformer can make or mar a set, and for this reason too



Circuit Diagram.

the baseboard. Their positions are shown on the wiring diagram.

The ebonite terminal strips are mounted on the back edge of the baseboard at each end. Slots are cut in the cabinet back to allow the terminal strips to be pushed through flush with the back, thus avoiding untidy connections to the front of the panel.

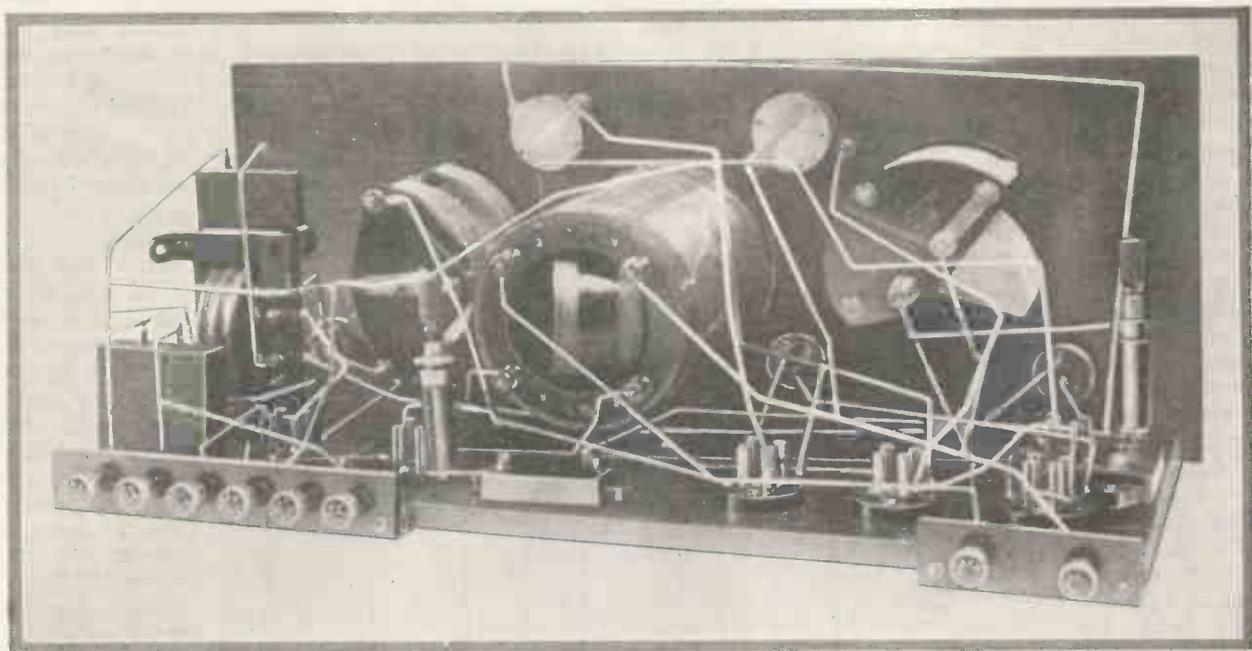


Details of Cabinet.

The baseboard is attached to the bottom of the panel by four 1-in. brass round-headed wood screws.

Wiring Up

The wiring is carried out with thick square-section tinned-copper wire. This looks neater than the



View of Wiring of Completed Set.

much emphasis cannot be laid on the desirability of using the components specified.

Before trying to tune-in a station it is necessary to know the wavelength ranges covered by each tapping on the tuner.

On the switch dial the tappings are marked in letters from A to H.

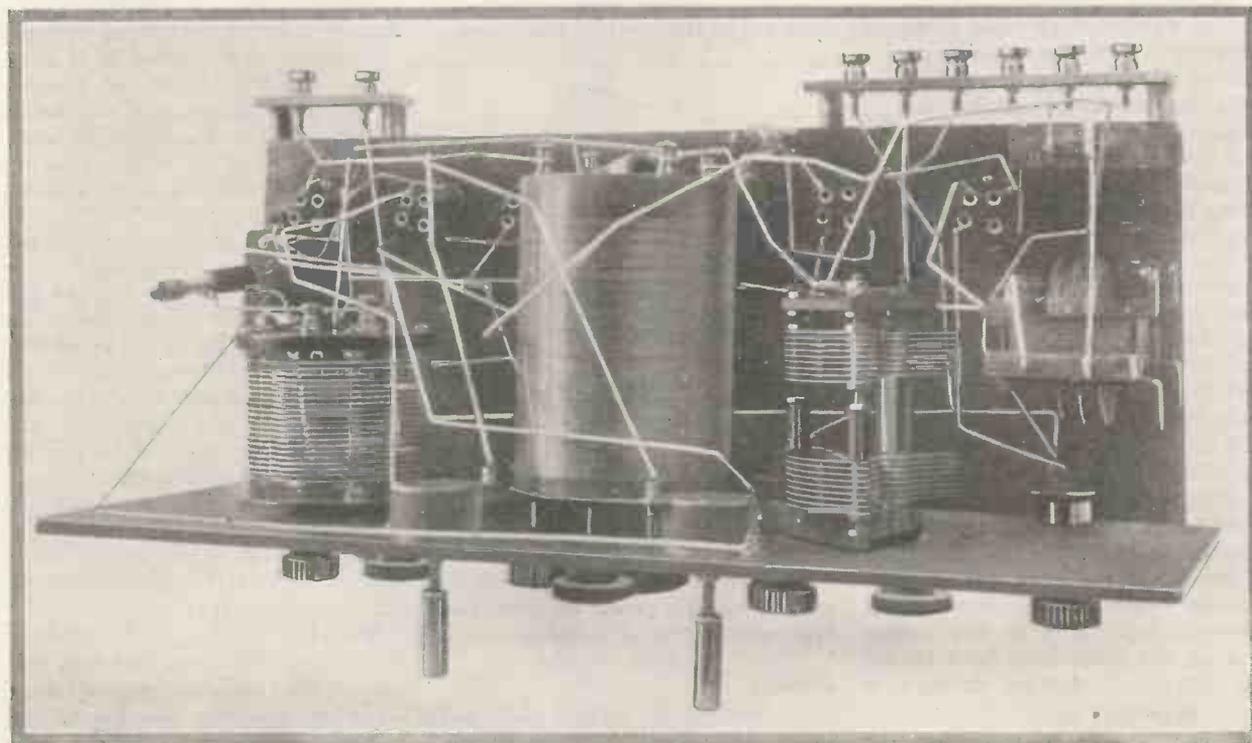
On tapping A the wavelength range, using the .001-microfarad variable condenser, is 175 to 250 metres; on B, 200 to 500 metres; C, 300 to 700 metres; D, 400 to 1,000 metres; E, 500 to 1,200 metres; F, 600 to 1,400 metres; G, 900 to 2,000 metres; H, 1,600 to 4,000 metres.

It must be remembered that for

the broadcast band of wavelengths and for the higher wavelengths (around 1,600 metres) two distinct sets of H.F. transformers will be required, one set for each wavelength band.

To tune in 2 L.O., say, set the tuning switch at B and keeping the

(Continued at foot of next page)



Another View of Completed Set.

AMERICAN TECHNICAL — and what it means

THERE is an old story that an enterprising Parisian shop-keeper once put in his window the notice, "English spoken; American understood." At the present time the two languages are becoming more and more unlike in many

terminal." The second may be translated as follows: "Measure off an equal distance to the right of the reaction-coil spindle and make a punch mark here for the spindle of the aerial-tuning condenser."

tion coil very slowly towards the coil with which it is coupled. The set should slide quite smoothly into oscillation.

You may, however, find that it does so with a loud click, and that when you move the reaction coil away oscillation does not cease until the distance between the two inductances is considerable. That is overlap. The set should go into oscillation gradually and cease to oscillate directly the coupling is loosened.

On this page is a list of American wireless terms, with their English equivalents.

GLOSSARY OF AMERICAN AND ENGLISH TECHNICAL TERMS

American	English	American	English
Antenna.	Aerial.	Audio trans- former.	L.F. transformer.
Ground.	Earth.	Pigtail.	Spiral-spring connection.
Loop.	Frame aerial.	Blow.	Burn-out.
A-battery.	L.T. battery.	Hang-over.	Overlap.
B-battery.	H.T. battery.	Soldering cop- per	Soldering bit.
C-battery.	Grid battery.	Busbar.	Square rod.
Tickler.	Reaction coil.	Fan.	Enthusiast.
Socket.	Valve holder.	Distance itch.	Desire to receive long-range trans- missions.
Loudtalker.	Loud-speaker.	D.X. Bug.	One smitten with above desire.
A radio.	A receiving set.		
Tuned impe- dance.	Tuned anode.		
Binding post.	Terminal.		
Tube, Audion or Radiotion.	Valve.		
Neutrodyne.	Neutrodyne transformer.		

Curious Passages

Some of these look very curious when you come across them in articles. The other day, for example, I read in some helpful hints for the beginner: "Do not use too much B-battery or your audio transformer may blow." Americans seem to find our words equally strange, for I found the following passage in an article in one of their papers recently: "Like the English the French do not even call a tube a tube; they call it a valve."

This, however, is not quite true, since the French word for a valve is *tube*, though they frequently use the term *lampe*.
B. A. R.

respects, and this is particularly noticeable in both technical terms and the jargon of wireless.

Typical

Here is a sentence quoted from a constructional article in an American magazine. "This lead is the A-lead and all returns are made to this lead, and it is finally grounded by a strap connection to the ground binding post wherever convenient."

Here is another: "Measure off an equal distance to the right of the tickler shaft and center punch this for the shaft of the tuning condenser." And how do you like this one: "The set comes into oscillation without any click or hang-over." These are all taken from a really high-class publication. If I were to quote to you from one of those in which slang is employed, you might easily find yourself unable to understand anything of it.

The first sentence put into English reads: "This is the filament negative lead to which all returns are made; it is earthed by means of a connection taken from it at any convenient point to the earth

The last means simply: "The set comes into oscillation without any plock or overlap." As even the English word "overlap" may present a difficulty to some readers, perhaps I had better give its meaning. You can test in your own set for it in this way. Move your reac-

reaction coil at its minimum setting search round with the two variable condensers.

In all probability it will be found that when the aerial circuit and the primaries of the two H.F. transformers are tuned to the same wavelength the set bursts into oscillation. This is where the neutrodyne principle comes into action.

Adjust the two neutrodyne condensers until the set stops oscillating. The neutrodyne condensers should be left at this position and reaction controlled by means of the reaction coil itself. Once a station has been tuned-in, the variable grid leaks mounted inside the cabinet can be permanently adjusted.

A Four-valve Neutrodyne Receiver

(Continued from preceding page)

Test Report

Tested on a rather poor aerial approximately six miles west of 2 L O, this set received the following stations on the loud-speaker: London, Bournemouth, Birmingham, Le Petit Parisien, Madrid (R1), Chelmsford, Eiffel Tower, Glasgow and Newcastle, the last two being rather faint. On the phones, Aberdeen, Manchester, Leipzig, and Brussels were heard at good strength.

The set was again tested on an aerial almost within sight of 2 L O, but it was found that this station was too strong to be cut out, thus preventing the reception of other stations having a wavelength almost equal to that of 2 L O's.

IN cases where a number of phones are in use from one receiving set it is often desired to have the phones in a room other than that in which the set is located, or possibly in the same room but at some distance away from the set.

The instrument described has been designed to avoid the permanent attachment of wires to walls, and as will be seen from the photograph, comprises a portable distributor for six pairs of phones and a

drum on which the flexible wire is wound, thus obviating tangling and consequent damage.

Materials Required

The materials required are as follow :

- 1 ebonite panel, $\frac{1}{4}$ in. thick, 6 in. diameter.
- 1 tin lid or tin bottom, 6 in. inside diameter and 1 to $1\frac{1}{4}$ in. deep.
- 1 2-oz. round tobacco tin.
- 1 paint-tin lid, lever pattern, 6 to 7 in. diameter.
- 1 3-ply wood baseboard, $\frac{3}{8}$ in. thick, shaped banjo fashion to form 8 in. diameter base with handle.
- 3 in. of 2 B.A. screwed rod.
- 4 2 B.A. nuts.
- 4 washers for 2 B.A. rod.
- 1 spring washer for 2 B.A. rod.

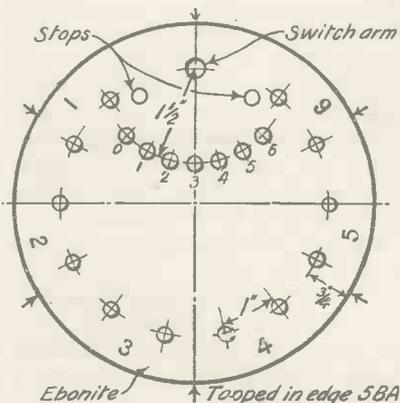
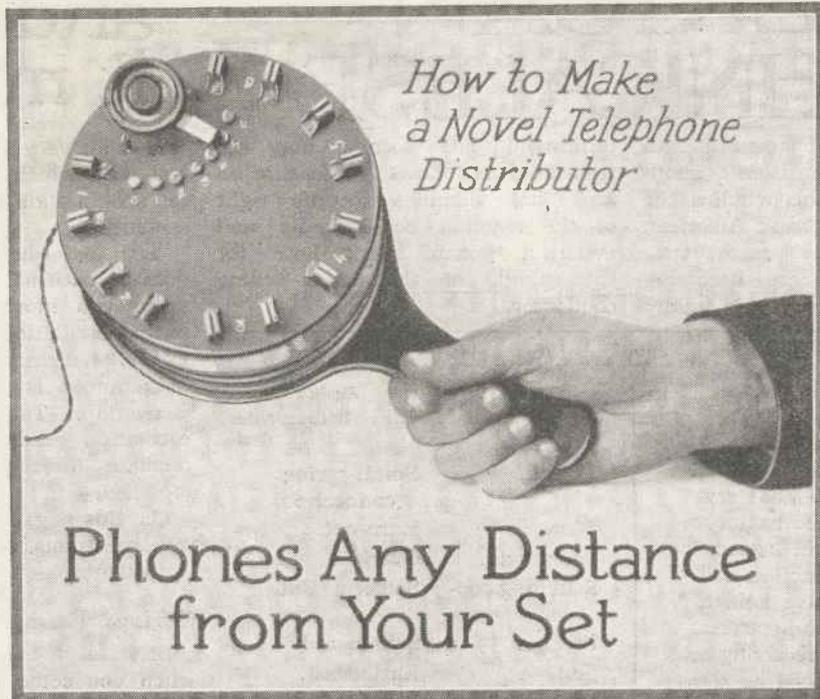


Fig. 1.—Layout of Panel.



12 telephone terminals, preferably spring type. (Those used were the Klutch type made by H. Joseph and Co.).

1 switch arm with 7 studs and 2 stops.

6 5 B.A. countersunk screws.

12 5 B.A. cheese-headed screws (if Klutch terminals are used).

Cutting the Panel

The cutting of the ebonite panel to a circle may appear difficult, but can be accomplished by first cutting it tangentially to the circumference of the desired size at numerous points.

The rough edges are then filed off, or trimmed down with an ordinary wood-worker's spoke-shave, and as the panel is designed to fit inside a container any irregularities will not be apparent in the finished instrument.

The panel is then drilled as shown in Fig. 1, and six holes to take 5 B.A. screws are tapped at equal distances into the edge of the panel to fix it into the holder.

After the panel has been drilled it is advisable to adopt the usual precaution of sandpapering the surface to remove any pencil marks or substances likely to act as conductors and cause leakage.

Making the Container

The container for the panel and the drum is afterwards constructed

in the following manner. A tin dish (conveniently made from a round tin lid or from the bottom portion of a round tin) of 6 in. diameter and 1 to $1\frac{1}{4}$ in. deep, a 2-oz. round tobacco tin, and a lever pattern paint-tin lid (the lid of a 7-lb. paint tin was used) are thoroughly cleaned so that all the surfaces to be soldered present a bright and clean appearance.

Having soldered on the lid of the tobacco tin, small holes are drilled in the

exact centres of the tin dish, the top and bottom of the tobacco tin, and the paint lid.

Soldering

These are then assembled with the top and bottom of the tobacco tin in contact respectively with the bottom of the tin dish and the top of the paint-tin lid, care being taken that the recessed flange of the lid faces downwards, small brads being placed through the central holes to hold them in their correct positions.

These are now soldered together to form the drum, as illustrated in the section diagram (Fig. 2). While the soldering is being done a weight should be placed on top to keep all the edges in firm contact.

Using the small central holes as guides, a clearing hole for 2 B.A.

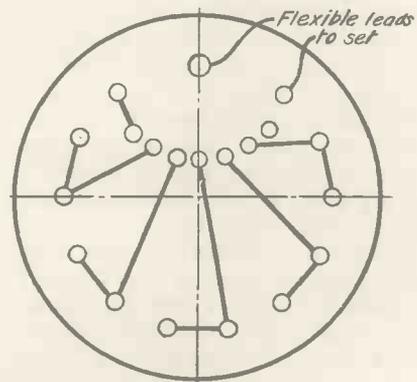


Fig. 3.—Wiring Diagram.

rod is then drilled through the centre of the drum. A small hole is also drilled in the bottom of the panel container, close to and outside the edge of the tobacco tin, and is subsequently used for the wire to pass through.

Baseboard

The baseboard is made from $\frac{3}{8}$ -in. three-ply wood, and is banjo shaped to form an 8-in. diameter base for the instrument with a carrying handle attached. A small block of wood is attached above the centre as an additional support for the spindle and to act as a bottom bearing for the drum.

This block of wood occupies the space in the recessed portion of the paint-tin lid. A hole is drilled through the block and the base to allow the rod to pass through, and is enlarged at the top and bottom sufficiently to allow a nut to be placed on the rod.

The switch arm and studs and the various terminals are then secured in place on the panel. On the underside of the panel all projecting screws are cut off to a height of about $\frac{1}{4}$ in. from the panel, and the ends are then filed off and "tinned" with solder.

Wiring the Panels

The panel is then wired up as shown in Fig. 3, all joints being soldered, with the exception of the flexible lead from the set, one end of which is secured under the nut holding the switch arm bushing to the panel, the other being connected to the first telephone terminal. Before the flexible wire is fixed in place it must be passed through the tin base from the drum side.

No Damage

The Klutch terminals, as used in this instrument, are extremely convenient for connecting and disconnecting, and easily release the phone cords in the event of their being accidentally pulled, thus preventing the distributor being pulled off the table and damaged.

They are, therefore, well worth their extra cost, but it will be found advantageous to cut off the existing hole for the screw and drill a new hole between the two uprights of the terminal. They can then be secured to the panel with 5 B.A. cheese-headed screws, the result being a more rigid job and less risk of the terminals turning.

The B.A. rod spindle is now placed through the

wooden base and locked in position by means of two nuts, one above and one below the base. A spring washer, between two flat washers, is placed on the spindle to keep the rim of the drum just clear of the wooden base.

The drum is placed in position on the spindle, two flat washers placed on, and final adjustment made by two nuts. The panel can now be secured into its base by means of the six screws in the side and the whole of the instrument, other than the panel, painted as desired.

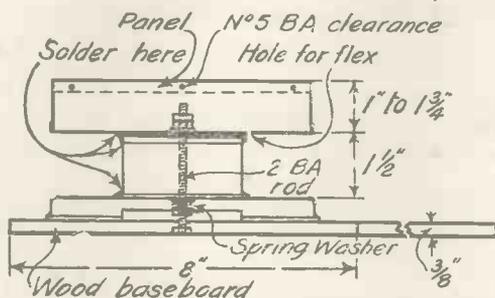


Fig. 2.—Sectional View of Distributor.

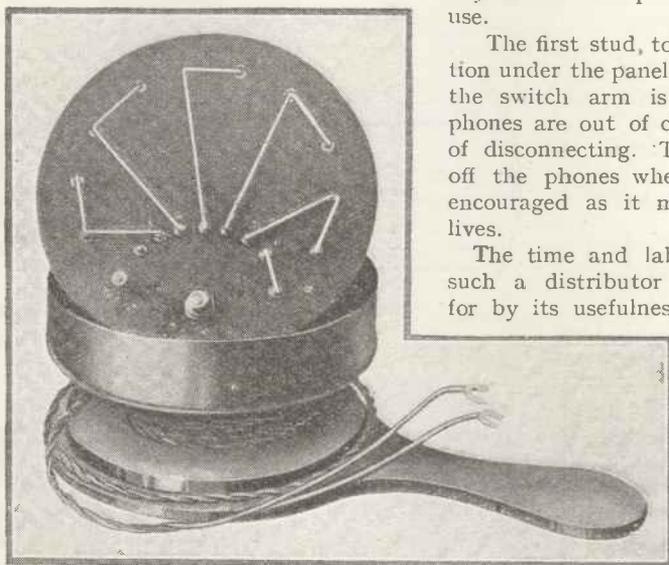
the desired position, the wire automatically uncoiling from the drum.

Terminal Numbering

The terminals should be numbered in pairs, and each stud according to that pair of phone terminals with which it makes connection (see Fig. 3), so that by adjusting the switch arm to the requisite stud any number of phones can be brought into use.

The first stud, to which there is no connection under the panel, is marked zero, and when the switch arm is in this position all the phones are out of circuit without the trouble of disconnecting. The practice of switching off the phones when not in use should be encouraged as it materially lengthens their lives.

The time and labour expended in making such a distributor are amply compensated for by its usefulness when finished. W. S.



Rear View of Distributor showing Wiring

towards defraying the tuneral expenses.

At last he reached a house, "detached villa in its own grounds," which gave promise of a healthy donation.

The mission was explained. The owner, a dry-as-dust wireless experimenter, took 5s. from his pocket.

"A bandsman, did you say?" he queried.

"Our saxophone, sir."

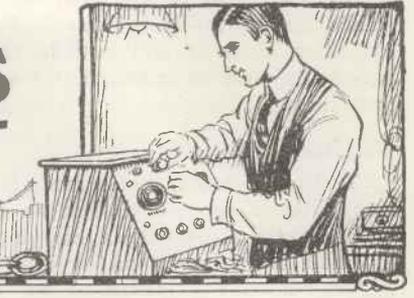
"Well, sonny." He took out his pocket-book.

"Here's a fiver. Bury the Savoy Orpheans, the Havana and the Selma Four at the same time. I'm busy."

HARSH!

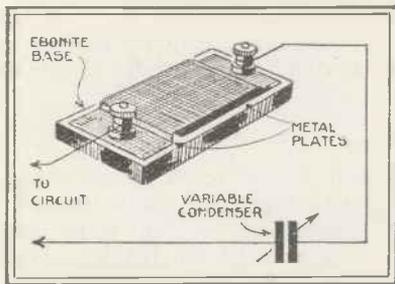
THE local band had suffered a heavy loss; its saxophone had passed away. A member of the orchestra called at various houses in the London suburb to collect subscriptions

Gadgets, Hints and Tips



Fine-adjusting Condenser

EVERY amateur knows that when two condensers are placed in series the total capacity is less than the capacity of the smaller condenser by itself. This principle can be made use of in constructing a fine-adjusting condenser for emergency use.



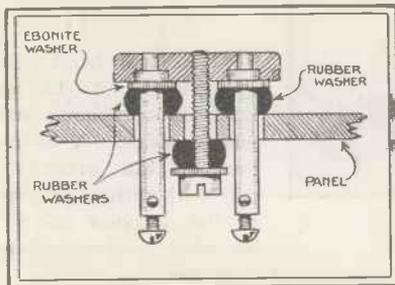
Fine-adjusting Condenser.

A small home-made condenser is constructed as shown in the diagram and connected in series with a variable condenser. The result is, of course, a fine-adjusting variable condenser.

R. W. B.

Vibration of Dull-emitters

READERS using dull-emitter valves have probably been troubled by the



Anti-vibrating Valve Holder.

microphonic noises set up by undesired vibrations.

A certain amount of the vibration can be absorbed by mounting the cabinet on rubber discs, but, in addition to this, it has been found that by mounting the valve holders on

rubber washers the trouble is entirely overcome.

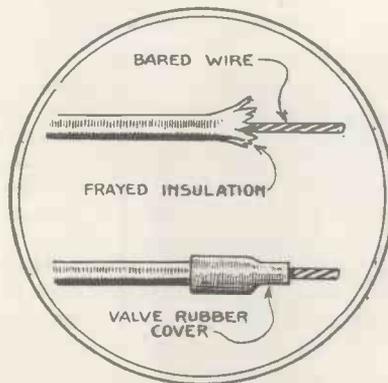
These rubber washers may be obtained from any dealer in gramophone parts, as they are used in mounting the motor on the cabinet top.

The diagram shows the application to the ordinary valve holder. Clearance holes are required in the panel.

S. J. G.

Tidy Connections

BELL wire is very efficient for wiring-up components of experimental sets, as it is sufficiently stiff to stay where it is put, but the ends get unravelled and become very untidy.



Method of Finishing-off End.

A way of overcoming this is to turn the untidy ends back, so that they lay along the wire, and then work a piece of cycle valve tubing, about $\frac{1}{2}$ in. long, over them, as shown in the diagram; this will prevent further unravelling.

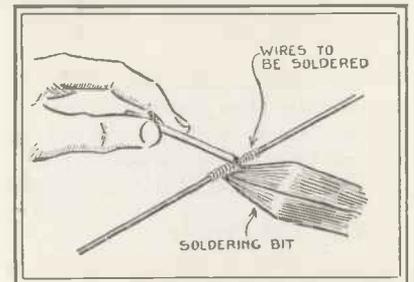
W. E. F.

Soldering Joints

ONE of the most difficult jobs for the amateur constructor is the simple soldering of the wire joints and wire ends to screws and connecting tabs. If executed in the following manner it will be found to be no trouble whatever.

Having heated the soldering bit, hold it under and touching the joint or screw to be soldered, and after a few seconds, depending on the size of the joint, rub a piece of resin on the joint until it flows.

Still keeping the soldering bit to the joint, immediately apply the



Soldering a Joint.

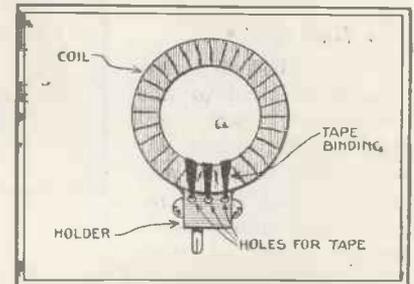
solder, which should be in the form of a fine stick, to the joint and the solder will run.

The sketch shows how the soldering bit should be applied.

J. H.

Binding Coils

A SIMPLE method of fixing coil plugs to coils is to cover the coil with empire tape. Then drill three holes in the coil plug and pass the tape



Coil Bound.

through, so binding the plug to the coil.

The arrangement is shown clearly by the diagram.

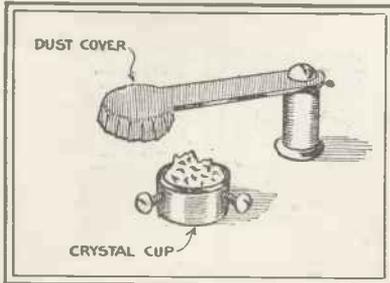
In the case of hexagonal-shaped coils the plug fits on one of the faces of the coil.

G. H. V.

Crystal Protection

To keep the crystal in your detector free from dust, try the device illustrated below.

A piece of an aluminium condenser vane is cut to the shape shown, and a hole made in one end so that it will slip over a terminal.



Dust Cover for Crystal.

One just swings the aluminium strip over the crystal cup when the detector is not in use, thus protecting the mineral and prolonging its useful life.

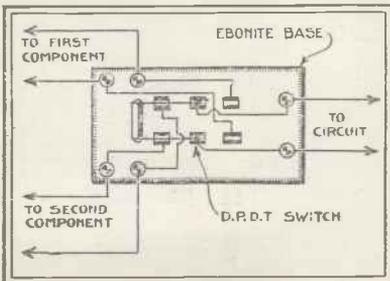
F. L.

"Comparison" Panel

To adjudicate the best value of components in varying circuits such as the experimenter is continually "hooking-up," the most decisive test is performance in actual reception.

To be of any value, all the comparisons must be made on the same transmission; the panel described has proved very useful in this respect.

By its aid any pair of condensers, transformers, chokes, etc., can be connected up. Two leads are permanently connected in the appropriate position in the circuit, and a comparison quickly made whilst



Connections of "Comparison" Panel.

listening by simply changing over the switch.

The panel consists of a D.P.D.T. switch, the centre connections of which are extended to the set. The remaining four contacts on either side are joined respectively to the components for test.

W. A. A.

Watering the "Earth"

A FALLING off in signal strength during the summer months can often be traced to the "earth" connection having become dry.

Should such a falling off in strength be noticeable the remedy may be found in moistening the earth-plate with the aid of a large watering can.

This note does not apply, of course, in the case of earth connections made to a water main.

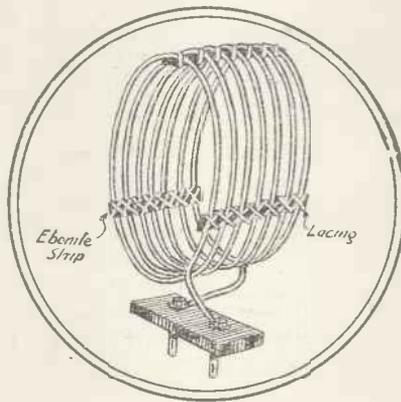
X.

Low-loss Coil

A SIMPLE type of low-loss coil is shown by the diagram. Enamelled wire of No. 18 or 20 gauge should first be wound tightly round a former about 2 1/2 in. in diameter.

When released it will spring to a diameter of about 3 in.

The turns are then bound (and



Low-loss Coil.

spaced) with thread or string, as shown, to a light strip of wood, such as a match-stick, the spacing depending on the thickness of the thread used.

When mounted on ebonite the result is a well air-spaced coil suitable for short-wave working.

W. J. S.

Changing Your Crystal

THOSE who use detectors in which the crystal is entirely unprotected from the atmosphere (and there are many such) should not expect that they will always obtain equally good results.

An exposed crystal is bound to lose a great deal of sensitivity in time and a new piece of mineral should be substituted periodically, say, to be on the safe side, every three months.

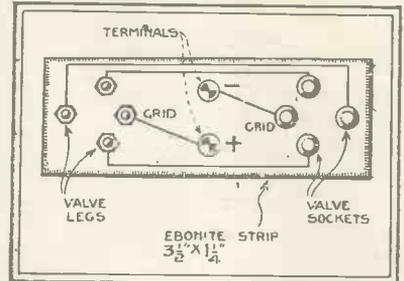
Crystals are cheap enough nowadays and nobody need begrudge the few shillings a year necessary to obtain consistently good signals.

Z.

Adding Grid Bias

A TEMPORARY method of applying grid bias to the low-frequency amplifying valve or valves in a set is shown in the illustration.

A strip of ebonite is fitted at one end with four split valve legs to fit the valve sockets in the set.



Device for Adding Grid Bias.

Four valve leg sockets are placed at the other end of the strip, while two terminals are fitted in the centre for the grid-bias battery connections.

The legs, sockets, and terminals are wired up as shown in the diagram, care being taken not to place the connecting wires too close together.

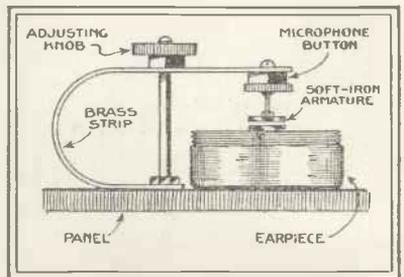
To use the device, plug the valve into the sockets on the strip and plug the strip complete with valve into the valve sockets of the set itself. To apply grid bias, connect a dry battery of the necessary voltage to the two terminals in the centre of the strip.

N. R. W.

Microphone-button Mounting

ILLUSTRATED by the diagram is a method of using a microphone button for amplifying without the need of having a reed-type phone.

The button is itself fixed to a



Mount for Microphone Button.

springy brass strip, and its position can be adjusted by means of the nut on the threaded rod.

To the armature of the button is soldered a steel nut or small steel plate, this being adjusted so that it is in close proximity to the phone magnets.

N. M.

Broadcast Music of the Month

THERE has been a marked rise this month in the entertainment "barometer" of programmes.

Necessarily much orchestral music has been performed, the general excellence of the stations' orchestras going far to atone for the dullness of some of the works performed. It is safe to say that the "three B's" (Bach, Brahms and Beethoven), valuable as they

are in the musical literature of the country, are by no means liked by the "man in the street," who is, after all, the average listener-in.

The Lighter Side of Things

Due, however, we presume, to the influence of Mr. George Grossmith, there has been a good leavening of humour. Old favourites are Ronald Gourley, John Henry, Helena Millais and Louis Hertel, the last named in a new sketch, *The Cornet Player*, with a real live cornet soloist as assistant. So clever, however, is Mr. Hertel at imitations that we shouldn't be a bit surprised if most people believe that he himself is the cornet.

Lovers of syncopated sounds, as distinguished from music, have found themselves well catered for with the efforts of both Layton and Johnson, as well as Scovell and Wheldon, while The Roosters, who have by now "roosted" successfully at every station, are usually to be relied on for some boisterous amusement, and are quite good in their own particular line.

Many people still wonder why they have given themselves this title. It was made as a compliment to their officer, Captain Roose of the 60th



The Roosters Concert Party.

Division, when they were formed in Salonica, in March, 1917, at the foot of the Thracian hills, so they are by no means amateurs at the game.

Mr. Percy Merriman, the founder, and Mr. William Mack are two original members, the latter playing as one of the "girls," his soprano voice lending itself well to the part.

Mr. Arthur Mackness, tenor, is another of the

"old stagers," and prides himself justly on having appeared at every performance in Greece, Egypt and Palestine. Mr. Septimus Hunt is the baritone, and Mr. George Weston, the pianist, who joined first in Egypt in 1917, was known as "Kitty," the flapper. His voice is easily recognised over the ether, and he was heard also in company with his cousin, Kenneth Weston, recently under their title "The Perfectly Polite Pair."

Amongst the entertainers, also, is Wilson James, an old Gaiety star, and with his partner, Mr. David Jenkins, as "The Wranglers," he has evolved good humour at both ends of the circuit.

On High Power

One of the best of the high-power programmes has been that carried out by Mr. Phillip Ritte and his concert party. Mr. Ritte himself is a concert-hall singer of rare musical gifts, and one remembers him at many of the big concerts in 1914.

Since 1916, however, he has devoted himself to his concert party, and gathered round him a very clever little band, including Doris Cowan, an excellent soprano, whose repertoire varies from grand opera to rag time; Miss Ethel Wilford, a clever comedienne with a gift for mimicry;



Miss Doris Vane.



Mr. W. Primrose.



Mr. John Buckleigh.



Miss Marcia Bourn.



Mr. Philip Ritte.

Miss Tina Foster, a capital soloist as well as accompanying pianist; while Mr. Geoffrey Dupree and Mr. Will Edwards supply the humour of the party, and are both capital entertainers.

Vocalists of the Month

A good singer, like good wine, "needs no bush," and one welcomes wireless that one is often spared the detract from the real value

vocalism for the very fact sight of mannerisms which of the singer's voice. The B.B.C., however, have given us some of the best, amongst them Leonard Gowings, a tenor who is heard to equal advantage at concert hall, by microphone and gramophone.

Then we have had Miss Nellie Walker, a singer with excellent diction; Miss Mabel Fitzgerald, whose war work made her one of the foremost singers, to the Dominions sailors; she was the first woman entertainer to be allowed on board ship. Miss Mary Lohden and Miss Adeline Senior are well known, especially at 6 B M, though Miss Lohden sang splendidly when demonstrating the songs of Mr. Manlio di Veroli at Wigmore Hall, London, recently. Miss Senior is a charming singer, especially in operatic rôles such as La Mascotte.

Miss Marcia Bourn, one of the earliest of wireless duettists, is now joining issue with Miss Lena Copping. Miss Winifred Davis is equally at home on concert platform or operatic stage. A member of several big opera companies, her favourite part is Carmen. She is equally at home in many other rôles.



Mr. Norman Notley.

Both Miss Doris Vane and Mr. John Buckleigh are too well known as wireless artists to need any introduction. It is interesting, however, to note that Miss Vane was one of the members of the original "Follies."

Mr. Buckleigh was originally intended as an art-teacher, but fortunately discovered his fine voice,

which oratorio and concert work has since developed.

Mr. Norman Notley is another singer destined for a scientific career who turned to singing, and after serving in the war in the Canadian army returned to England to become a member of the staff of the Royal College of Music, as well as a vocalist.



Miss Adeline Senior.

Part Songs

In addition to the many

choirs, we have had several singers of part-songs recently, notably Mr. Leonard Salisbury, who came into notice while leading the well known Gresham Singers. Now he has his own little band of voices, known to us all as "The Salisbury Singers," and one of the best, too, in this class of work.

Many interesting singers, too, have come to us through the medium of de Groot and his Piccadilly Orchestra. Just recently was heard that fine singer Ashmoor Burch, and also Mavis Bennett.

There is a real story round the success of this young singer. She is a coloratura singer with a voice of such pure quality and flexibility that after a recent appearance hundreds of letters of appreciation were sent in. Yet at the age of sixteen, when she left school she had never been taught a note of music and was obliged to start earning a living as a dress designer.

She says that every penny saved was then spent on tuition to achieve her

ambition, and often she went without her meals in order to save. At the age of twenty she was able to join the caste of the D'Oyley Carte Opera Company and understudied all the parts.

Then she came to London with only £10 in her pocket, and the fight for existence was a very grim one, until Mr. Edward Iles of the R.A.M. happened to hear her and brought her voice to its present stage of art. She is one of the



Mr. Dan Godfrey, jun.



Mr. Ashmoor Burch.



Mr. L. Salisbury.



Miss Nellie Walker.

best coloratura singers that we have, and fully deserves her success for the pluck she has shown in attaining it. Recently she was heard with Frederick Ranalow and Gladys Palmer.

Instrumental Progress

The month's music has given us some fine soloists, amongst them being the Virtuoso String Quartet, the London String Quartet and the Chaplin Trio, with its old-world instruments, the viola da gamba, viola d'amore and harpsichord.

Amongst the notable violinists were Albert Sammons, Daisy Kennedy and William Primrose. An ex-student of the Guildhall School of Music, Mr. Primrose has proved himself to be a soloist possessed of

exceptional brilliance of tone.

It is some time since we heard the English Concertina Band broadcast, and their reappearance at 5 X X was viewed with much satisfaction by those who appreciate this instrument. One of the best exponents is Miss Christine Hawkes, who broadcast quite recently.

Max Darewski's band, which is being relayed from the Spa, Bridlington, to Hull station three times a week until September, has been a great success, for Max's music is widely known throughout the East Riding of Yorkshire especially, and it does not seem so many years since he was one of the first boy prodigies on the London concert platforms.

Special stunts—Derby Day, Military Command Searchlight, and *Frasquita* from the Princes Theatre, to say nothing of German opera—have also been broadcast, not a bad selection for a month's programmes.

Subjugation of Musical World

The broadcasting, too, of such artists as Ysaye, Moisewitch and Forbes Robertson made another epoch in broadcasting history from a musical standpoint. It needs now but Pachmann, Melba or Calvé to come forward to complete the subjugation of the musical world to the miracle of this century.

Although most of the talkers might well be placed "on the list and never would be missed," yet there are a few here and there who

make listening worth while. For those who like their tragedies from first hand witnesses, the talk arranged by Mrs. Starr of the C.M.S. Hospital at Peshawar was of interest, for it was this lady, now Mrs. Underhill, who "trekked" into Tirah after Miss Mollie Ellis, who was kidnapped last year.

Diction

Mr. Herman Klein is another interesting talker, and he chose as his last subject that very important one, "Diction in the Broadcasting Voice." Most of us have suffered from talker and singer who are weak on this point, so perchance those vocalists who listened will essay improvement.

STUDIUS.



Miss Winifred Davis.



Mr. Leonard Gowings.

WATCH THOSE LAMPS

MANY listeners have adopted the plan of inserting a small pocketlamp flash bulb in the positive high-tension leads of their sets in order to protect the valve filament from accidental short circuiting with the high-tension battery.

The idea, of course, is that the pocket flash-lamp bulb will burn out before the valve filament; that is, when a current exceeding about half an ampere is passed through it. Unfortunately, things do not always work out as premeditated, and this is no exception to the rule.

There are many German and other makes of flash-lamp bulbs on the market which will pass considerably more current than this half an ampere without damage, the writer recently having the bitter experience of damaging a valuable thermocouple ammeter rated at one and a half amperes, when using one of these bulbs as a protector.

On examination of another lamp of the same batch it was found that it took just over three amperes before it finally burned out.

The bulb was a German one. The amateur experimenter should take care to satisfy himself that his lamp fuses will not stand an overload of current before placing reliance upon them.

A. J. C.



Miss Mary Lohden.



Miss Mavis Bennett.



Mr. Wilson James.

How Signals Get to Your Aerial

MOST amateurs know that before a receiver can reproduce a broadcast programme energy must be transferred from the broadcast-

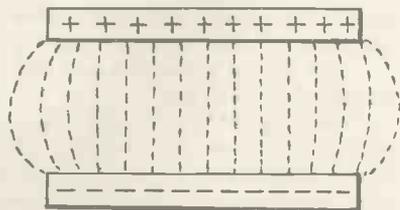


Fig. 1.—Dielectric in State of Strain.

ing station to the receiving aerial. In the case of a crystal set this energy actually works the telephones; when valves are used it has only to vary the potential of the first grid. The energy, after being radiated from the transmitting aerial, reaches each particular receiving station by a wave-motion in the ether. A brief outline of the theory most generally accepted by scientists to explain this process is here attempted.

When a condenser is charged a certain amount of energy is stored up in it. The ether between the two plates is then in a condition of strain, shown diagrammatically by the dotted lines in Fig. 1. It should be noted that the energy is actually stored in the *dielectric* and not in the metal plates. If a condenser with, say, a glass dielectric be charged and then taken to pieces without allowing the energy to leak away, it will be found that the plates have no charge on them.

Stored in Dielectric

If new and absolutely uncharged plates are substituted and the condenser reassembled, it will be found that the energy is still there. As of the condenser originally charged only the glass remains uncharged it is obvious that the charge is stored in the dielectric.

It will be understood that energy could be transferred from one place to another by charging up a condenser at the first place, removing the dielectric and taking it to the second place, there inserting it between metal plates. (This, of course, is impracticable owing to the

difficulty of so handling the condenser without releasing the charge.)

In wireless, however, the charge is separated entirely from the condenser and is transferred from one place to another without any material substance being moved.

As far as is known, the ether cannot get into a state of strain unless material bodies are oppositely charged. On the other hand, once strained, the ether cannot "relax" unless some material substance is so placed that the charge can be neutralised by the passage of an electric current from the point of high potential to the point of low potential.

Thus, provided that insulation is perfect, the condenser shown in Fig. 1 will remain in a charged condition until a conducting path exists between the two plates. If

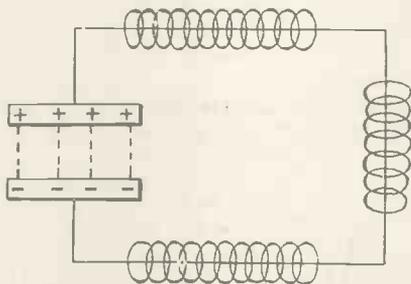


Fig. 2.—Dielectric Strain "Relaxed."

we connect the plates together by a piece of wire, as indicated in Fig. 2, such a path is provided.

The condenser will discharge itself through the wire, producing in this an electric current. The strain (static) between the plates will "relax" (indicated by fewer lines of strain in Fig. 2) and a new strain, this time magnetic, will be set up round the wire, the lines of force of this forming *expanding* circles concentric with the wire.

When the condenser is completely discharged, all the energy (except that expended in overcoming the resistance of the wire) which was previously stored between the condenser plates will be conserved in this concentric field around the wire.

When the current would otherwise cease to flow this magnetic field will collapse upon the central wire and

cause the current to continue, so charging up the condenser in the reverse direction; this sequence of events will go on until the whole of the energy originally stored in the condenser is dissipated.

This is the familiar theory of the production of oscillations by the discharge of a condenser. In a wireless transmitter sufficient energy is continually supplied to compensate for that lost in producing the above phenomenon.

Aerial and Earth

The aerial and earth of a wireless transmitting station correspond to the condenser plates shown in Figs. 1 and 2, and the down-lead and earth wire form the conducting path between them (taking the place of the wire in Fig. 2). Really the whole aerial is both a condenser plate and the connecting conductor, but for the sake of simplicity it is represented in Fig. 3 as though only the flat top acted as a condenser plate.

Fig. 3 corresponds to Fig. 1, the aerial being shown charged positively. Fig. 4 represents the state of affairs when the aerial is being discharged. As the electric strain between aerial and earth collapses the positive ends of the electrostatic lines of force rush down the aerial to the earth and, at the same time, expanding magnetic lines of force spring outwards from the vertical part of the aerial and "push" away the electric field, which is

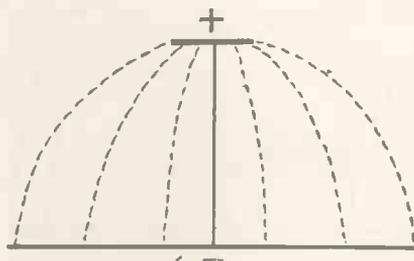


Fig. 3.—Representation of Aerial and Earth.

now in the form of a kind of arch with both ends resting on the ground. (It must be remembered

(Continued at foot of next page.)

On With the Dance Music!

I DROPPED in to see Houghton the other evening, because Houghton is the man who persuaded me to install a wireless set, and the wireless set had refused to function.

I found him busy. The table was littered with pens and paper, and a pile of letters ready stamped for the post lay on the mantel-piece.

"I hope I'm not intruding," I apologized.

"No, I'm glad to see you," he admitted. "My wrist is too tired to do any more to-night."

"Literary work?" I hazarded, and told him the sad facts about my wireless set. A spasm of pain flitted across his brow, but he suggested one or two remedies which seemed promising.

"I'm afraid I seldom listen in now," he said. "You see, I stuck to a crystal set, and I resent being tied by the ears to the small table

up the corner. There are other reasons, too, but I won't bore you with an unpleasant——"

At that moment a series of blood-curdling shrieks made me glance about me in alarm. They seemed to come from the walls of the room. Houghton gritted his teeth, but otherwise remained calm.

"There you have it," he said, "my other reason for not listening-in. What you hear is my neighbour's five-valve super set. In a few moments he will cease these callisthenics, and we shall settle down to an evening's stentorian entertainment. He keeps his extra loud-speaker up in that corner. My neighbour in the other direction keeps his at the back of the house, immediately under an open window. His set is slightly louder."

"And so you have taken to literature as a relief?" I said.

"Literature be hanged!" Stanton replied. "I have found their weak spot. They both switch off when dance music is being broadcast. They are high-brows, of sorts. So," he lowered his voice, "I am the man who writes to the B.B.C. asking for more and more dance music in the wireless programmes!"

"But surely an occasional letter cannot influence the B.B.C.?"

"Occasional!" he laughed, and a strange glint came into his eye. "I have reduced this to a science, and can invent fictitious names and addresses without the slightest effort. The B.B.C. admit that my letters already outnumber those on the other side by three to one, and," his voice sank to a whisper again, "provided I don't get writer's cramp, I hope that soon there will be nothing but dance music broadcast." H. P.

How Signals Get to Your Aerial (Continued from preceding page.)

that these diagrams show only a section of the field around the aerial and perhaps a circular tunnel would be a better description than an arch.)

The collapse of the magnetic field causes the aerial to be charged in the reverse direction and so it goes on oscillating. Fig. 5 shows the state of affairs after several oscillations. It is only possible to indicate the magnetic lines of force by dots as these form circles in a

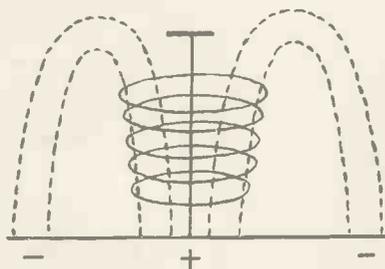


Fig. 4.—State of Affairs when Aerial is Discharged.

plane parallel to the surface of the earth. In Fig. 5 is also explained the term "wavelength," this being the actual distance between two

consecutive points at the same potential.

It will be realised that "disembodied" charges of electricity

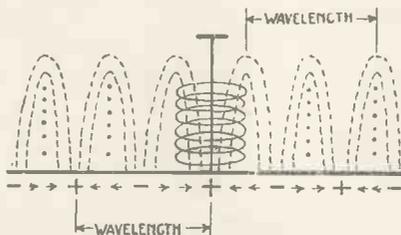


Fig. 5.—State of Affairs After Several Oscillations.

are being forced across space. During their progress, whenever two points at different potentials happen to cut a conducting body at the same time, an electric current flows. Buildings, gas-pipes, electric-light wires, steel bridges, etc., all sap away some of the energy. This explains why an electric-lamp socket or a wire fence in the country can sometimes be used as an aerial. It also explains the "screening effect" of trees, telephone wires, etc., near an aerial.

As the earth joins the feet of all the waves, currents flow through the ground. These are shown by the arrows in Fig. 5, which indicate the

actual directions of the *electronic* currents, that is from negative to positive.

Fig. 6 shows the waves reaching a receiving aerial. As this happens to join two points of the electric field at different potentials a current is produced in it. The top of the aerial being more positive than the earth end, electrons rush up from the ground and charge the aerial negatively. If the aerial is in tune with the transmitting station it will be just in the process of discharging itself when the next half-wave arrives which, of course, will assist the discharge and recharge in the opposite direction.

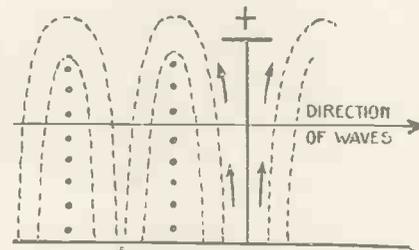


Fig. 6.—Waves Reaching a Receiving Aerial.

Thus the energy thrown off from the transmitting aerial will cause an oscillatory current to flow in the receiving aerial. J. F. JOHNSTON.



THERE has been a recent tendency to cry down the H.F. amplifier as an inefficient and unnecessary piece of apparatus. For actual efficiency, of course, the L.F. amplifier is far ahead, but to say that the H.F. amplifier is unnecessary is quite untrue.

H.F. Amplification

One stage of high-frequency amplification (provided that the valve is working on the correct portion of its characteristic curve) will bring in stations that otherwise would be out of range. It is true that the signal strength of those stations received without the aid of an H.F. amplifier is not increased to any appreciable extent, and for this reason this method of amplification has been condemned. For the reception of the local and comparatively near-by stations, if a good outdoor aerial is used, the H.F. amplifying valve is a "passenger."

For the reception of far-distant stations on an outdoor aerial or frame aerial, however, the inclusion of two stages of H.F. amplification is essential.

Tendency to Oscillate

The trouble usually encountered with a multi-stage amplifier of this type is its tendency to oscillate. For the reception of, say, distant amateur stations using C.W. telegraphy, the

tendency to oscillate is highly undesirable.

The cause of the oscillation is to be found in the back-coupling effect, present in the form of capacity between the grid and plate of the valve. There are several methods of controlling oscillation, but in the amplifier described in this article use is made of the damping effect of grid current.

The amount of grid current flowing is in turn controlled by the potentiometer. When using this instrument it will probably be found that the maximum signal strength is obtained when the slider is at the negative end of the resistance winding owing to the negative (or nearly negative) resistance of the oscillatory circuits.

Tuning, however, will be flattened

cut out one or both stages of amplification. It is absolutely essential that these be of the low-capacity type, and it is advisable to employ switches of a reputable make.

Valve holders and H.F. transformer holders should also have a minimum amount of capacity between the sockets.

Dual Control

In order that the primaries of both transformers may be tuned by one control a "dual" variable condenser has been incorporated. The capacities of the two condensers must, however, be matched, otherwise the transformers will be out of resonance with the incoming oscillations, thus lowering their efficiency.

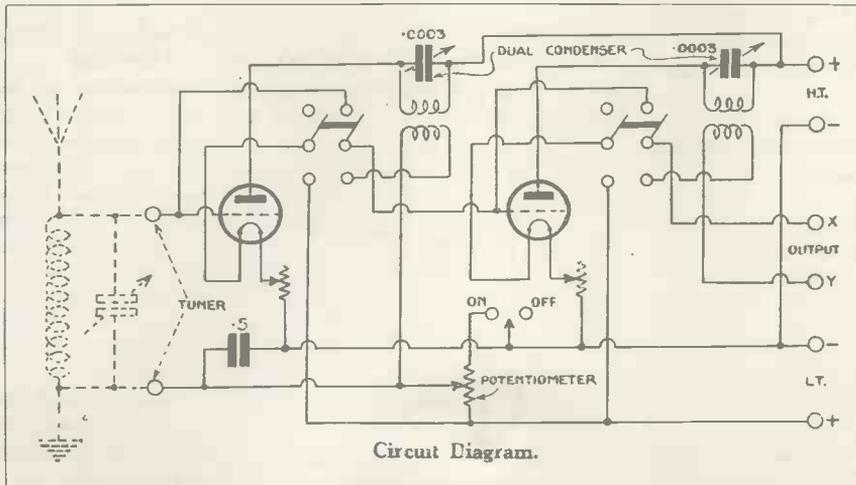
A valve or crystal detector may

be used in conjunction with the amplifier, as shown by the diagrams on page 638. The terminals marked X and Y are the output terminals of the amplifier.

In the case of a valve detector, terminal X on the amplifier is connected to the grid condenser and grid leak of the detector and thence to the

grid of the detector valve, while terminal Y is connected to + L.T.

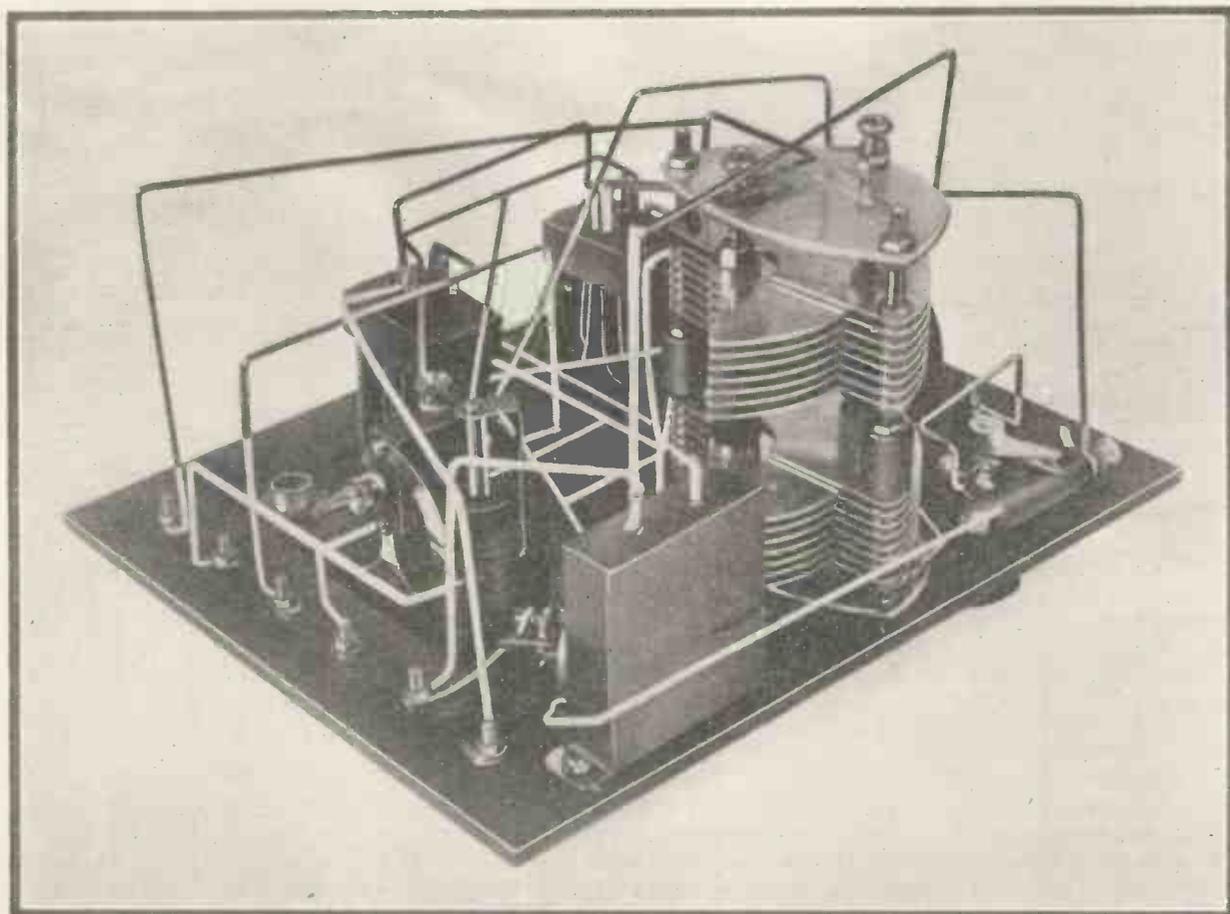
If a crystal detector is used, terminal X on the amplifier is connected to the catwhisker of the crystal detector and Y to one phone tag.



Circuit Diagram.

and self-oscillation easily and critically controlled by moving the slider of the potentiometer towards the positive end of the winding.

Referring to the circuit diagram it will be seen that two double-pole double-throw switches are used to



View of Underneath of Panel Showing Components and Wiring.

Component Parts Required

For constructing the amplifier the following components are required :

- 1 Radion ebonite panel, 10 in. by 8 in. (American Hard Rubber Co.).
- 2 valve holders and rheostats (Woodhall).
- 2 valve holders (Lissen).
- 1 dual .0003-microfarad variable condenser (McMichael).
- 1 potentiometer.
- 2 low-capacity double-pole double-throw switches (Burndept).
- 1 "off and on" switch (Lissen).
- 1 .5-microfarad fixed condenser (T.C.C.).
- 8 terminals.
- 1 oak case.

The Case

The case is designed on the same lines as that used in the construction of the two-valve power amplifier described in No. 4 of THE WIRELESS MAGAZINE. The H.F. amplifier in this cabinet will thus form a companion to the power amplifier, and if used in conjunction with a valve detector, a very efficient five-valve

receiver will be obtained. A dimensioned sketch of the case is given on page 640.

The Panel

The panel must be cut to the size indicated in the list of components. The edges should then be trued up

and finished off with emery paper, after which the panel is ready for drilling.

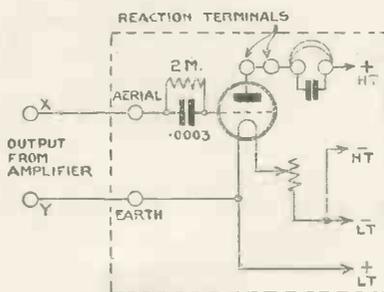
Combined Template and Wiring Diagram

Attention is drawn to the combined wiring diagram and drilling template given away with this issue of THE WIRELESS MAGAZINE. The positions and sizes of all holes to be drilled are shown in thin blue lines.

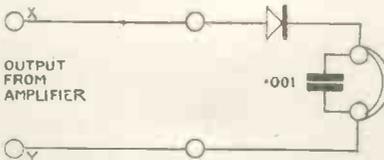
Lay the template flat on the panel and mark through with a sharp steel point the centres of the holes. In this manner unsightly scratches on the polished faces of the panel are avoided.

A considerable amount of labour is saved if the specified combined valve holder and rheostat is used. There are only two holes to drill for this instrument—one for the rheostat knob and the other for the valve window.

By an ingenious piece of design, the clamping screws of the valve window and rheostat also clamp the valve holder in position.



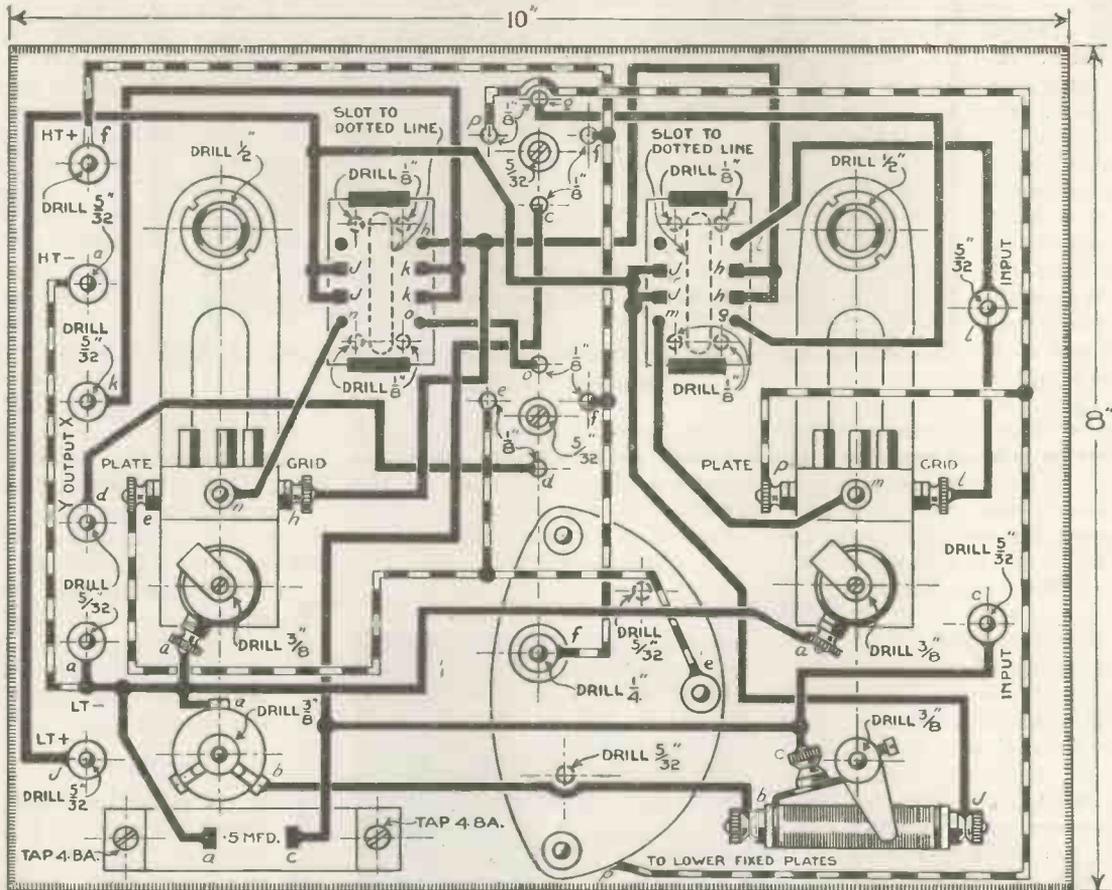
Connections for Valve Set.



Connections for Crystal Set.

REDUCED REPRODUCTION OF "THE WIRELESS MAGAZINE" SPECIAL COLOURED COMBINED LAY-OUT, DRILLING TEMPLATE AND WIRING GUIDE

(Given Free with this Issue.)



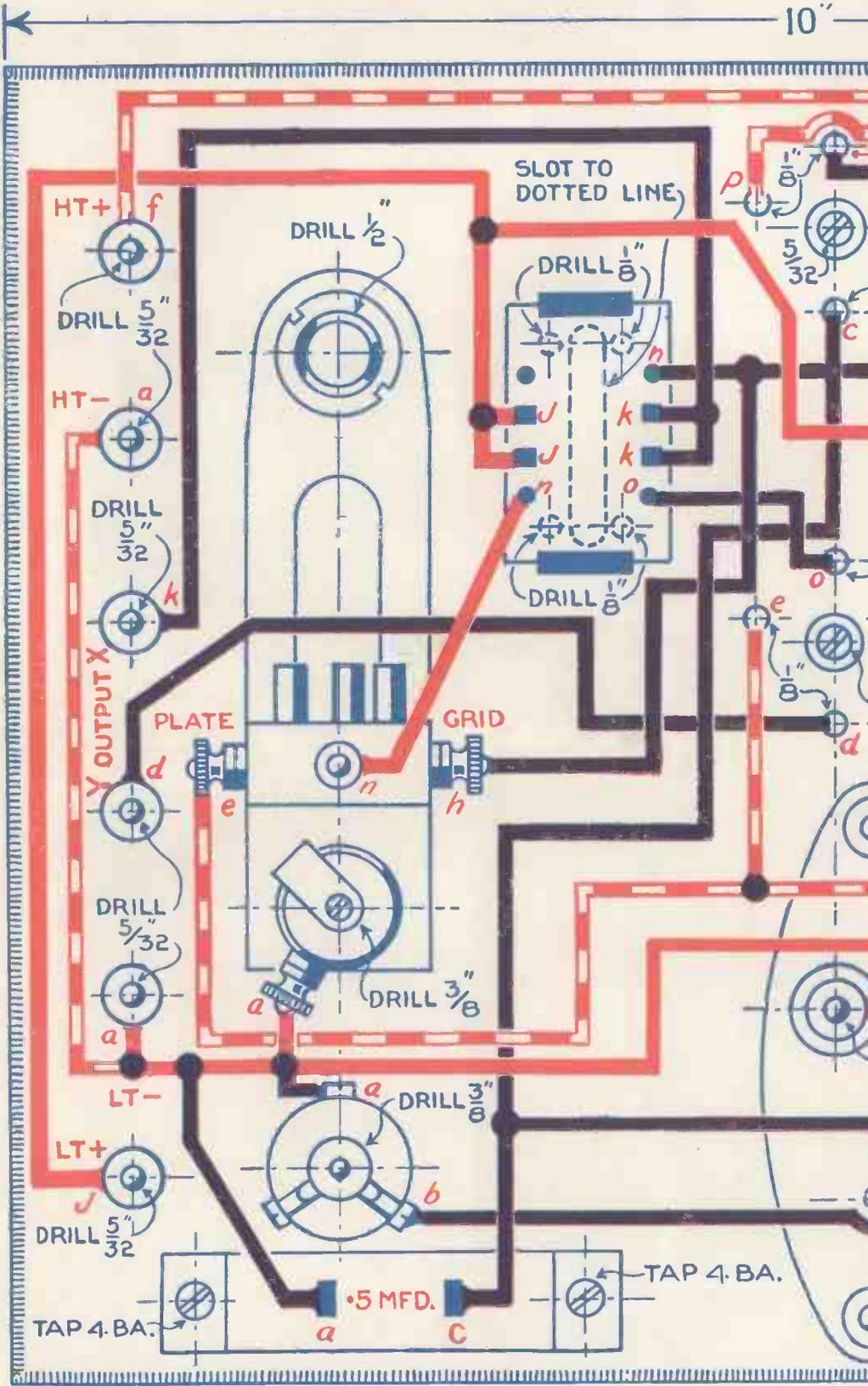
SPECIAL INSTRUCTIONS FOR WIRING.—In wiring up there is a choice of three methods. (1) Simply follow the wiring lines. A black circle at the intersection of two wires indicates that the two are joined together. At all other intersections there is no joint between the two wires. (2) You can ignore the lines of the wiring if you like, and work entirely by means of the letters shown at the various terminals. You just connect all like letters together with one wire or 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 TWO-VALVE HIGH-FREQUENCY

Combined Drilling Template and Full Wiring Diagram

For full particulars, see article entitled "Building a 'Range'

10"



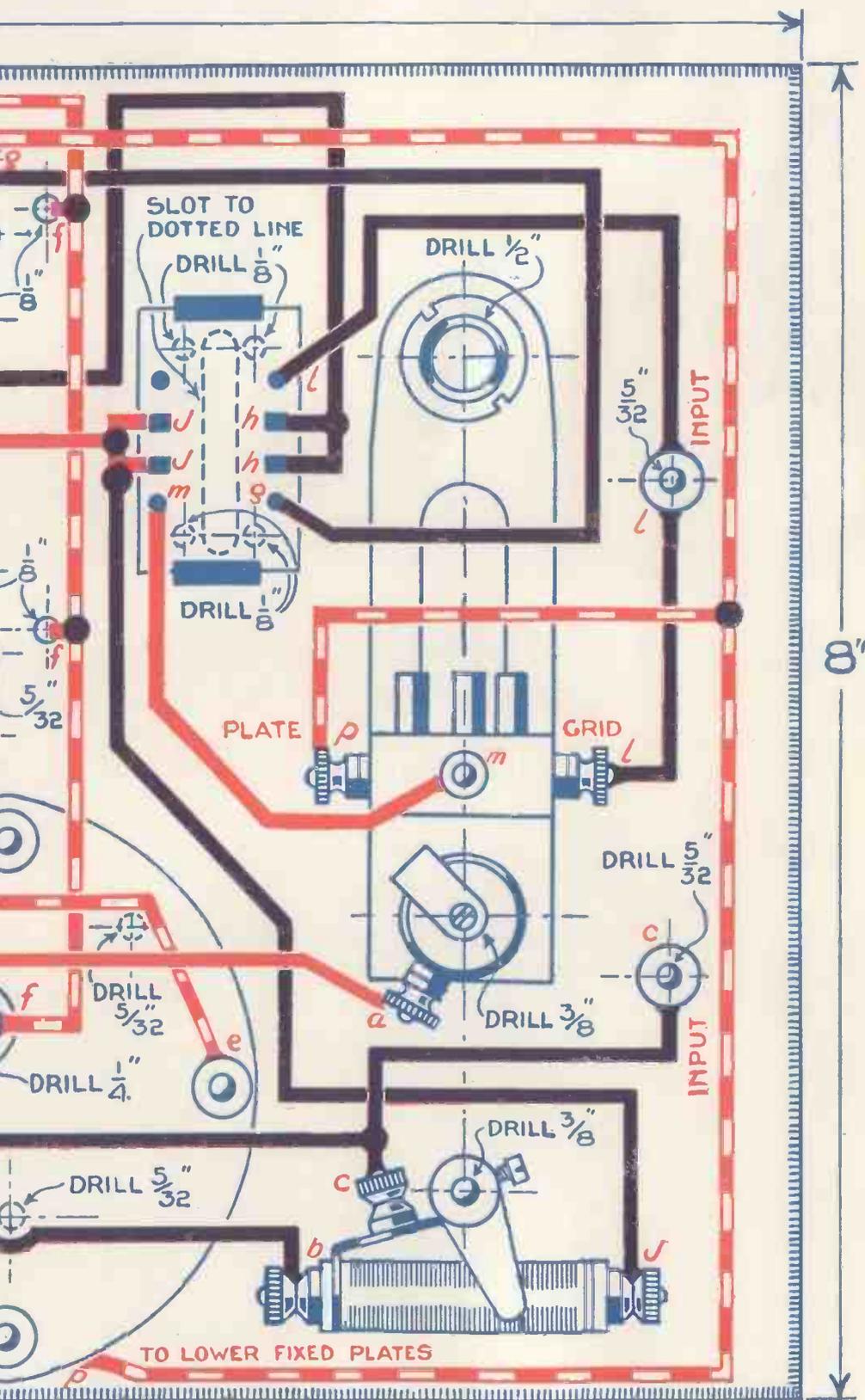
HOW TO USE THIS DIAGRAM AS A TEMPLATE:—The blue shaded components. This template should be laid on the panel and the drilling centres for the whole plate being retained for use as a layout and wiring diagram.

SPECIAL INSTRUCTIONS FOR WIRING:—There is a choice of three methods: red-and-white lines, the H.T. or plate circuit; and black lines the grid circuit. At all other intersections there is no connection between components. You join all the a's together, all the b's together, and so on, and you should do so with care, it having been carefully worked out to save the home-construct

FREQUENCY AMPLIFIER

Full-size Layout and Wiring Diagram

' Amplifier" in "The Wireless Magazine" for July, 1925.



...outline indicates underside of panel; all blue lines relate to either panel or wires pricked through, the template thus serving many times if so required, and

...ods. (1) Follow the wiring lines, red lines indicating the filament-lighting circuit; (2) A black circle at the intersection of two wires indicates that the two are to be connected together. (2) You can ignore the lines of the wiring, if you like, and work on the components in alphabetical order, the a's first. By this method you cannot go wrong if you are in a hurry or both time and worry. (3) The ideal method is to combine (1) and (2).

A new system has been used in the drawing of the wiring diagram. Hitherto the amateur has had no indication of which instruments he should wire up first. This difficulty has been overcome in the following manner. An instrument terminal on the wiring diagram will be seen marked *a*, say. All the terminals on the diagram marked *a* are joined together, and should be connected up first.

Similarly all the terminals marked *b* are joined together with the second wire, and so on.

In some simple circuits, of course, it matters little which connection is made first, but in complicated circuits, employing switches and such like, it is of great importance to wire up certain instruments first.

It must be pointed out here that the H.F. transformer sockets are wired up to suit the McMichael transformer, and for this reason the wiring will not be suitable for all makes of H.F. transformers.

Using the Amplifier

The operation of the amplifier is quite simple. Two matched McMichael H.F. transformers (marked 300 to 600 metres for broadcast wavelengths and 1,100 to 3,000 for the high-power station, 5 X X) are plugged into the two sockets seen in the centre of the panel.

To the input terminals on the left of the panel are connected the tuner, together with the aerial and earth leads. These connections are shown dotted in the circuit diagram on page 637.

The six terminals on the right of the panel, reading from top to bottom, are H.T. +, H.T. -, output X, output Y, L.T. +, and L.T. -. The valve or crystal detector is connected to the output terminals X and Y. (See diagrams on page 638.)

When both of the switch levers are in the "up" position both the H.F. valves are in circuit. Placing the left-hand switch lever in the "down" position cuts out the first valve, while if both levers are in the

the potentiometer must be adjusted until oscillation just ceases. This point will be found to be the most sensitive.

When the amplifier is not in use place the two D.P.D.T. switches in the central position and switch the potentiometer out of circuit. This prevents the gradual discharge of the accumulator through the winding of the potentiometer.

Test Results

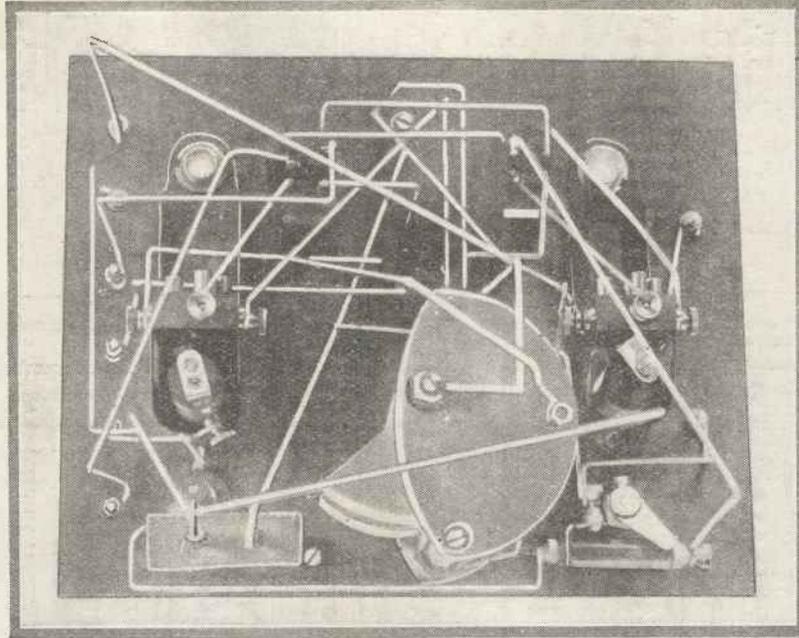
The amplifier was given a short test on an outside aerial six miles west of 2 L.O. A valve detector with reaction on the aerial was employed.

All the main British broadcast stations were received, together with the following Continental stations:

Brussels, Le Petit Parisien, L'Ecole Superieure, Breslau, Hamburg, Madrid, Leipzig and Rome.

The amplifier was not tested on the higher wavelengths owing to lack of time. Control and sensitivity were all that could be desired.

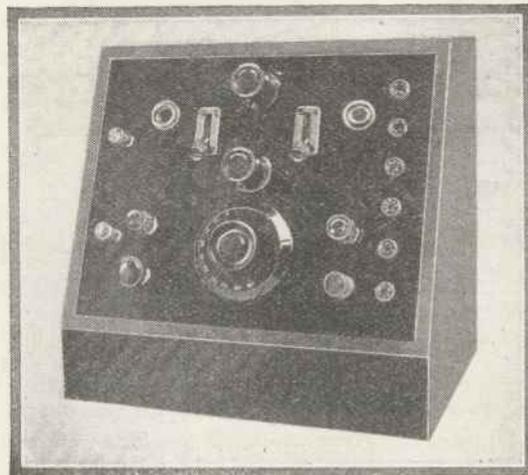
A photograph of the back of the panel when the wiring has been completed is shown on the opposite page.



Wiring of Amplifier.

"down" position both valves are cut out and the aerial-earth system is connected straight through to the detector (valve or crystal).

The valve filaments are adjusted to a suitable brilliancy, and the



Completed Amplifier.

potentiometer should be brought into circuit by means of the switch seen in the bottom right-hand corner of the panel.

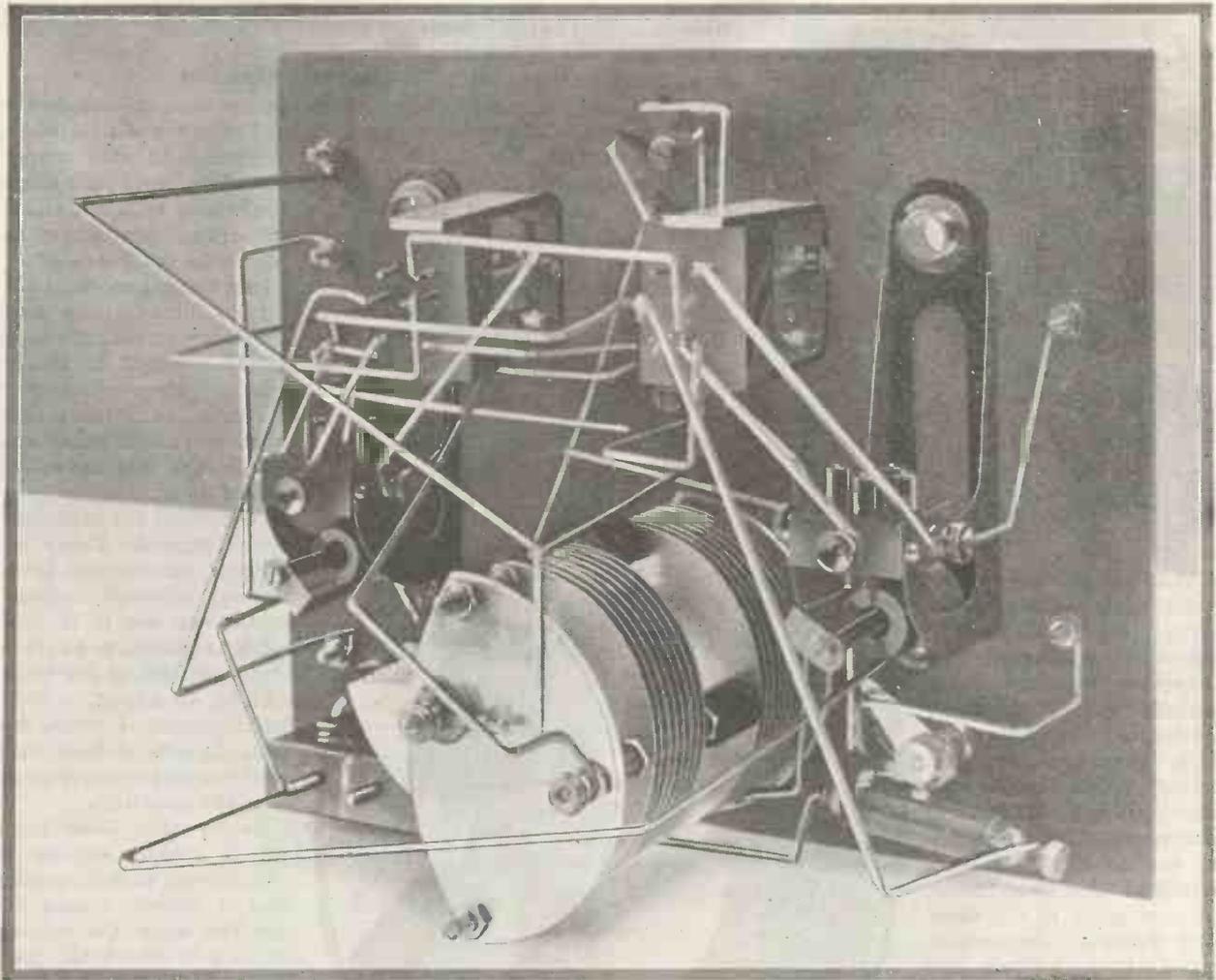
Tuning is accomplished by the slow rotation of the central condenser dial. If the amplifier oscillates,

It is said that some of our homes will soon be heated by wireless. They are nowadays, especially when father and mother want to use the same pair of phones at once.

It is suggested that butchers' prices should be broadcast by loud-speakers. So far as the butchers in our neighbourhood are concerned, we are afraid that this is done already.

For reasons connected with the arrangement of a wireless programme, an Australian bridegroom deferred his wedding for a day. These beneficent possibilities of the science deserve to be thoroughly explored in the interests of suffering humanity.

A Two-valve High-frequency Amplifier (Continued)



Back View of Panel, showing Components and Wiring.

RIPPLES

JAZZ programmes from Melbourne have been picked up by a listener 11,000 miles away. One would have thought that he was outside the danger range.

THE wireless expert on a Sunday paper has been holding forth on the theory of oscillation. This is one of those cases where theory is better than practice.

A WRITER in *Amateur Wireless* advises amateurs to tabulate their results in a notebook specially kept for the purpose. Scottish readers, of course, will be able to find room on the "payment" side of their account books.

NEVER be disheartened if the supply of "juice" runs out. Surely you have a Scotsman living somewhere in your street.

THE recent lecture on sheep diseases was so uninteresting that many listeners have got their wool off about it and written to the B.B.C.

ON St. Patrick's night several jigs were broadcast. We understand that with the return of the char à banc season the practice of broadcasting jigs will also be reintroduced.

A SCIENTIST has proved that it is possible to receive by wireless the noise made by an electron in motion. This disposes finally of the rumour that the electron is a member of the Bricklayers' Union.

OSLO, we learn, has not yet definitely fixed its wavelength. Nor its name, according to recent events.

WIRELESS has now become a household word, says a writer. But some of the words we use about it are decidedly otherwise.

GLASS instead of ebonite is being used for panels. Scottish listeners are opposing the innovation, we understand, on the ground that there is already a shortage of glass for more essential purposes.

AN M.P. has nearly been killed in a wireless mishap. Some of them will be quite killed, so far as their constituencies are concerned, when the electors hear their unedited speeches over the wireless.

The
Ideal
WOMAN'S
HOUR
A Special Article
by MRS. H.
BELLOC LOWNDES

I WAS much struck by Mr. Arthur Burrows' excellent confidential chat in the April number of THE WIRELESS MAGAZINE. Especially was I impressed by his clear description of the peculiar conditions under which those who draw up each broadcasting programme are compelled to work. His bull point was that these good friends of ours work in the dark, and he made one understand that whereas the editor of a newspaper, the manager of a theatre and the big concert-agent can each, as it were, feel the pulse of his public, the broadcaster has no circulation figures, no nightly box-office receipts and, above all, no visible audience.

Out of the Common

To my mind Mr. Burrows might have made a further point, namely, that, on the whole, the kind of people who will sit down and write a letter to the broadcaster, are, generally speaking, people out of the common.

They are either exceptionally intelligent, or—the other thing. They are not typical.

I myself feel that just as there is a type of "everyman," so there is a

type of "everywoman," and, personally, I cannot say that from my point of view the programme, excellent and varied as it often is, makes as wide an appeal to the woman or the girl who is listening-in as might be the case.

It has long appeared to me that those who choose the various items which are to fill the woman's hour try to please, charm, and instruct simultaneously too many types of women.

Surely only an utterly unreasonable woman can expect to be catered for every day, and in every way. More and more the world about us is



Mrs. H. Belloc Lowndes.

tending to specialisation. From some points of view this may be a pity, but it is a fact which cannot be gainsaid.

Take, for instance, the great world of medicine. In old days, the man whom everybody trusted was the general practitioner. Only in quite exceptional circumstances was a specialist called in. In fact the specialist was a kind of last hope, generally sent for when a patient was actually dying.

Now, as often as not, the general practitioner, however sure he may feel of himself and of his diagnosis, almost invariably proposes a second opinion, if his patient's means permit of it.

Counsel's Opinion

And, as in medicine, so with everything else. There was a time when counsel's opinion was very rarely sought. Nowadays, a solicitor often begins a conference with his client with the remark: "We might as well have counsel's opinion——"

It has long seemed to me, both with regard to broadcasting and with regard to the great film industry, that a gallant attempt is nearly always made to please every type of patron, with the unfortunate result that sometimes only a very few are really pleased at all.

To go from the particular to the general. Every intelligent woman who takes a keen, personal, interest in the art—for it is now rightly regarded as an art—of cookery, would like to be told, by an expert, certain definite facts. I mean, by that, the sort of facts that even the best cookery-book does not deal with.

As to what those facts are, I cannot express it more clearly than by saying that I myself always remember, when the subject of food is raised, the part played by butter in French cookery.

No woman interested in the preparation of food, and who has lived abroad, can doubt that the great difference between what is generally called "English cooking" and "French cooking" lies in the fact that the English cook hardly ever uses any butter, and the French cook uses butter all the time. Firstly, in almost every way of heating eggs for the table; secondly, in the preparation of practically every vegetable; and, thirdly, in connection with the roasting of all birds, and the cooking of almost all fish.

If I Broadcast

Were I broadcasting a short chat addressed to either the amateur or

THE IDEAL "WOMAN'S HOUR" (continued)

the professional cook, I should deal as follows with the one subject of butter, and I should try to consider my invisible audience as just one young woman-friend with whom I was having a talk.

Butter!

I should begin by saying to her: "Any doctor will tell you that butter is an important food, and that most people, particularly all thin people, do not eat enough of it. This is especially so in these days, when there are so many good substitutes, and when almost everyone has to practise strict economy.

"Now I do not ask you to be extravagant, but I do suggest that you try, for one week, to economise on one item in your food budget, putting the difference saved into even only one pound of real butter. Then try the following four recipes. . . ."

And, as the French recipes in which butter plays an important part may almost be described as legion, I personally should choose an egg dish, the simpler the better, say *œufs au beurre noir*; a vegetable dish; some form of roast bird; and a meatless soup.

It would be quite easy to make out a list of special subjects connected with home cookery which would instruct and please the keen housekeeper.

In these days, when so many doctors, instead of prescribing medicine as in the old times, now set down a very careful diet-table, a most valuable series might be made out concerning various forms of meatless cookery, of strictly vegetarian dishes, of dishes which increase weight, which reduce weight, and so on, and so on.

Management of Children

I should pursue the same system with regard to chats connected with the management of children—I mean by that, I should always take one subject at a time, and avoid, as far as might be, anything of a general nature.

As a newspaper reader, I have always noticed that the article which aroused my own interest was an article that dealt with one subject really well and clearly.

But it is obvious that the woman who is listening-in is not, as a rule, inclined to take notes. Therefore, whatever is said of a practical nature should be so clearly expressed as to be easily remembered—at any rate for a short time.

I thoroughly realise that this fact does increase the difficulty of the broadcaster who wishes to give real, useful advice.

With regard, again, to anything to do with dress. The advice offered over the wireless always seems to me to be too general in nature. My idea would be that the dress-chat should be boldly stated only to apply to one section of the vast feminine public who are listening-in.

I should begin, for instance, by saying: "The following remarks are only intended for the dark woman—for the stout woman—for the middle-aged woman. . . ." as the case might be.

To every woman who has the slightest interest in her appearance the question of her clothes is individually important.

Questions and Answers

If you wish to realise the truth of my assertion you have only to glance at the questions and answers in any woman's weekly paper or monthly magazine. The most successful of these features generally print the reader's question just above the answer, and I have been struck by the clear and frank way in which these questions are framed.

To quote a typical example: "I am a tall, sallow woman of forty-eight. I weigh eleven stone. I am going to be married in four weeks from now. What would you advise me to wear on my wedding day and what should be my going-away dress? On the whole I look best in some shade of brown."

I venture to assert that the answer to such a question is read with deep interest, not only by the lady herself, but by many other women who are not forty-eight, who are not sallow, and who are not going to be married in four weeks!

A man or woman who is engaged in writing this kind of article can only speak for himself or for herself.

I have often been privileged to listen to the most marvellous wireless set I have ever had the good fortune to encounter.

Both I and the friend who possesses the receiver are never weary of hearing what I should call familiar music—that is, the music we have always known and loved. The lovely lyrics from *The Beggars' Opera* brought back to me the intense delight with which I witnessed my first performance of Gay's famous play.

Things That Do Not Appeal

If I am to undertake the ungracious task of saying what least appeals to me in the broadcasting programmes, I must admit that it is anything in the nature of an essay or lecture. To my mind, a voice must be of most attractive *timbre* and exceptional quality to be heard with pleasure when completely disassociated from the personality of the speaker.

To this, however, I make one great exception. I always welcome the sound of the voice engaged in broadcasting news. But it seems to me that the news might be just a little more dressed up—not presented, that is, in a bald and soulless fashion.

The Human Touch

I did not hear the news of John Sargent's death broadcast, but had I been the person broadcasting that evening, I should have liked to have occupied as long as, say, two minutes, in saying what an inspiring example Sargent presents to all would-be artists, and how this very man, to whom fell the rare honour of seeing his work hung in the National Gallery during his own lifetime, had had one of his best early pictures refused by the then hanging committee of the Academy!

In these days, at any rate, people demand the human touch in news as much as they do in everything else, and I think it would be well worth while for those who govern the broadcasting destinies of this country to engage a good journalist to "present" the news in such a fashion that it would interest and instruct, as well as inform, the listener-in.

Marie Belloc Lowrey

Broadcasting in Sunny South Africa

By Our South African Correspondent

The Pier,
Cape Town

AMONGST the tens of thousands of listeners in the British Isles there are probably many who would like to know something about broadcasting in South Africa. It may be that some have picked up snatches of programmes from these parts on occasion, and it goes without saying that their interest in the Cape will already have been aroused.

On the other hand, a little knowledge in advance may prove very helpful to other optimistic enthusiasts who daily live in hopes of pulling in something new from the southern extremity of the "Dark Continent."

Three Stations

At present there are only three broadcasting stations in South Africa. These are situated at Cape Town, Johannesburg, and Durban.

Johannesburg, popularly known as "J.B.," is the oldest, having been in operation for some eighteen months. "J.B." is mighty proud of its Western Electric transmitter, which, although considerably less powerful than either Cape Town or Durban, has the reputation of "getting over" far better than either of the latter.

Johannesburg, of course, is situated at an altitude of some 6,000 feet above the sea, whereas the stations at Cape Town and Durban are at sea-level, a feature which seriously

handicaps the southern stations serving a mountainous inland area. The wavelength of "J.B." is 450 metres.

Neither Cape Town nor Durban makes use of abbreviated call signs. If you should chance to tune-in the Mother City's broadcasting station, which is run by the Cape Peninsula Publicity Association, you will hear "Cape Town calling." Such a call sign is particularly appropriate

Although broadcasting in South Africa is not carried out on so wide a scale as it is in this country there is, nevertheless, no lack of enthusiasm on the part of the South African amateur.

In this article our correspondent tells of the conditions at present obtaining in that country, and gives much interesting data concerning the "stunt" station, Cape Town.

for this beautiful city, which only recently has taken upon itself to advertise its charming scenery to prospective visitors.

The publicity folk, knowing that their broadcasting area extends to the Orange River and beyond (taking in a tract of country bigger than the whole of the British Isles where ten stations are considered necessary!), have adopted the phrase "Cape Town calling" to perpetuate the irresistible "call" of Cape Town

and the peninsula. The Karroo farmer knows this "call," and those who boost Cape Town know that he knows!

"Cape Town" certainly carries the honours of being the "stunt-station" of this country. A Swedish cruiser called here the other day, and on her departure crystal-users in the city were treated to a Swedish concert from the vessel when 200 miles out at sea. A clever bit of relay that was.

Hearing the Ocean

Inland homesteads have heard the dashing waves of the great Southern Ocean beating on our rocky shores; New Year Eve revels of the cosmopolitan street crowds have been put "on the air"; complete church services in English and Dutch come over on Sundays; in fact, "Cape Town" has carried out a host of novelties of the correct type to make broadcasting live on.

Yes, Cape Town is enterprising. One of the finest orchestras in the world is here, and all its performances are broadcast. We have had KDKA relayed with great success and, what is more, "J.B.," 850 miles distant, has been picked up on a frame in Cape Town's studio and relayed simultaneously from the local station just across the street!

Here is a bit of work calling for extreme selectivity. Remember,

RIPPLES

LOTS of complaints can be treated by wireless nowadays. But the perpetual complaint of the Scotsman is that he cannot be.

A NOTTINGHAM café has installed two loud-speakers. This is in addition, of course, to the new-laid variety served to customers.

QUITE a lot has been said recently about pipless valves. But it is the programmes as a rule, and not the valves, that give us the pip.

WHY should wireless have to be licensed like a dog? asks a correspondent. Because, like a dog, it occasionally has fits of howling.

SOME of the Glasgow hospitals want more loud-speakers. We understand that Mr. David Kirkwood may be asked to place his services at their disposal.

WIRELESS warnings have enabled aeroplane pilots to dodge snow-storms. Inasmuch as Summer is now here, we may soon have to avail ourselves of them, too.

BEFORE they give their consent to the broadcasting of Parliament, M.P.s are asking to be assured that a microphone will not be secreted in some of the cosy corners of the smoke-room.

SOMEONE has been suggesting that we should broadcast the proceedings of the Law Courts. Would it not be better to wait until we get the wireless cinema?—there is so much that would want "screening."

CAMBRIDGE Council are putting a tax on all aerials. And, incidentally, on the patience of all their townfolk.

LECTURES on painting are being broadcast from Cardiff. Who says the woman listener is not being adequately catered for?

SECRETS told by one telephone-user to another have recently escaped on to the wireless by some electrical accident. Dealers would be well advised to place before their lady customers this additional advantage of installing wireless.

A RECENT attempt to broadcast the noise of Niagara was not entirely successful. If the experimenters want something to practise on between now and their next attempt, we shall be pleased to lend them our flat when the musical family above is in full blast.

"Cape Town" is 6 kw, 375 metres (Type Q, Marconi), situated 100 yards from the studio, and "J.B." is 3 kw, 450 metres, some 850 miles distant. Is such a feat ever accomplished in England?

And this brings me to an important point. From experience gained in this country so far, it would seem that South Africa is much more favourable for wireless transmission and reception than are the British Isles and the Continent. And I say this in spite of the knowledge that Africa has high mountains and horrible atmospherics.

"J.B." is picked up with perfect ease in the Cape peninsula on two valves. Many listeners are accomplishing it with one, but two valves give the margin of safety for comfortable reception.

Glancing at the map, I see that Stockholm, Budapest, Rome and Gibraltar are all approximately the same distance from London as is Cape Town from Johannesburg.

What I would ask is whether two-valve listeners in these continental towns get 2 L.O. with the same consistency nightly as Capetonians enjoy "J.B."?

The fact that it has never been made known in the Press would seem to indicate that it is not so!

"Snatches" from England

Of course, I stand open to correction, not having listened-in at Stockholm and these other places. But there is another feature of long-distance reception in the Cape which strengthens my belief. Every night of the week someone in South Africa is picking up "snatches" of programmes from either 2 L.O., Bournemouth or Aberdeen.

With two H.F. amplifiers and a detector it is possible to get something from Bournemouth every night throughout the year, irrespective of weather conditions. A strong carrier is always audible, and it is broken down some nights better than others.

Now, the experts say that all telephony heard from overseas is "freak reception." Amateurs of the Cape maintain that it is not. Of course, the great point in the argument is, what is meant by "freak"?

I do not propose to discuss the matter further. All that I would say is that the time has arrived when some other word should be used for the type of overseas reception

tuned-in in South Africa regularly to-day.

Only a "very little bit more" is required in signal strength to enable present-day ordinary broadcast receivers to pick up audible speech from London at will. Strangely enough, 5 X X on 1,600 metres has never been heard in this continent.

The Natal Station

A word about Durban. The Natal station of the same type as Cape Town is run by the Municipality. It was the last of the trio to open up, and the financial position at the moment seems none too rosy. Durban's wavelength is 400 metres.

Every station finds it a strain in popularising the new hobby amongst the uninitiated. And in South Africa with its vast distances it is difficult to educate the ignorant, particularly when numerous nationalities are concerned. To satisfy the likes and dislikes of listeners is a big enough problem in England. It is a thousand times magnified out here.

And another problem lies in the scarcity of the population as compared with the size of the country.

The Annual Licence

The annual licence is £2 to the broadcaster and 5s. to the P.M.G., but it must be so for the broadcasters to come out on the right side at all.

Then again, the majority of listeners are in the cities where the stations are situated. These people, it is found, soon get fed up in view of the fact that the majority of commercial broadcast receivers will not admit of their cutting out their own station and tuning-in the next nearest, some hundreds of miles distant.

Naturally there have been many disappointed hearts on this score; for there are those who, knowing nothing, dived deeply in their pockets and purchased receivers which they now find are of little more use to them than crystal sets would have been.

But the big fact remains. Wireless in the Cape on the whole is expanding, and becoming more popular in the country districts where it is so badly needed. Overcrowding of the ether is not likely to come about for a few years. A dozen new stations could be scattered, making but little difference. There is room for all in "Sunny South Africa."

T. S. H.

Is the Ether Necessary?

THE question which forms the title of this article may well seem a daring one to the millions of wireless amateurs who have been, as it were, "brought up on" ether.

It would certainly have been regarded as a very stupid question by those scientists of the last century who spent their lives describing all the wonderful characteristics of the ether, and explaining how conclusive was the proof of its existence. But there *may* come a time when this question will be regarded as stupid for another reason: to wit, for the reason that it will have been proved that the conception of the ether is *not* necessary.

Familiar Conception

It cannot be claimed that there is much evidence in favour of this latter conclusion at the present time, of course. The conception of the ether, in fact, is still a very prominent and familiar one in the modern scientific world. But that there is at least a tendency in this direction is shown by the ever-changing interpretations that are put upon the term "ether"—interpretations which tend to make the ether a much less real thing, and therefore a much more vague thing, than it was conceived to be by those scientists who first postulated its existence. Moreover, there already exists a small body of scientists who definitely deny the existence of the ether.

Early Definitions

In order to appreciate the significance of this tendency it is necessary to recall some of the early definitions of the ether, and then to compare these, so far as may be possible, with modern views on the subject.

It will then be seen that what were at one time regarded as "fundamental characteristics" of the ether are no longer regarded as such, and that the ether of to-day is, in fact, a fundamentally different "thing" from the ether of yesterday.

The idea that the universe is filled by an all-pervading substance, incapable of detection by our ordinary

physical senses, can be traced (like many other modern ideas!) to the ancient Greeks, who, it may well be, got the germ of the idea from still earlier Aryan races.

The notion of the existence of the ether is certainly inherent in the philosophies of such eminent thinkers as Democritus and Lucretius, whose original (albeit in some respects quaint) theories of the atomic structure of the universe bear a startling

Does the ether really exist?

The question is not so impertinent as might be supposed, for there already exists a small body of scientists who deny the existence of the ether.

This article outlines the various theories for and against the existence of the universal medium.

resemblance to the most advanced modern views on the same subject.

These theories of the early Greeks were almost purely hypothetical, of course. That is to say, they were not founded on conclusions that had been verified by scientific experiment. They were arrived at mainly by what we would call to-day "the mystical approach."

It was not until comparatively recent times—during the past few centuries—that scientists began to put forward definite "proved" facts as the basis of their claim for the existence of a "uniform medium filling all space."

Scientists of the eighteenth and nineteenth centuries were compelled to postulate the existence of the ether in order to harmonise their conclusions with regard to the nature of "matter."

The process, briefly, was as follows: A number of scientists, working independently, arrived at certain definite conclusions concerning the "structure" of the universe. These conclusions were, unfortunately, mutually antagonistic, although each one, regarded by itself, appeared to be quite legitimate.

Scientists therefore put their heads together and came to the decision that these conflicting conclusions

could only be reconciled by assuming the existence of a uniform medium pervading all space. So they said: "Let there be ether." And ether was made.

Need for Ether

It was felt by the pioneers of modern science that, in order to explain the interactions which were known to take place between the particles of matter, it was necessary to postulate some kind of "linking" medium.

It seemed incredible that one particle of matter should be able to influence another particle of matter unless there was some intervening medium through which the influence could be conveyed. Sound, it was known, required air for its conveyance. But light came to us across billions of miles of airless space.

Therefore it appeared reasonable to assume that light was conveyed through some medium other than air. In short, ether seemed essential to explain the phenomenon of "action at a distance."

Newton realised the need of ether to explain the phenomenon of "gravitation." Moreover, the theory that regarded particles of matter as separate, unconnected particles set a limit to the divisibility of matter, and this conflicted with other philosophical theories of the time.

First Theory

It was natural that Huygens, the first scientist to propound a definite theory of the ether, should have fallen into the trap of thinking that the light waves which came to the earth from the sun followed mechanical laws that were similar to those which operated in the case of sound waves acting through air.

On this assumption, Huygens set out to explain the kind of "elasticity" the ether would have to possess in order to permit of light waves acting through it. The ether was then regarded as possessing the properties of an "elastic fluid."

Fresnel, following on the work of Huygens, sought to extend this theory of the elasticity of the ether,

but the discovery of an important optical phenomenon in the early part of the nineteenth century led him to modify his views considerably.

This discovery was the "polarisation of light." The phenomenon of polarisation conflicted with the hitherto accepted idea that light waves were "longitudinal" (i.e., like sound waves). Polarisation, in fact, enforced the view that light waves were "transverse," and therefore fundamentally different from sound waves.

This made it necessary for Fresnel to attribute to the ether certain qualities which were quite incompatible with its fluid nature, because, according to the theory of elasticity, transverse waves can only be propagated in the interior of a solid substance! Fresnel therefore found it necessary to postulate that the ether acted as a "fluid" in some circumstances and as an "elastic solid" in others.

Maxwell's Theory

Then came Clerk Maxwell, who staggered the scientific world by introducing the conception that light waves were electromagnetic vibrations. Maxwell was only concerned with the mathematical proof of this theory, of course.

It was left to Hertz to furnish experimental proof by producing electromagnetic waves which were of the same fundamental nature as light waves. This new conception of the nature of light again conflicted with the existing definition of the ether.

Although it did not dispense with the necessity of postulating an ether, it dispensed with the need for a "rigid" ether. But it still left the ether endowed with certain complex mechanical properties.

During the past century a good deal of controversy centred round the question of the "mobility" of the ether. Is the ether mobile or motionless? Is the ether that is "in and near" the earth affected by the rotation of the earth on its axis or by the movement of the earth in its orbit round the sun? Is the ether carried along by the earth, or does it slip through the interstices between the particles of matter that comprise the earth?

An astronomical phenomenon known as the "aberration of light" pointed to the conclusion that the ether was stagnant—that is, that

it was not affected by the motion of the earth at all.

With a view to confirming this conclusion a number of other astronomical observations were made, but these not only failed to produce data in support of the theory, but actually produced evidence which seemed to conflict with it.

In particular, the famous Michelson-Morley experiments appeared to point definitely to the conclusion that the ether *was* affected by the motion of the earth through it. These experimenters were unable to detect any flow of ether past terrestrial bodies, from which it would seem that the ether moved *with* the terrestrial bodies.

This, however, conflicted with the theory deduced from the aberration of light, which gives evidence of the fact that the motion of the earth through the ether has no effect on the latter. Subsequent experiments provided data which strengthened the argument in favour of a motion-

less ether, thus bringing the theory of the aberration of light once more into harmony with the theory of the ether. This is an aspect of the problem which Maxwell's theory of the electromagnetic nature of light failed to solve.

A Modern View

A modern sceptical view of the problem may be summed up thus: If there be such a medium as ether, we should be able to postulate one of three things concerning it. It may either be (1) absolutely at rest—that is, not involved in the motion of the earth to any extent; (2) fully involved in the motion of the earth (or any of the "heavenly" bodies, of course); and (3) partially involved in the movement of bodies that pass through it.

Experiments conducted with a view to justifying one of these postulates have all been contradictory. Moreover, it is now generally accepted that it is impossible to measure the velocity of a body moving through the ether.

Is it logical to conclude from this that there is no such thing as ether? Is it necessary to cling to the view that electromagnetic fields are "states" of the ether? Can we not regard them as independent realities, capable of existing without any connecting medium?

There are some who follow this line of thought to-day, though it must be admitted that the bulk of modern scientific opinion is against them. There is a growing tendency among the latter, however, to "give the ether a rest." Scientists are content to be much more vague about the ether than formerly.

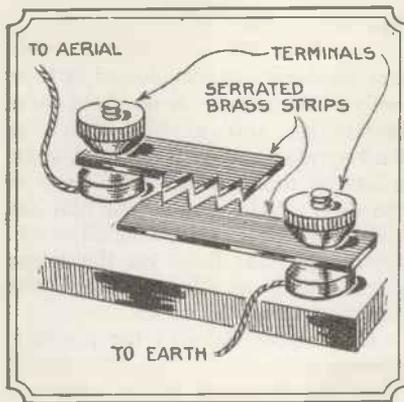
Even the great Einstein, who insists upon the existence of ether, postulates a much more "abstract" medium than any of his predecessors. Einstein's ether is such that the mere "idea of motion" may not be applied to it! Nor may it be conceived of as possessing any quality characteristic of "ponderable media." . . .

At which point, I think, I shall do well to leave off. M. E.

PROTECTING THE SET

WITH the arrival of the summer the risk of damage to the receiving set through static discharges must be reckoned with.

By the expenditure of a small sum and a few minutes' work the set may be safeguarded by fitting a spark gap (of the type shown) between the aerial and earth leads.



Simple Spark Gap.

Two pillar terminals are fixed into a piece of ebonite, measuring approximately 4 in. by 2 in. and two pieces of $\frac{3}{16}$ in. strip brass, each serrated at one side, are clamped in the terminals.

For ordinary purposes the points should be set opposite each other with a gap of $\frac{1}{32}$ in. R. N. W.

AMERICAN spiritualists are hoping that the new wireless photographic machine will enable them to photograph spirits. It will have to have a very rapid exposure, with all those Scotsmen over in the States.

With A Portable Set in the Highlands

IT is pleasant to be revered as a master of strange mysteries, to feel yourself an innovator, a professor of progress. The first artist scrawling strange images of a man and beast on the cave walls while his fellows watched open-mouthed, the witch doctor with his images and incantations and devil dances, the alchemist working with bubbling retorts and hissing chemicals in the red glare of his charcoal furnace, all have been men of mystery to the age in which they lived, men on a plane apart, venerated and sometimes dreaded by those around them.

Where Wireless is Unknown

Nowadays the wireless experimenter occupies much the same position among those ignorant of his science. Some men speak as if wireless had already become a commonplace of existence; to some, perhaps, it has reached that stage. But there are still many thousands of simple folk in this country who have never done more than read of wireless in the newspapers, who find the whole thing incredible, strange and remote. In the Scottish Highlands especially, among the farmers and shepherds who live there far removed from the rush of modernity, wireless is unknown. It is a word; no more; and a word darkened by shadows of the incomprehensible.

I have been over a large part of the Scottish Highlands recently, and in the rear compartment of the car was a large brown suitcase, lying on a thick mat of Sorbo rubber sponge to save it somewhat from the buffeting of the rough Highland roads and tracks.

An Hour of Wireless

One evening I spent at a farm that stands on a high exposed shoulder of the Grampians, where all the winds of heaven seem to blow by turns. After supper, I asked my host if he would like an hour or so of wireless. He received the proposal with native caution. Oh, aye, it would be fine to hear it; but what way could it be, and them had none of these listening things at all?

The brown suitcase was brought

in and set on the living-room table; I took the eldest boy out with me and we hammered a copper spike into the ground outside the window. There seemed to be solid rock little more than a foot down, and the spike had to be driven in at a slant, so as to cover its whole length. We took the wire through the window alongside a trail of thick-leaved ivy, that wandered unchecked down the inside of the window frame.

To most readers of this magazine wireless has become a commonplace of existence, but there are still thousands of people living in remote country districts who have never done more than read of wireless in the newspapers, and to whom the whole thing is incredibly strange and remote. The position of some of these people as regards wireless is explained in this article.

Wound round the edge of the suitcase lid was a frame aerial, and the pleated-parchment disc of the loud-speaker occupied the centre. The boys gathered round me, while their father watched proceedings from the fireside.

He did not want to show too much interest; he might have to show that he did not understand.

"Look at the wee lights," cried one, as the six valves glowed in their wells in the panel. Soon there came mutterings and groans from the loud-speaker; then a pleasant voice filled the room, reading the news of the day. "He speaks just like our school teacher," said a small voice. Every eye was fixed on the white paper thing as if to discern the image of him who spoke.

The farmer listened for a while, puffing pipe smoke into his beard. Then he ventured a few cautious questions. I explained in a low voice so as not to interrupt the bard music that was coming through. Just you try to explain wireless in a few words to someone who does not even know what an electric current is, and see how you get on. I mentioned that the waves that brought the music were everywhere. In him and me, in the walls of the room, everywhere.

"Why could we not feel them, then?" They were not the kind of waves you could hear or feel, not like the waves of the sea or heat waves. You needed a thing like that on the table to let you hear them.

Six Hundred Miles Away

"Where were these folks speaking, and playing music? Were they in Inverness? (the nearest town of size). I said, No; they came from London and a place called Chelmsford nearly six hundred miles away. I don't think he believed me; or perhaps I should say the information did not convey much to him; it was outside the range of his experience and comprehension; beyond his ken.

"And what might a thing like that cost, now?" This one, I said, cost about fifty pounds, but a cheaper one would do nearly as well; only he would have to put a long wire up above his house to catch the waves. If only they had one of the sending places at Inverness, he could hear on a tiny little thing costing only a pound or two.

So it went on, at intervals all through the programme, till the pleasant voice said: "Good night, everybody; good night," and the white paper thing spoke no more. There must have been strange dreams floating through these boys' heads that night, after they trooped off to bed, long after their usual hour. They had skimmed a long chapter of new experience those last few hours.

What Wireless Would Mean

Think a moment of the life of these people. Up with the dawn all summer, and far before it all the winter months; hard toil on moor and farm land; a twenty-mile walk over their sheep runs a regular part of the daily routine, and none knows what that means unless they have done it.

All winter and spring there will be bad weather to fight against on five days out of seven, and many a storm of wind and sleet and snow to add to the struggle. All the time they see no others of their

kind, except perhaps a neighbour on a Sunday afternoon, and their friends when they journey to the nearest market town once every fortnight or month.

If wireless could only be made available to all these! It would bring them from their fastnesses into the heart of modern life, show them just exactly how important their little cog is in the community machine, and teach them how they could improve its efficiency.

Music Lovers

And how they do love music, these men of the hills, whose ears are attuned to the earth's finest harmonies, the wind that comes breathing over the hills at dawn, the silver falling waters, the bleating of distant sheep. They are an unapproachable folk, reserved with strangers, whose lives have made them so different; but let that stranger sing them a song, or play to them, if only on a tin whistle or a mouth organ, and they take him to their hearts. For here is an interest, an enthusiasm they have in common.

I wonder if the B.B.C. realise the inestimable benefits they would confer on the Scottish Highlands if they set down a station in their midst? True, the listeners would be a scattered family, but their total number would be considerable.

The question of such a station's location would be no easy one. Distances are great, and even if an absolutely central position could be found, the power would have to approach that used by Chelmsford, if reception on crystal sets were to be possible all over the Highlands.

Perhaps wireless will be brought to the Highlands another way. We badly need the universal wireless

receiving set. The problem is no easy one. It must be capable of receiving the nearest broadcasting station anywhere in Britain at loud-speaker strength. It must be very economical, capable of being run on dry batteries; and anyone must be able to handle it.

Mass Production—Low Cost

If these conditions can be satisfied and really effective publicity methods adopted, the demand will be such that mass production will be possible, and the price should be very low.

In the meantime, Scotland provides a happy hunting ground for the seeker after novel wireless sensations, if he be the owner of a portable set.

We took the set one day when out hare shooting. The shaggy little hill pony must have felt it had a

pony simply does not know how to fall.

Fifteen Hundred Feet above Sea Level

We drove the earth spike home on the summit of the hill fifteen hundred feet above sea level, and soon the midday concert was coming through on the loud-speaker while we sat around on piles of springy heather and ate a cold lunch. We could see fifteen miles in any direction, over fifty towards the sea; and in all that great area there was no sign of the presence of human beings, no houses nor chimney stacks, not even a tree, but only hills covered with brown heather and rocks and patches of rushes.

And in the midst of it all we sat and listened to music played six hundred miles away. A phlegmatic little old gamekeeper

was so delighted that he forgot to hurry us on with lunch, that we might get back to our shooting with small delay. Never before had this stern sportsman allowed a full hour for the midday meal. The only one who objected to the innovation was a wise-eyed spaniel, who stood with legs wide spread and barked furiously at this strange inter-rupter of the moorland silences.

A dog does not like things which speak, and yet have not the scent of a man. When admonished, he put a good fifty yards between himself and the set, and lay growling. There have been doubtless

many human growls at 2 L.O., but surely not very many canine ones.

Yes, if the British Broadcasting Company sighs for fresh worlds to conquer, they are there, ready to hand. And what matter if the work be not all for gain, but in part a labour of love?

N. R. W.

THE OPTIMIST!



grievance, carrying a heavy case in one of its game panniers during the morning march when normally it is care-free. Also its dignity must have been wounded by the anxious owner of the set taking its bridle when crossing some steep-banked hill burns, when he should have known perfectly well that a hill

WITHOUT a word my wife pushed a letter across the breakfast table. I picked it up and, like a guilty female reader of novels, glanced covertly at the signature at the end, and then I grunted.

The Pickerings are very good clients of mine, but perfectly horrible neighbours. When they are not keeping chickens they are keeping dogs, and when they get tired of dogs they try goats; all are equally offensive round about 5 a.m.

"What is the joke, Dad?" queried Mary.

"I am unaware that there is any joke," I replied somewhat austerely. My daughter is irrepressible. "Spout it out," she said.

There was nothing for it but to read the letter.

"Dear Mrs. Jamieson," I read, "We are asking a few friends in after dinner on Thursday evening to hear Signor Flatello on the wireless. We shall be so glad if you, your husband and daughter will join us.—Yours sincerely, Janet Pickering."

"I have a dance on Thursday," exclaimed Mary hastily. "Thank goodness!" she added fervently.

"Wait a minute," I said, "Here's a P.S. in Pickering's handwriting:—'B.Y.O.H.' Now what the dickens does that stand for?"



"I have a dance on Thursday."

My wife ignored my question; she had one of her own to ask. "Need we go?" she inquired. "If we want to listen to the wireless we can listen to our own, and you know what a boring lot of friends the Pickerings have."

"I do only too well," I replied, "and they probably think exactly the same about us. Are we growing boring?" I asked anxiously.

"Diddums!" said my daughter facetiously.

"I wish you would not use those

"P.S. - B.Y.O.H."

slang expressions, Mary," I admonished. "They are hardly suitable for the daughter of a rising city solicitor."

"Now you are growing boring," cried Mary, interrupting what might have grown into a little lecture.

I was on the point of remonstrating with her when my wife tactfully headed me off. "I suppose you mean, my dear," she said, "that we must humour your clients, and go."

"I suppose we must," I agreed. "It is our bread and butter, and we have Mary's future to think of. I suppose there is no loophole of escape," I added suddenly, recollecting the postscript to the letter. "B.Y.O.H. may mean something important which would enable us to refuse with dignity."

"Can we interpret it as 'Weather permitting,' or 'Do not hesitate to say 'No' if you mean it'?" queried Mary.

"I never can understand how you can be funny at breakfast," I said testily. "I don't suppose it means anything like that at all. He has probably been decorated with some order or other."

"More likely he has joined the Ku-Klux-Klan or a new golf club, or perhaps," Mary added brightly, "he has won some distinction in the wireless field—been decorated with the 'Crystal Order of the Valves,' or something."

"I have little doubt it is an order of some sort," I replied, and then to my wife, who had given up the problem, and was immersed in the ladies' page of my newspaper: "If you will write the reply now I will drop the letter in their box on my way up to the station."

My poor wife sighed patiently. "What a burden it is being the wife of a solicitor," she said. "How I wish it were Friday morning"—and she sat down and wrote:—

Dear Mrs. Pickering,

Mr. Jamieson and I will be delighted to come in after dinner on Thursday evening. Mary is sorry, however, that a previous engagement will prevent her from coming.

Yours sincerely,
Julia Jamieson.

"Is that all right?" she asked, handing the letter to me for perusal.

"I think we must just add a P.S.,"

I said playfully, and taking the pen I wrote "M.R.C.C."

"What does that stand for?" said my wife.

"Much Rather Couldn't Come," I replied, "but he will never guess, so it doesn't matter."

* * * * *

We entered the Pickerings' drawing room on tiptoe. There was a deathly silence. The room was surrounded by a herd of crouching figures, each crowned with a badly fitting halo.

"Do not say you have not brought your headphones?" queried Pickering in a hushed whisper, rising from his armchair by the fire.

"I am afraid we have not," I confessed.

"Never mind," said Pickering, "there is only another hour of this, and then we will have some bridge. Just amuse yourself and Mrs. Jamieson in the meanwhile, there's a good chap; you will find the children's games on that table over in the corner."

I went in the direction indicated, and sure enough the children's games were on the table. Prominent amongst them I recognised a set of dominoes, and a racecourse, also



"Quite," my wife agreed.

a box of bricks. I was rather attracted by a game called whizzbang; I do not know how it is played, but it sounded noisy, and but for my wife's earnest entreaties I should have at once proceeded to teach her—something, I do not quite know what. After some minutes my wife decided to play wordmaking and wordtaking, a game I cordially detest as involving too much mental strain after an arduous day in the city.

"Now we each take a handful of these little cardboard squares and

make up words of five letters, and see who can guess the most of the other one's," my wife instructed me.

"Thank you," I replied coldly, "I have played the game since I was an infant," and I grabbed a number of letters and industriously began sorting them. Presently I picked out and passed four letters across to my wife. "M.R.C.C."

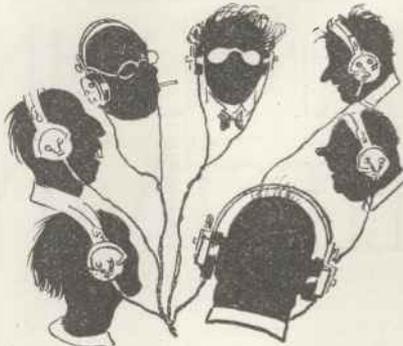
My wife looked across and smiled intelligently, and she passed me across two T's, an I, an O and a D, which I had no difficulty in deciphering as "Ditto."

"Now watch," I whispered to her: "by a simple transfer I convert this word into an explanation of our being here this evening," and I transposed the I and the O.

"Quite," my wife agreed, and feeling that the occasion was an unique one, I rose and bowed.

All unpleasant, just as all pleasant, things must have an end, which may account for the termination of the Pickering's evening.

"I say, old chap," said Pickering as we were on the point of departure, "I am awfully sorry you've had such a boring evening, but I distinctly remember telling you to bring your



A herd of crouching figures.

own headphones—I wrote the postscript myself."

"B.Y.O.H.," I replied with dignity, "was your postscript, nothing more nor less."

"Exactly," replied Pickering, "'Bring Your Own Headphones.' I thought you'd recognise the abbreviation; all the best people are using it; but tell me what did your postscript 'M.R.C.C.' mean?"

I badly wanted to tell him the truth; but after all, bread and butter is bread and butter, and I did not dare. To have said I did not remember would have sounded untrue, and I accelerated my brain up to lightning pitch. "Ah!" I said, and drew it out so as to give me more time. "Ah!" I repeated in the same way, and then as I had a brain wave, "I put that in at Mary's request; she was so sorry not to be able to come. It stands for 'Mary Regrets Can't Come.'"

"You see," I said to my wife as I rammed my latch-key home a few minutes later, "I was right about that postscript; it was an order after all."

STANLEY J. RUBENSTEIN.

TAKING CARE OF YOUR VALVES

VALVES are not very expensive, but they will often last longer if proper attention is paid to the conditions under which they are worked. The filament voltage of a new valve does not concern us as much as that of the valve that has done its normal life's work and is entering into that stage when its existence may come to an end at any moment.

Worn Filaments

The filament has been worn thin by continual battling with those little electrons, and a sudden spurt of current may put an end to its useful career at any moment. When the valve is in this condition great use should be made of the filament resistance, the current being turned on very slowly so as not to burn out the delicate wire. The filament voltage should be reduced by half a volt or so, if possible, and the anode voltage slightly increased to make up for the deficiency. We can then confidently expect the valve filament to last for double the time as would otherwise be the case.

Sometimes the filament lead wires become detached from the valve legs, and in many types it is possible

to resolder the thin wire into position. The flux should be applied very sparingly, and also the soldering bit should not be too hot. It is very often thought that the filament has burnt out when really it is only the leads which have come unsoldered.

An old valve makes one of the best detectors, and when senile decay is upon it, it should be carefully fathered for this reason alone. Sometimes the filament will bulge and touch the grid, causing crackling noises in the phones and a total loss of signals. This trouble may be remedied by making up a little wooden universal valve adapter with three holders mounted on the two sides and top of a box-like formation. The valve may then be used upside down or lying sideways in either direction, and the filament will cease to caress the grid after a few minutes' use.

After a time the valve may again be used in its normal position and the process may be repeated if the trouble recurs. Sometimes indifferent results are directly traceable to poor contact between the valve legs and the inside of the valve sockets. It is advisable to make a

practice of scraping the valve legs occasionally with the edge of a thin knife and to open up the pins slightly if the valve is fitted with such devices.

A. J. C.

GRID: "What is the best circuit?"

ANODE: "Horse-racing, vaudeville, legal, methodist or wireless?"

"FATHER likes broadcast church services," writes Willie McDougal, near 5 S C, "but he takes off the phones when the minister announces the offering."

To those who have been wondering who raised the old-fashioned "flowers of oratory" we are able to state that they are now grown on wireless broadcasting plants.

ENTHUSIAST: "Oh, I say, you know, I want to build my own set. Can you give me a good circuit?"

SHOPMAN: "Have you ever built a set before?"

ENTHUSIAST: "No, never even used one."

SHOPMAN: "Ah! here's just the right circuit for you. It's quite new—it's never been tried yet. You can start out together."

HOW YOU CAN GAIN SELECTIVITY

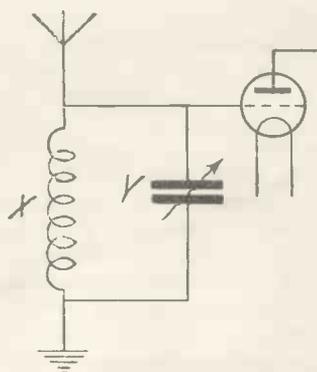


Fig. 1.—Direct-coupled Aerial Circuit.

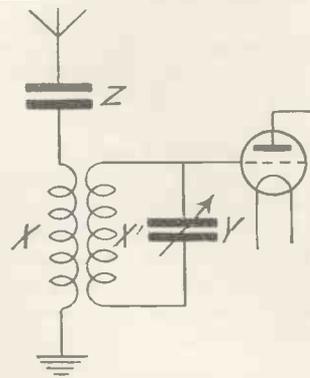


Fig. 2.—Loose-coupled Aerial Circuit.

IN the matter of wireless development, England is certainly not behind America. For this emphatic and encouraging conclusion we are indebted to Capt. P. P. Eckersley, the popular Chief Engineer of the B.B.C., who has investigated the situation at first-hand in the land of "big noises."

Music or Distance?

There was one point, however, in Capt. Eckersley's incisive comparison which has special interest for us in discussing selectivity. Broadly speaking, he said, the main difference between the British and American listener is that the former concentrates on the programme, and therefore aims principally at purity of reception, whereas the American does not care a variable grid leak—or similar inexpensive component—so long as he can "get by" the next-door station, steer through the etheric disturbance of a dozen remote stations and disentangle something emanating from an obscure aerial, the more thousands of miles away the better.

And he succeeds. Often he only gets "noise"—but he is happy. That particular "noise" is infinitely sweeter to his ears than the best of programmes dispensed by the station over the road.

My sympathies in this case are with the American. I rejoice that Capt. Eckersley's distinction is only

—aerial, earth, and the aerial tuning system of his set. Aerial and earth should "balance."

A good aerial with bad earth, or vice versa, is not merely fatal to selectivity, but is often detrimental to all forms of reception. You should therefore, at the beginning, provide yourself with at least two different earths with distinctly different resistances.

If your present lead runs directly to the ground, take another from, say, a water pipe. When some critical tuning operation is in progress, join these leads alternately to the earth terminal on the set. Then try both, or all, together.

The results will probably surprise you. It should be unnecessary to emphasize the importance of keeping the aerial well insulated.

One of the most pressing of the many problems that confront the amateur is that of selectivity. But there is no short cut to solution; individual conditions give rise to vastly different effects.

In this article some methods of gaining selectivity are outlined for the benefit of those amateurs whose receivers are not as selective as they might be.

a "broad" one, and that there is in this country a big and ever-growing band of earnest experimenters whose continual aim is to accomplish the difficult. That spirit begets progress.

Except, perhaps, for long-distance reception the problem of selectivity now predominates in the field of amateur research, and experiments in this direction are the more fascinating by reason of the fact that there is no short cut to solution. Varying local geographic conditions, types of sets, and aerial and earth systems are only some of the factors in a problem for which general prescription would be as stupid as would the recommendation of one particular pill to cure all the physical ailments of humanity.

Essentials

Before embarking upon the problem the amateur should concentrate attention on three important points,

Near-by Stations

For those disappointed people who live in the shadow of a powerful broadcasting aerial—within, say, two or three miles—and expect their set to live up to its manufacturer's boast that it receives *all* British and Con-

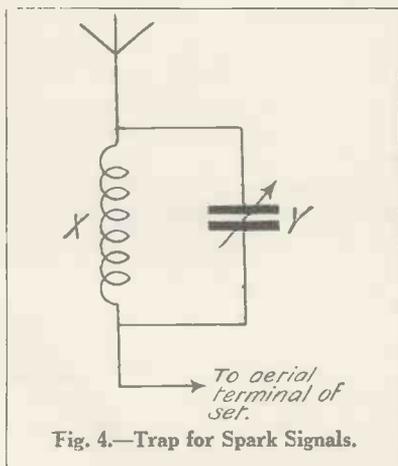


Fig. 4.—Trap for Spark Signals.

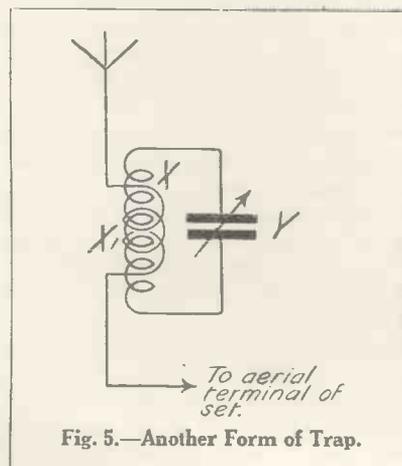


Fig. 5.—Another Form of Trap.

tinental broadcasting, I have no crumb of comfort. As reasonably might one manipulate the domestic water tap to stem a flood of water which is also pouring in at the roof.

Nevertheless, by following these notes faithfully they should succeed in bringing in those stations whose wavelengths differ by an appreciable margin from that of the one near by.

A less extreme case is that of the set established within a radius of about four to ten miles of a transmitting plant. Here the need is for a frame or other directional aerial, which can be switched in when it is desired to sample the programme of a distant station operating on a similar wavelength to the neighbouring aerial.

The action of changing over from out-door to frame aerial will, naturally, result in reduced signal strength which can, if necessary, be compensated for by additional amplification.

Fine Adjustments

Before considering aerial tuning systems, I would stress the importance of having micrometer adjustments fitted to all variable parts. Fit fine-adjustment controls to all tuning condensers, moving coils, and, if possible, to filament rheostats. Such refinements are anything but luxuries.

Those constructing their own sets would also be well advised to make provision for the supply of a different high-tension voltage to the H.F., detector and L.F. valves. This is easily accomplished by taking the anode leads to separate terminals, which can be connected up with flexible leads terminating in wander plugs, all of which may be inserted in different sockets in the one H.T. battery. Where more than one stage of H.F. or L.F. is employed, only one voltage need be supplied to each group.

Aerial Tuning

Next we come to aerial tuning. Three systems in most common use are represented in Figs. 1, 2 and 3, which show, respectively, direct-coupled, loose-coupled and close-coupled circuits.

In Fig. 1, although tuned by inductance X and condenser Y, the signals pass, by metallic connection, directly to the grid of the H.F. valve.

In Figs. 2 and 3 transference is effected by induction between the

two coils. For our present purpose the system shown in Fig. 2 offers the best hope of successful experiment. X and X1 are adjustable in their proximity to each other by a movable coil holder. Z is a fixed condenser usually with a capacity of .0001 microfarad.

Remove this and substitute a variable condenser of approximately

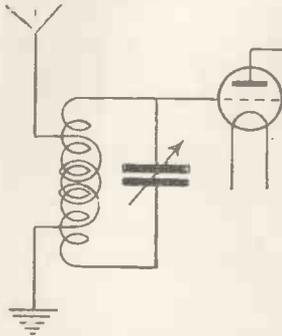


Fig. 3.—Close-coupled Aerial Circuit.

double the capacity. The knack of controlling this extra "knob" is soon acquired. Again we find we are sacrificing signal volume to selectivity. Compensation, however, is easily provided, in this case by introducing into the circuit the maximum amount of inductance while keeping down the capacity to the minimum or, in simple terms, by

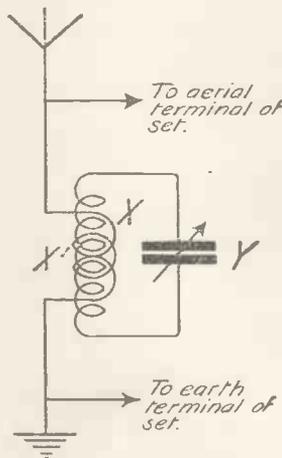


Fig. 6.—Parallel-connected Wave-trap.

using a coil of such a size that we get the best results with the aerial condenser "out" as far as possible. Although this necessitates a supply of coils varying in some instances by only ten turns or so from each other, the results are well worth the expenditure involved.

The foregoing suggestions should solve most difficulties excepting those of the most inveterate experimenter,

and, perhaps, of some dwellers near the coast who are the victims of the antiquated system of spark transmission still used by shipping.

For such, further profitable pastime will be found in the orthodox "wave-trap" (used in addition to, and not as a substitute for, the measures enumerated above). The three commonest types of trap are all easily and inexpensively made at home.

Practical Details

They are illustrated in Figs. 4, 5 and 6. Fig. 4 is especially suited for the elimination of spark signals both for crystal and valve receiving sets. X is a plug-in coil of 50 or 75 turns for broadcast and shipping wavelengths; Y is a variable condenser of .0005 microfarad capacity.

Like the other two types it is connected between the lead-in and the aerial terminal of the set, no alteration to the set itself being necessary. X1 in Fig. 5 contains forty turns of No. 24 d.c.c. wire wound on to a three-inch cardboard former, while X has ten turns of the same wire wound over the middle of the forty turns.

Fig. 6 is made in the same way, but with only 5 turns on X, the ends of which are connected respectively to the aerial and earth terminals of the set.

Facility of operation comes with very little practice.

A New Invention

Many surprisingly successful demonstrations of selectivity have recently been given by the manufacturers and patentees of a three-electrode variable condenser worked on the bridge principle. This instrument, which holds many fascinating possibilities, is also built into a composite instrument known as the bridge tuning and rejector unit.

A booklet giving details of its many uses, together with some scores of interesting circuit diagrams, will, if this article is mentioned, be sent free of charge on application to Autoveyors. Ltd., 84, Victoria St., S.W.1.

WIRELESS traders in Ireland say there is too much home construction for their liking. That's a pleasant change from Home Rule, anyhow. Most listeners are looking for better results with less juice! They should try taking it neat.



Wireless Femininities

RECENTLY I commented on the fact that wireless is beginning to creep into art. Before the Roya Academy closes I hope that many wireless enthusiasts will have found time to visit Burlington House and see Mouat Loudan's vivid picture called "London Calling!"

In the course of painting this picture Mr. Loudan has made one or two interesting little discoveries. One is that listening-in to a wireless programme is a great mitigation to a model of the boredom of posing—a discovery that no doubt other artists will follow up.

But much more important to the average woman is to have it stated by such an authority on beauty as a famous artist that phones are extremely becoming as a feminine head-dress. It was because Mr. Loudan was accidentally struck by their pretty effect on the head of a model who was listening-in while resting that he was inspired to paint "London Calling!" He compares the decorative effect of the phones to that of a Greek fillet—which is surely high praise—and he took great trouble to get silvery ones for his picture because they contrasted so admirably with the model's darker hair.

What Shade in Phones?

Surely this opens up a new field to the colour and fashion experts? If silvery phones lend beauty to dark tresses, what is the most becoming shade to Titian or golden locks? The colour experts will work it out, and then we shall read advertisements that up-to-date wireless firms are now stocking phones "in all the latest colours, something to bring out the glory of every shade of hair. Give second choice if ordering by post; or enclose a lock

of hair, and our colour expert will choose the right shade for you."

Yes, I think wireless firms will do well to follow up this idea. For beginning with individual "becomingness," colours in phones will soon follow colours in dress, and become a question of the season's fashion. Which means that women will start buying new phones every spring and autumn as *la mode* changes, and even match up their phones with each new gown.

How good for the trade!

The High-brow Grouse

Listeners-in are always complaining, both orally and in print, of the great amount of time which (they allege) the B.B.C. programmes allot to high-brow music—though an analysis of programmes proves that the "light and jolly" fare for which they clamour already claims twice as much time as more classical music. "We can't understand that stuff," they grumble, and therefore want to prevent its being heard by those who have trained themselves to appreciate it.

For that is what the low-brow consistently overlooks—that nobody, however musical or talented, gets the best out of good music on a first hearing and that enjoyment of it is largely a matter of training. Many educated folk are so trained from childhood, but many others tutor themselves by listening to good music whenever they can (and that's often in these wireless days) and reading books which help them to understand it.

One can't help wishing that the grouzers, instead of grumblingly switching off for the evening when a chamber concert is due, would realise that they can soon learn to enjoy it if they take it the right way. It is quite understandable that the person whose musical diet has been jazz and sentimental ballads will be bewildered if she suddenly undertakes to listen all through a symphony; but the initiation needn't be so drastic as that.

A Gradual Training

I'd suggest to such listeners-in that they should make a point of hearing merely *part* of every programme of short classical items. Leave off when, perhaps in fifteen minutes, you are bored stiff; but listen again, next time, for twenty minutes, and increase the period a little on every occasion. You'll gradually find not only that you can listen longer in comfort, but that you get far more enjoyment and understanding out of what you do hear.

Mr. Percy Scholes' simple explanations of the music to be played each week are worth reading and having by you while the concert is in progress, and by reading a little about each of the famous composers, and knowing the kind of life and environment he had, one gets some idea of what may be looked for in his music.

And, when you find that true musical appreciation is coming to you, remember the easier path to enjoyment of those who are trained in childhood, and give your kiddies this advantage. Little by little, as their minds expand, teach them to love high-brow music.

Wireless Holidays

No, I don't mean what you—meaning the trade, the press and many individuals—mean by the above heading. I'm not about to suggest to you some simple method by which you can fix up an aerial in your summer camp or for use when you spend a day up-river. I don't know any such methods, for one thing, and for another I think that holiday-makers would do well to get right away from listening-in.

After all, isn't change the essence of a holiday? Change not only from the tiresome things of life, such as work, but from all everyday routine and preoccupations. Listening-in is as much a part of one's all-the-year-round life as preparing meals or typing letters, and the

(Continued on page 677)

The Wireless Drama

The B.B.C.'s Dramatic Producer Chats With Our Special Commissioner.

ONE advantage of broadcast telephony is that if you wish to visit the producer of plays you are not compelled to call at the stage-door and wend your way, at the risk of breaking your valuable neck, through heavy piles of lofty scenery and other dangerous properties which threaten, at the merest touch, to fall down and engulf you under folds of particularly dusty canvas.

No, just two short flights of stairs, an airy and bright office, a very comfortable arm-chair and (what luck!) a tin of my favourite cigarettes within easy reach. So I tackled him on the all-absorbing and important subject of the B.B.C.'s broadcast entertainment.

"Well, yes," replied Mr. R. E. Jeffrey, "stage training is absolutely essential; but if we are to be successful in our production of wireless plays it is necessary that we should adopt—or what would be more correct, contrive—a new technique. Until quite recently, organizers of broadcast entertainments have been satisfied to adapt plays written for the stage to the purpose of wireless.

"Some time back I realized that this would not do, and that if we were to reach our goal it would be desirable that plays should be specially written for performance before the microphone. In my opinion, on occasions where I have been compelled to utilise the older material, I have

felt that we were losing ground in what should be continued progress."

"M'yes—but what about excerpts from Shakespeare's works?"

The dramatic producer gave me a quick look. Was I serious?

"We must place the classics in

"I shall require notice of that second question."

"Sorry," I answered, with humility.

The cigarettes were excellent; I took another one.

"There are three types of plays suited to broadcast; they include comedy, drama and tragedy. Firstly, plays with action set in one scene as in the usual stage production, but—this is a big BUT—certain considerations must be borne in mind. Ordinary stage business with minor properties would be ineffective, as such by-play must be seen to be appreciated or understood. The dialogue must include pointers to indicate scene of action, period, time of day, locale in which the action takes place; the dialogue, to a certain degree, must replace scenery."

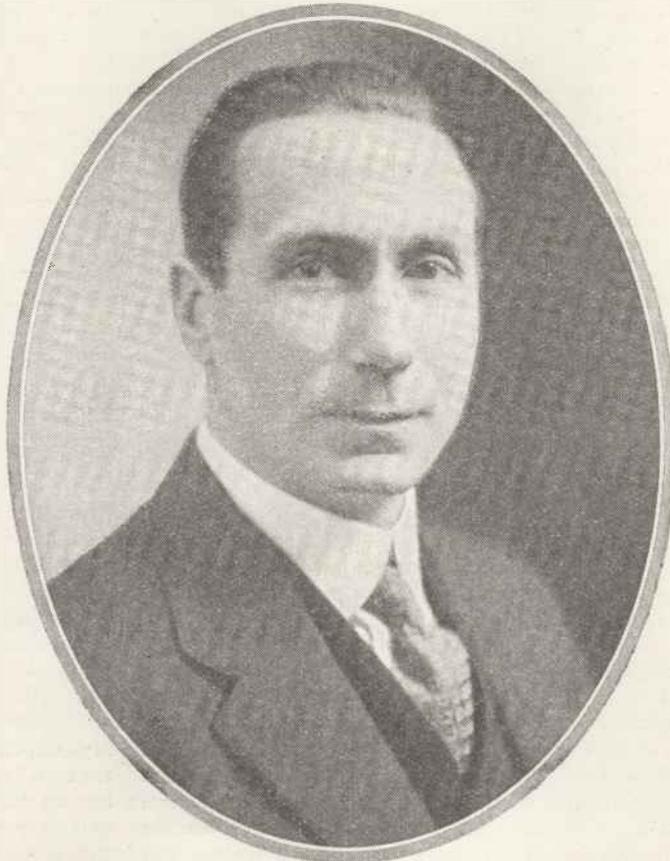
"I quite understand. By the wireless play you can only appeal to one sense, that of hearing."

"Exactly," replied Mr. Jeffrey. "We have to create, by these means, mental pictures of scenes and appearances of characters. Our dialogue must also give pointers for the expectation of entrances and exits and, later, for the actual en-

trance and exit of each character in the play.

"It is true that the imagination of the listener can be stimulated by the introduction, in the studio, of sound effects such as sea, wind, motor noises, mobs, explosions,

THE B.B.C.'S DRAMATIC PRODUCER



Mr. R. E. Jeffrey poses for "The Wireless Magazine."

a separate category and, as such they are subject to a totally different treatment. Your first question referred to plays, either dramatic or humorous, as a source of light entertainment and amusement." With a twinkle in his eye, he added:

revolver shots and all kindred sounds which are capable of reproduction, but this alone is not sufficient. It is advisable to suggest the coming effect by means of a word or so; the listener must be prepared for the sensation as, in some instances, two effects might be somewhat similar in sound."

I agreed. "But how"—now this is becoming interesting—"how are these sound effects produced?"

Mr. Jeffrey thought for a few moments, then shook his head.

"No," he answered, "I think it would be wiser not to enlighten you as to the means by which we obtain these effects. It would be a pity; it causes disillusion. Suppose, one day, I wished to give you a real thrill and desired you to imagine pouring rain. I could easily produce a sound which would convey to your mind the picture of a perfectly torrential downpour. Say the plot appeals to you, you are interested in the play; would it not take away a considerable proportion of your pleasure if, at the crucial moment—the thrill—the thought suddenly flashed across your mind that this was not real rain, that this was no flood, but merely a contraption of dried peas rattled in a wooden cylinder? In my opinion, the means whereby an effect is achieved should remain a mystery: it is the result alone which counts."

I nodded assent. The man was positively convincing, but I had another shot in my locker.

"Why not real effects, real noises, real sea?"

Broadcasting the Sea

"Why not? Some weeks back we *did* broadcast the sea from Plymouth. You heard the sounds of the incoming tide, but we chose our time for this transmission. During the performance of a play we might require this particular noise and, on the night in question, the sea might be so smooth, so free from ripples, that no convincing sound would be obtainable. At least, we are sure of our studio effects. At another time we might wish to broadcast the sounds heard in a farmyard. It would be easy to lead a cow to the microphone but more difficult to induce her to moo at the right moment and as frequently as required. In fact, the real noise, in many instances, might not be as convincing as the

imitative sound produced in our studio."

"Moo—I mean, yes," I said. My last shot had fizzled out like a damp squib.

Imaginative Pictures

"Where were we when you so rudely interrupted me?" queried the play producer. "Ah—yes. Well, next we have plays with action set in one scene, but which introduce imaginative pictures. These have an equivalent in many films you have seen in which the thoughts of a character are reproduced on the screen in picture form, thus illustrating what is passing in his or her mind.

"In the film this replaces dialogue and makes a greater appeal to your imagination. Lastly, we have plays where the action moves swiftly from place to place and thus follows the character's adventures. You will find but few stage equivalents owing to difficulties and costliness of production. With the wireless plays lies the advantage that the action may begin in a hotel room, go down the stairs, into a taxi, to a wharf-side, across the gangway to a tender, out to a liner, and may conclude with a wreck at sea. The dialogue, the studio noise-effects, would all aid the listener's imagination to realise each and every scene and to picture the unbroken progress of such an episode."

"There appear to be few effects impossible to broadcast plays," I admitted.

". . . Because the listener is induced, by various means, to create his own picture of the scenic surroundings. It is, as a matter of fact, his own conception and, therefore, likely to appeal to his senses with greater realism than the more artificial stage scenery.

"There is, practically, no limit to the scope of self-created scenes and to the settings which can be used by authors for wireless plays. In a theatrical production it would be a difficult proposition to stage an open sea with a ship tossed upon it, at the mercy of the waves, but in broadcast the listener's imagination would easily conjure up such a picture. Although, actually, we may never have experienced a similar adventure, the books we have read, the illustrations we have seen, the vivid descriptions we have gleaned from survivors' stories retailed in our daily newspapers all help us to

visualise a picture of a shipwreck with a wealth of infinite detail and truth."

"But, Mr. Jeffrey, it is then essential that we should concentrate all our attention on our sense of hearing; other senses, such as sight, cannot help us to appreciate a broadcast entertainment."

"Exactly. It is for this reason I always recommend that a play should be heard with the lights in the room turned down or out, as the case may be. It is a necessity with the cinema theatre that the hall should be in darkness, but it possesses the great advantage of compelling the spectator to concentrate all his attention on the screen.

In the Dark

"For the same reason, a broadcast play can be better appreciated in a darkened room; there is less chance of the attention being diverted from the one organ able to convey impressions to the listener's brain—the ear."

"In your opinion, we must be gradually trained to rely on one sense only if the wireless play is to achieve any success?"

"Yes, at least, to a certain degree. The effect of a thoroughly good story or plot may be nullified by any slight irritation in the listener's mind caused by some outside influence which may distract his attention. This may arise from his immediate surroundings or from something upon which he fixes his gaze. In view of this fact, until the public imagination is sufficiently trained almost instantaneously to visualise action and setting from word-pictures and imitative sounds, moderately simple and broad effects of building and sustaining the desired picture must be used."

"What is the ideal duration of a wireless play?"

"Say from fifteen to forty minutes. My experience has proved to me that a short 'snappy' playlet lasting not longer than about twenty to thirty minutes is the one which will most appeal to the public. It is difficult to hold a hearer's undivided attention for a longer period; but if, for the development of the plot, more time is required we should introduce some musical effects consistent, of course, with the story. All mental strain would, thus, be 'eased up,' and if further action and dialogue follow, the listener has,

unconsciously, benefited by the short rest."

"Up to the present, Mr. Jeffrey, you have spoken about the technique of the play, but what of its exponent—the artiste before the microphone?"

"Voice and delivery are the be-all and end-all of wireless play production. The actor must unlearn much of the technique he has acquired on the stage. By this I mean the gestures, the facial expressions, the walk and the movements of the body, all things which, coupled with his make-up and dress to enable him to 'live a part,' go by the board.

"All expressions must be conveyed by the inflexions of the voice alone, and the right stress upon the right words. Obviously, he must be endowed with a good broadcasting voice, and its pitch must be studied. The actor, who is used to stage delivery, may not be a success before the microphone; he requires a course of training, and it is for this sole reason I have formed 'The London Radio Repertory Players.' They have already acquired the necessary experience and have been chosen for the production of broadcast plays. We have toured some of the provincial main stations with, I believe, considerable success, and newer developments of a very novel kind are being proceeded with.

"The B.B.C. possesses a sufficient number of transmitting centres to make this worth our while, as it is evident that plays produced by such a repertory company must attain a higher degree of perfection than if they were entrusted to local artistes rehearsed for 'one night only.' The scheme will be extended to cope with an ever-increasing number of productions, and I am confident that it will work to the general satisfaction of the public. Several of the main stations have formed semi-professional companies of players; much good work

has been done by them and I hope, by the variation of an occasional play by the London Repertory Players, to stimulate these combinations to yet greater effort, and thus eventually raise the standard of these transmissions at all the B.B.C. centres.

"Even to-day all plays specially written for broadcast have been of an experimental nature; we are only at the beginning of the road. As these lines of development are tested, absorbed and digested fresh

Mr Jeffrey rose from his chair.

"'Tis," he declaimed, in a sonorous voice, "a consummation devoutly to be wished."

Quién sabe? JAY COOTE.

CANADA handled 5½ million words by wireless last year. And yet they say more women are wanted there! LOUD-SPEAKERS are getting more handsome, says a trade journal. Another tribute to our twentieth century women.

DECEIVING THE AMERICAN LISTENER!



The photograph shows how they deceive the listeners at W G Y. The scene is as follows: "Jap" Durkin has fired at Pierre from the ambush. Pierre feigns death and falls in the dead leaves of the forest (a heap of onion-skin paper). When Durkin approaches he grapples with him (the two players in the centre do this). Pierre kills his enemy in the hand-to-hand fight which follows, and then rides away on horse-back (imitated by the lady sitting at the piano).

ideas will be evolved from them. We are laying a basis for a new technique in wireless play-writing and production. It is an interesting study, a fascinating experiment, and the public, by expressing its opinions and preferences, will receive ultimately the style of entertainment with which it desires to beguile its leisure hours."

"In order to secure the true atmosphere of the theatre, would it not be an incentive to the artistes if they could act in a studio comprising a small stage? Should not the studio possess an audience?"

A WRITER says that the ether in East London is choked with howls and screeches. That must be Poplar calling.

THE output of wireless messages from the *Majestic* on a recent trip averaged only 3½ words a minute. If only we could have married a wireless set!

"PROBLEMS of speech" is the title of a series of forthcoming broadcast lectures. We are afraid that the problem of the speechless would have a wider appeal, especially for a Saturday evening talk.

DOUBLING THE STRENGTH OF THE CRYSTAL CIRCUIT

THE purpose of this article and the accompanying diagrams is to show how it is possible to double the normal strength of any crystal set by very simple alterations and with little extra apparatus.

Now, if the terminals at the back of one of the earpieces of a pair of phones are short-circuited, the whole energy of the received signal, instead of being equally divided between the two earpieces, is then concentrated upon the other one with a consequent

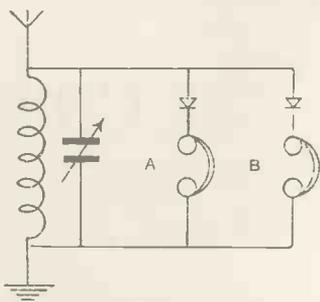
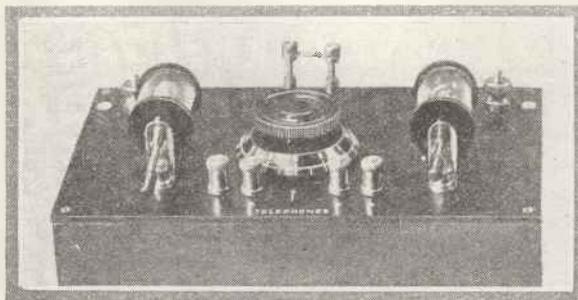


Fig. 1.—Circuit with Extra Crystal and Phones.

increase of signal strength, inasmuch that one earpiece is equal to approximately double its normal strength when in series with the short-circuited one. Also, if an extra crystal detector and pair of phones are incorporated in the set so that they are in parallel with the existing detector and phones (as in Fig. 1), this second pair of phones can be worked at equal strength to the first pair and without any diminution of signal strength.

Doubling the Strength

With these two facts at our disposal it is a comparatively easy matter to double the normal strength of any crystal set. All that is required is the addition of an extra crystal detector and the division of the headphones in such a manner that one earpiece will receive the whole energy of the circuit marked A in Fig. 1, and the other ear-



Set Using Double-strength Crystal Circuit.

piece will utilise the whole of the energy in the circuit marked B.

The two crystal detectors should preferably be of the same type, and Fig. 2 shows quite clearly how they must be placed in the circuit.

The existing phone leads will require alteration, and they can

visable to adjust each detector separately with its respective earpiece. W. D.



H.T. BATTERY HINT

WHEN making up H.T. batteries from small flash-lamp refills of the 3-cell type a piece of thin waterproof material, such as ebonite, celluloid or rubber, should be inserted as insulation between adjacent refills when the batteries are placed close together.

"Creeping"

If the exciting compound happens to escape from any one of the cells it will invariably creep to the remainder and cause a short circuit through the whole series of cells forming the battery.

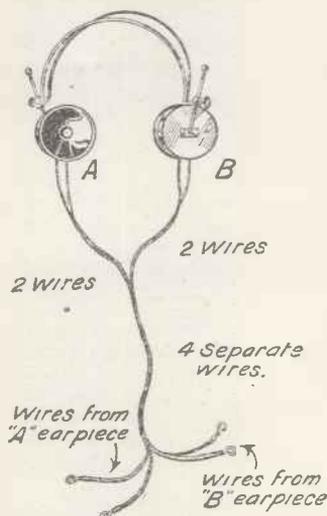


Fig. 3.—Method of Connecting Phone Leads.

either be entirely removed from the phones and two new separate leads taken from each earpiece, or the existing leads may be cut just above the place where they join (as shown in Fig. 3) and new lengths joined on in such a manner that there are four telephone leads, two from each earpiece, which are quite separate from each other, and in no way connected, except, of course, by the headband, which is not altered at all. One

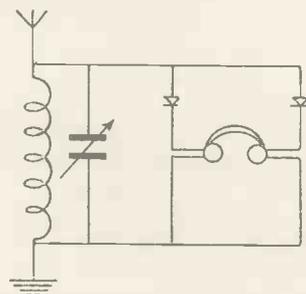
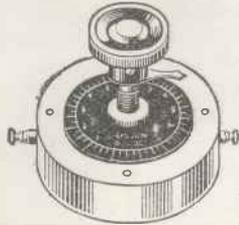


Fig. 2.—Double-strength Crystal Circuit.

Pieces of rubber cut from an old cycle inner tube may be used for the insulators, which should be large enough to effectively separate each individual battery from its neighbour. J. R.

LISSENIUM

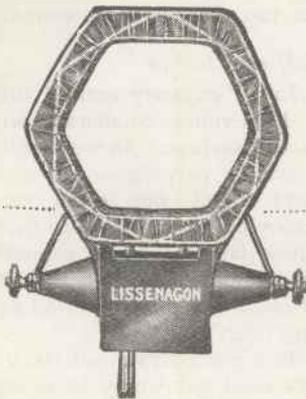
Don't cramp your tuning



WITH an ordinary condenser you can often get three stations with a degree of scale movement. Think of the painstaking care necessary which short-wave work calls for with such a condenser, and how easy it is to miss those distant stations altogether.

The first time you use the LISSEN MARK 2 MICA VARIABLE CONDENSER you will appreciate its delightful control of tuning. In it you have a condenser which covers every capacity from a negligible minimum up to its conservatively rated maximum of .001. The economy and convenience of this condenser is worth noting therefore.

If you want to try a perfect CONDENSER, try the LISSEN MARK 2 MICA VARIABLE (patent pending). LISSEN ONE-HOLE FIXING, OF COURSE. Table **17'6** or panel mounting, without alteration



LISSENAGON "X" COILS

IN addition to the well-known and standard LISSENAGON COILS, we now make LISSENAGON "X" COILS. They are similar to standard LISSENAGON COILS but have the addition of two tapping points brought out to easily accessible terminals on the coil mount. Used for aperiodic aerial tuning LISSENAGON "X" COILS give very great selectivity, whilst reaction control is exceptionally smooth and much finer than is usually obtainable. Used in Neutrodyne Circuits, the high frequency amplification obtained, when using LISSENAGON "X" COILS, is remarkably stable, the use of one or other of the tapping points having the effect of neutralising the grid-plate capacity of the valve.

The No. 60 LISSENAGON "X" COIL covers all Broadcast Wavelength whether used for aerial or anode circuits, but the No. 50 "X" COIL is recommended for the lower and the No. 75 "X" COIL for the higher Broadcast Wavelength.

The No. 250 LISSENAGON "X" COIL makes it possible to receive Radio-Paris when Chelmsford is transmitting.

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LISSEN PARTS—WELL THOUGHT OUT, THEN WELL MADE

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Absolutely for the Novice

Condensers & Variometer Tuning



A CONDENSER in wireless tuning acts much in the same way as a tension spring can be made to act in adjusting a predetermined amount of mechanical strain. Although a condenser keeps back ordinary electrical currents, either high- or low-tension, oscillatory currents produced by wireless energy can pass through it quite well.

Capacity

The way they pass is by first of all charging up the condenser plates until an amount of energy has been stored up in them, dependent upon the size of the plates, their nearness together, and the kind of insulating medium (dielectric) between them. The amount of energy required to charge the condenser is termed its "capacity."

From our very slight sketch of the functioning of an inductance we shall not be surprised to find that placing a condenser either in series or in parallel with an inductance greatly alters the wavelength to which it will best respond. We saw that tuning depended upon the total effect of the sum of the current surges within the inductance itself, this being a measure of their oscillatory frequency—matter of time. Now, with the introduction of a condenser we have imported a new time-absorbing factor into the situation. Hence the more capacity we use in parallel with an inductance the longer the wavelength to which that inductance, other things remaining equal, is tuned.

How Condensers are Made

The condensers which we shall chiefly use will be fixed condensers, made of alternate strips of copper and of ruby mica bound up closely together, and variable condensers.

Variable air condensers have sets of semi-circular aluminium plates

pivoted on a central spindle so that they may be easily rotated to pass between, and near to, but not to touch corresponding fixed aluminium vanes (see heading photograph).

The nearer the metal plates of a condenser are brought together (so long as they do not touch) the greater the condenser's capacity. And, again, the larger the plates, the greater the capacity, since it is on the surface of the metal that static electrical energy stores itself, thereby setting up a strain across the intervening dielectric of air, mica, waxed paper, or whatever it may be.

Using plates of equal size, those separated by thin sheet mica make condensers of far greater capacity

Condensers play an important part in wireless. In this article is explained what they do, how they do it, how they are made, and the effects of capacity in different parts of the set.

The principle of Variometer tuning and important points about crystals and catwhiskers are also dealt with.

than those separated by air, while the capacity of condensers wherein the separating dielectric is waxed paper comes intermediately between that of mica and air condensers.

Capacity Effects

If a condenser consists essentially of two electrical conductors separated by a non-conductor, it must follow that condenser values, or capacities, are cropping up everywhere in our wireless outfit, whether we want them to or not. Wherever two wires in the set pass fairly close to one another, there is a capacity. Also the turns of an inductance coil must possess not only inductance, as we know, but capacity as well.

The aerial is itself a condenser (of

approximately .0003 microfarad if of full length) for is it not a wire separated from the surface of the earth (itself a conductor of electricity) by spacing of air? The earth wire of the set, too, must have its own capacity.

Self-oscillation

In a "capacity earth," this forms a high-value condenser with the earth's surface. In valve sets, moreover, the valve pins and sockets all have small but often extremely annoying capacities of their own. These last fortuitous capacities are objectionable in that they tend to promote violent oscillation or "spilling over."

In a plain crystal set stray capacities need not worry us much. But the valve-set user should realise that oscillation is essentially the result of an inductance acting on a capacity, and wherever inductance and capacity come together, there it only needs sufficient feeding of local energy for the overcoming of wave damping to bring about oscillation.

Howling

All oscillation is not howling. Oscillation only breeds howling in a set when the local feeding with energy from a high-tension battery is sufficient to impart to the original wireless signal a tendency to build up upon itself. Before this noisy oscillation is reached a mid-way point is attained where the locally reinforced wireless waves have sufficient energy, or almost sufficient energy, to sustain themselves without further building up. That is the critical point where signals are at their loudest consistent with clarity.

Variometer Tuning

A variometer is in principle two fixed inductance coils wound in

(Continued on page 662)

Brandes

The name to know in Radio

Grandpa reflects on how fine it is to be quiet and restful, yet still finding a full measure of amusement for the leisure hours. The armchair presses comfortably against the back of his head; his broad shoulders sink luxuriously into its padded depths. Glancing down the stem of his pipe he sees the deep, rich colour of the polished bowl, and just beyond, into his uninterrupted line of vision, comes a glass—and a “finger” of mellow liquid with the thousands of tiny bubbles hurrying to the top. Across his head is the dark, comfortable-looking headband of a Brandes. The *Matched Tone* receivers, clasped gently but firmly to his ears, bring the world and its news; its pleasures and achievements. No need to have it bawled at you across the club smoking room by a choleric ex-colonel. “Great!” he sighs contentedly.

Ask your Dealer for Brandes.

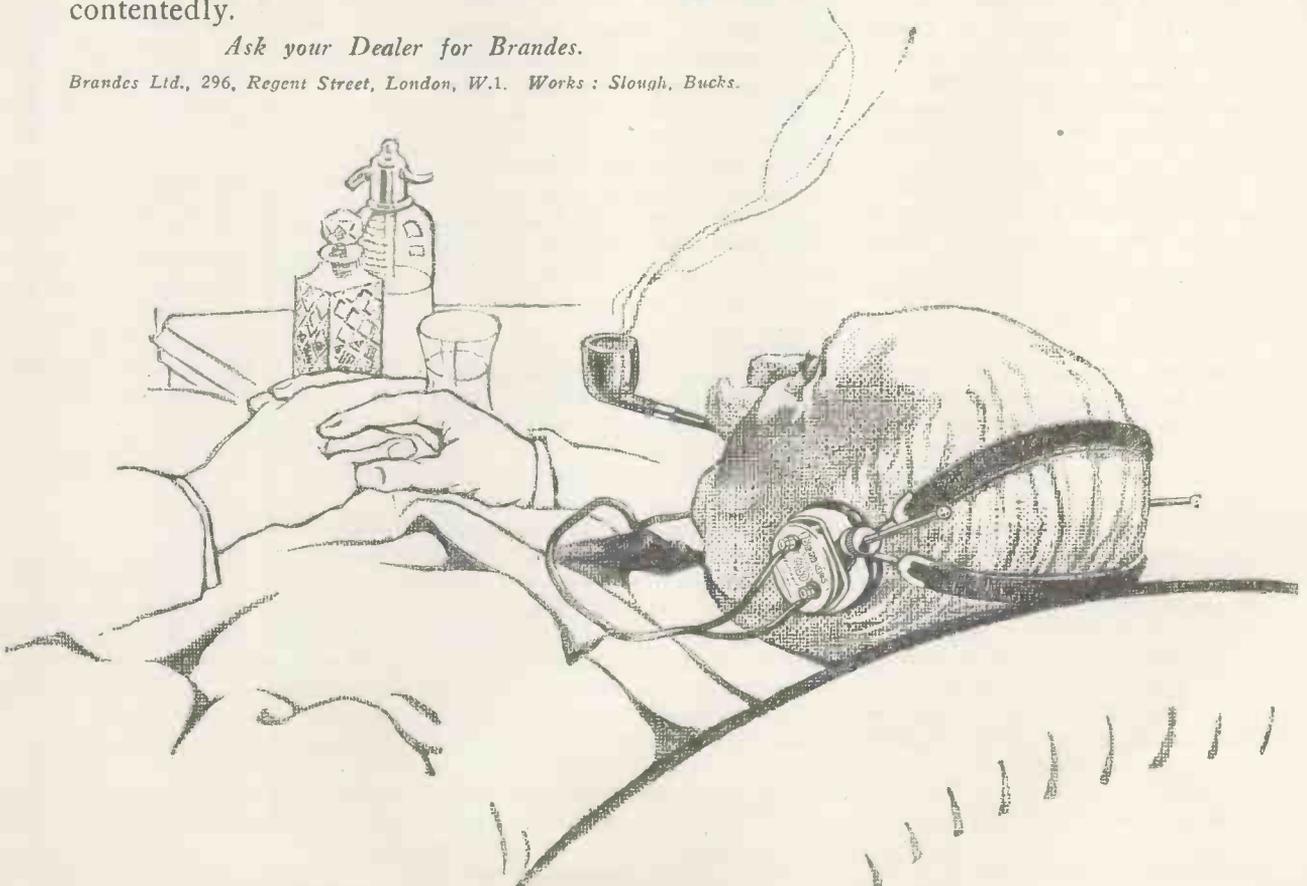
Brandes Ltd., 296, Regent Street, London, W.1. Works: Slough, Bucks.

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TRADE MARK
Headphones



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All Brandes products carry our official money-back guarantee, enabling you to return them within 10 days if dissatisfied. This really means a free trial.



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ABSOLUTELY FOR THE NOVICE

(Continued from page 662)

series, one coil being placed inside the other and mounted upon a central spindle so that it can be turned round upon its axis relatively to the outer coil. Since both coils are in series with each other, being wound from the same length of wire, they are really one and the same inductance in two portions.

Therefore any oscillations set up in either of the windings will pass equally forth and back through both coils. But since one coil can be turned round at will, to make its windings run in the reverse direction from those of the second coil, a variometer holds within itself the means of varying its total inductive value, for by swivelling the inner coil relatively to the outer, the windings on the one can be made to assist or to oppose those on the other, so tuning for a longer or shorter wavelength.

Efficient and Simple

Variometer tuning is very efficient, and is the simplest of all where the difference in wavelengths to be tuned-in is not extreme. For instance, the wavelengths of British broadcasting stations vary between three hundred and fifty and five hundred metres, and any reasonably well-designed variometer can easily cover more than this range.

Radio-Paris and the Eiffel Tower have wavelengths of 1,750 and 2,600 metres, and a variometer which would cover the British broadcasting wave band would not tune to these much longer French wavelengths. Wiring a condenser in parallel with a variometer enables it to tune to higher wavelengths and, if the value of the condenser is not more than .0003 microfarad, brightens and sharpens signal reception and tuning, but to use an ordinary variometer with a very high value condenser for long wavelengths, such as that of Eiffel Tower, is inefficient, and gives proportionally poor results.

For the higher wavelengths the best inductance to use is a fixed value slab coil, basket coil or plug-in honeycomb coil, with a variable condenser wired in parallel with it for fine tuning (see diagram).

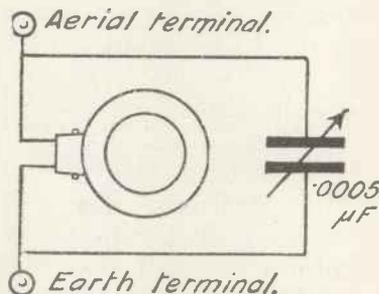
Crystals and Catwhiskers

The only other part of a simple crystal set to be mastered is the

crystal and catwhisker. For the catwhisker almost any thin metallic wire can be used. Copper, hard brass or silver wire are generally considered best. Some people prefer gold wire. German silver or nickel wire will also do.

It is usually twisted round into a fine spiral spring to give a light contact and the end which is to touch the crystal should be cut obliquely to a fine bright point.

Though native galena will do quite well for the rectifying crystal if you pick out a piece having some sensitive spots, and find one or other of



Coil with Parallel Tuning Condenser.

these spots by diligent experiment, much trouble and vexation will be saved by buying a prepared crystal.

Most, if not all, of these are made of galena put through a process which greatly increases the fineness of its crystalline structure. As a result the crystal develops so many sensitive spots that wherever the catwhisker is dabbed down you are pretty certain to hit upon one.

Fixing the Crystal

The crystal is set in a metal cup, from which a lead goes to the aerial terminal of the set. This cup may hold the crystal firmly by pinch screws, or the crystal may be more permanently and satisfactorily set in the cup by melting around it a little Wood's metal. Wood's metal can be bought of any dealer in wireless supplies. It is an alloy containing four parts of bismuth, two parts lead, one of tin and one of cadmium, and has a melting point so low that it easily melts in the flame of a match.

The reason why Wood's metal should be used to set the crystal in its cup, and not ordinary solder, is because the melting point of solder is high enough to injure or spoil the crystal.

COLIN BENNET.

CONTROLLING THE TONE

SOME amateurs are far from satisfied with the quality of the results which they obtain from the loud-speaker, in spite of the fact that the amplifier and all other accessories are as good as and designed as well as it is possible to do so. It is not that there is any marked distortion present, but rather the quality, or style as I have heard it termed, is not to their liking.

Difference in Taste

The difficulty is due entirely to differences in individual taste—just as much as some people prefer the rolling tones of an organ to the mellow notes of a good pianoforte. The loud-speaker itself is sometimes the cause of the difficulty. The material from which the sound-duct and flare of the bell-mouth is constructed produces either a very round rolling tone or a thin clear note. Wooden and ebonite trumpets give the latter, whilst spun and cast aluminium produce the former. To a certain extent, the quality can be controlled in the amplifier itself.

Placing a large capacity condenser of about .002 microfarad across the secondary of the first intervalve-transformer will considerably lower the pitch of the sound produced by the vibrating diaphragm, whilst a grid leak will often have the same effect. If a thin tone is preferred the effect may be in part obtained by using a low-ratio transformer in the first stage in place of the ordinary 5 to 1 ratio as commonly used.

Large Condensers

Large-capacity condensers across the loud-speaker windings or terminals also have a controlling effect upon the quality, but the best thing of all is to select in the first instance a loud-speaker that satisfies not only as to volume but also as regards the material, bearing in mind that metals generally produce deep notes whilst fabrics such as wood, ebonite, fibre and the like act in a reverse manner.

A. J. C.

B.T.H. Headphones

The original pattern B.T.H. Headphones achieved a remarkable reputation for sensitiveness and tonal quality. Many improvements have since been made, with the result that to-day B.T.H. Headphones are the most comfortable and convenient instruments of their kind. Some of the more important constructional features are given below:—

Price
per pair **20/-**
(4000 ohms)
Weight with cord 9½ ozs.

- A The body is of special non-resonating material.
- B The stirrup moves freely within the slider, and takes up and retains its position without any locking device.
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- D The special slider adjustment obviates the use of screws
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- F The leather covering gives perfect comfort.
- G The earpieces fit closely to the ears.
- H Best quality flexible cord.
- I Nickel plated series connector.

Obtainable from all Electricians and Radio Dealers.

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Buy B.T.H.—the Best of All.



2273

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Clutterbuck's Conversion!

I BUMPED into Clutterbuck in Throgmorton Street.

"Blow it!" he spluttered.

"Change over your H.T. and L.T. leads if you want to do that," I advised. "There will be no quest—"

He hurled me from him like a porter closing the door of a moving train.

"Fiend!" he hissed.

I was at a loss, a complete loss.

Regardless of his brother brokers he came at me as a Filigree Islander approaches his jazz partner; on his face was a look so fearsome that I trembled like an interrupter. Had he not recognised me, I blanch yet to think what my final shape would have been.

"Oh, Claude, how *could* you!" he exclaimed. He choked with pity for me. "Have you joined the flat-ear brigade?" The reproach made me weep.

"My life is a misery!" he snapped, his eyes flashing again. "At breakfast they all want the broadcasting page; and while I'm studying the markets there's a continual buzz about orphans, low foreheads, and flyblows—tremendous shrieks and guffaws go up when wheelbarrow is mentioned.

"In the train it is just as bad. There's old Dollar Dedmond—ninety, if he is a fortnight—shrewdest jobber I know—ought to be ashamed of himself—stuffs the *Financial Times* under the seat directly he gets into the carriage and reads aloud extracts from some other *Times*. Says he got W. J.'s head! More pleased over Mr. J.'s head than if he had cornered oils! Just the same up here. No business in the Kaffir market, but someone heard Cape Town on a penknife!

"In the evening I go out. Yes, go out!" he snapped, daring me to ask why. "Club—grub—pub. I used not to"—this in a tone of apologetic defiance. "I used to stay with the family. They all sat round looking like unhappy mutes—till I tripped over a piece of wire and pulled somebody's ears off. Yes," he snapped in the tone of defiance without the apology, "I go out!"

I know how to manage Clutterbuck. I stroked his arm as I pulled it through mine. "Extraordinary," I exclaimed, "how folks change! Fancy you deserting your family like that."

He corrected me, shaking his locks like a tragedian. "Fancy my family deserting me, m-m-me," he sobbed.

I soothed him. I took him to my own particular Funk Hole, where we started on a couple of dozen oysters and a pot of No. 1 apiece.

"Now, Clutterbuck," I said. "Tell me, have you ever listened?"

"Never have and never will," he exclaimed, taking two bites at a native to stress his determination.

"You don't know the joys of it," I said. "It isn't so much the music, as making your own set, adding to

"Clutterbuck," I said, "have you a match?"

Now, I knew he hadn't, for I had pocketed his box at the lunch-table.

"Dear me, I had some."

"Never mind, let's buy some."

I pushed him in the shop. "That reminds me." I pulled him over to the wireless counter. "My phones, Mr. Cathode—I left them for repair." I turned to Clutterbuck. "Wait here, old speculator. I'll buy a match. Oh, I've forgotten something. I won't be a minute." Then I dashed out of the shop.

Now, if only old Cathode will have the sense to insist on Clutterbuck testing the ph—. I put my ear as far round the shop door as I could without disclosing any more of my component parts.

Ah! He has succumbed! Then I beat it for ten minutes.

I returned to the shop as breathlessly as I could. "So sorry, old man, I—"

A policeman controlling the traffic at the "Bank" was less peremptory than Clutterbuck with my phones on. Half-a-dozen sets were on the counter, valves, batteries—you know. Clutterbuck was watching the set in operation like a cat watches a mouse. Old Cathode was washing his hands in staticless ether. My convert swayed to music, fingered valves, switched switches, twiddled terminals, oscillated outrageously.

Then, who should blow in but old Dollar Dedmond, just as Clutterbuck with a seven-valve look beckoned to me to take the phones to pass an opinion on his tuning. Dollar gasped, choked, and—. I bent over him as he lay limp on the floor. I put my ear close to his lips and faintly heard the exclamation: "Clutterbuck's double!"

* * * * *

And though we at last convinced him it was Clutterbuck himself, Dollar always sniffs when they meet. That may be because:

(1) Of the shock to Dollar's heart, or

(2) Of the fact that Clutterbuck is one United States station ahead.

C. B.

UP AGAINST A KNOTTY PROBLEM?

Let us help you. Send your questions (together with the coupon on page 695 and a stamped addressed envelope) to The Editor, THE WIRELESS MAGAZINE, La Belle Sauvage, E.C.A., and we will let you have a reply in two days.

it, subtracting from it, dividing it, and taking away the part you first thought of. It has a peculiar attraction," I said dreamily, "a magnetic attraction."

I was unable to get another wireless word in, and the rest of our one-sided conversation was about bulls, bears, and broking generally. I will confess it was a holiday to exchange square deals for square laws, and to hear about rigging the market instead of rigging the aerial—and all the while I was scheming—scheming.

With heavy stomachs and light heads, with vacillating legs and oscillating hearts, arm in arm, we wended our way towards the "House." We stopped in an alley at a small double-fronted shop displaying, in one window, tobacco, and in the other—(hush)—wireless!

(Tip-toe here and don't make a noise lest he suspect!)



Essentially a practical paper—exclusively devoted to the interests of all Listeners-in

Amateur Wireless

Edited by BERNARD E. JONES,
Editor of "The Wireless Magazine"

It deals with every phase of this fascinating subject in an informative, interesting and helpful way; 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"), Practical Odds and Ends, Components You Can Rely Upon, Around the Showrooms, Progress and Invention, Latest News in Brief, Times and Wavelengths of Home and Foreign Stations, Chief Events of the Week, Club Doings and Correspondence. Brightly written and brimful of information, "Amateur Wireless" informs, instructs, directs, advises and enthuses its readers.

Every
Thursday

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Take "Amateur Wireless" Each, Week
and Get the Best Results from Your Set

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Transmitting on One Metre

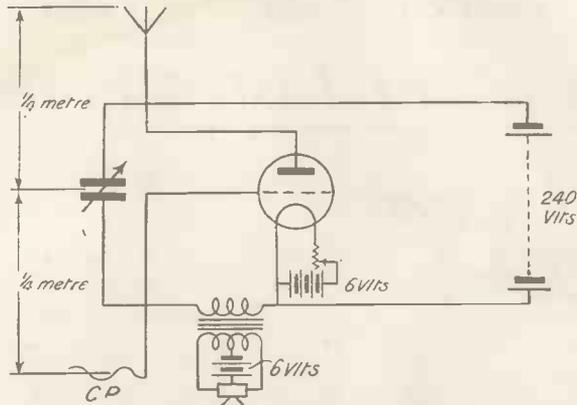


Fig. 1.—Circuit for One-metre Work.

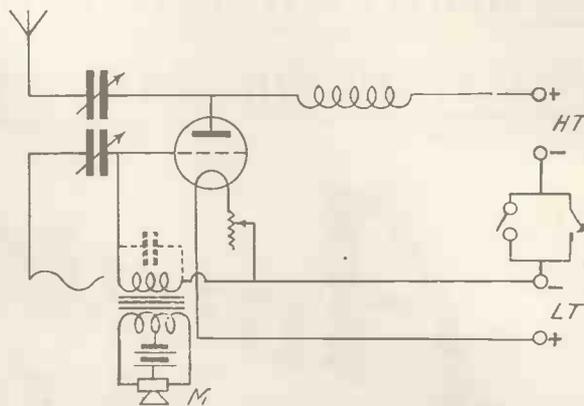


Fig. 4.—Circuit Used by Author.

THERE are so many sides to any discussion on ultra-short-wave work that it would perhaps be as well if we commenced with some reference to the primary difficulties with which an experimenter in this kind of work is faced.

The chief of these, so far as we are concerned in this country, is undoubtedly the lack of proper facilities and instruments. The American manufacturer is far ahead in the construction of low-loss condensers and special valves for specific work. Using an ordinary receiver the British amateur will find the definite limit so far as short-wave work is concerned chiefly determined by his condensers.

Research

When he comes to consider work on one and two metres he will find himself undertaking all sorts of research that would not be necessary had he the proper valves to operate instead of having to adapt his circuit to the existing types.

Most amateurs know that absorption occurs much more intensively when very high frequencies are concerned than when frequencies approximating to the normal wave-band are in use. This fact gave rise to the theory that very short waves would have no penetrating power owing to the tendency surrounding objects would exert to absorb them before they travelled very far from the transmitter. The credit of being perhaps the first

amateur to investigate and tabulate results in this field of research belongs to a Frenchman, but to Mr. Reinartz we owe the greater part of our present knowledge.

Whereas the hours of darkness are more favourable for work on the normal wave-band, it was soon discovered that the exact opposite was the case with the ultra-short waves. Darkness kills reception below about forty metres.

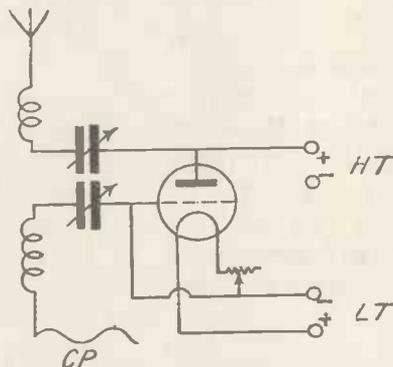


Fig. 2.—Circuit for Four-pin Valve.

Theoretical explanations of this are of necessity incomplete and arbitrary, but it appears that very short waves are radiated upwards at a sharper angle than usual until they impinge upon the Heaviside layer, to be reflected downwards to the earth again, which they will strike at some considerable distance from the source of origin. This causes in many cases a curious "dead" area. Marconi has proved the possibility of reflecting short waves by means

of specially constructed reflectors. It is possible that the sun has a reflecting influence also. Though details are somewhat obscure it seems fairly obvious that the sun is the controlling element where short waves are in use. This may be explained possibly by remembering that the sun transmits waves which differ only from wireless waves in their frequency, which is many times greater than even the shortest of ultra-short waves. And so we come to a consideration of actual means of transmission.

Marconi's Work

Marconi has been able to construct a transmitter capable of radiating waves of less than one metre. A simple circuit of this type is shown in Fig. 1.

This apparatus will oscillate and generate a frequency corresponding to a wavelength of about one metre or slightly over. Speech may be transmitted by using a microphone instead of a buzzer. This circuit should be an excellent one to experiment with as it requires nothing that the average amateur does not already possess, with the exception of the condenser, which may be constructed in half a dozen different ways.

An ordinary V24 valve can be used and is, in fact, the only valve on the British market which is at all suitable for work of this type. Special valves are, I believe,

(Continued on page 668)

Some facts about Valve life

"I may say I have had a Cossor Detector Valve in use now for ten months, and to the best of my belief has given one thousand one hundred and forty-three hours reception, and I think everyone will be to admit that this valve is one of the best ever made."—H. G. PATLSON, Hope Road, Edale, via Sheffield.

"I wish to tell you how very pleased I am with your valves which give such satisfactory results. A valve I bought from you over a year ago is still going strong, though on occasions it has been used to test the units of my H.T. battery.

Last night, using a single reflex circuit, using the above-mentioned valve, I clearly received between 12.30 and 8 a.m. this morning part of the programmes from W.B.Z. and W.G.Y. This is the first time I have sat up to try and get America. I am delighted with my success, as I am only fifteen, and I attribute it to the Cossor Valve."—H. C. T. ALLEY, Ashford, King's Road, Sherbourne, Dorset.

"I bought two of your valves at the beginning of August, 1923, and after daily use I passed them over to a friend of mine a month ago, and he is getting absolutely perfect results from them. These valves have been constantly carried about in a case or pocket and have never once let me down. I should think that record is hard to beat."—HENRY M. CONROY, 61 Hale End Liverpool.

"Exactly a twelvemonth ago, I purchased two of your Cossor Valves, a P.1 and P.2, for use in a reflex circuit, the S.T. 100.

They have been in use exactly 12 months at an average of six hours per night. Sundays included, until last night when the P.1 went out and will not light again. The 'Red Cap' is still on duty and functioning as well as ever.

I may add that I have the following Stations to their credit: all B. Stations, including Belfast, of course, Hill, Dundee, Swansea slag at good phone strength, Cardiff, Bourne-mouth, Newcastle, Chelmsford, and good loud speaker strength, and occasionally a few of the others, according to conditions prevailing at the time of reception. The total burning hours of your valves follows:—

- 6 hours per night (average) 12 months
- 42 hours per week
- 2,184 hours for the 12 months

Thanking you as the cause of my having spent such a pleasant time at such low cost, I am, Sir, Yours faithfully, J. JENKINS, 24, and T. Nautymoll, 10, Legend, G.

"It may interest you to know that I am still using a Cossor Valve No. R3864, which I bought in February, 1923.

It was used practically every evening for 18 months and has been used on an average about one evening a week since that time (by the evening I mean all the time the London Station has been broadcasting).

I used it as a detector last night and received W.G.Y. just audible off detector only, but quite good off detector and two L.F. The first stage of amplification is also a Cossor P.1 which I have had for over a year."—J. W. HARRIS, 12 Raper Road, Wembley.

"I feel I should like you to know the result I am getting with Cossor Valves. I bought a P.1 just twelve months ago, and used it as a H.F. amplifier with crystal rectifier for about three months. I then converted it to a single valve and crystal dial and ran it like this until before last Christmas, when I bought another P.1 and converted the Set into the S.T. 100 circuit."

As I use the Set at least 100 hours per month the first valve has given 1,200 hours service already, and is still going strong, but I suppose I cannot expect it to last a great deal longer."—L. FELLOWS, Garston, Watford.

"In the beginning of October, 1923, I built the S.T. 100 circuit and purchased two of your valves. Since that time they have been in use practically every evening for about 3 1/2 to 4 hours, say, on an average of at least 25 hours per week, and sometimes they have been used at other than broadcasting times for experimental purposes. This makes over 1,000 hours work, with a 6-volt accumulator and over 100 volts on the plate. I have mentioned this fact to several of my radio friends and they have been very much surprised at the long life."—WALTER HANKIN, 8 Barbara Street, Barnsbury, N.

"I have had in (practically) continuous use for nearly fifteen months (i.e. the customary 2 or 3 hours on most nights) two Cossor P.1 Valves which are still using. Rightly or wrongly, I am inclined to think your formance is exceptionally high, if not somewhat so."

I shall be glad to mention has been in use in ordinary use (I mean in use to your knowledge). "The Lamp Mon."

"Items in the New York programme included the songs 'Fair moon to thee, I sing,' from Sullivan's 'H.M.S. Pinafore,' and 'If I built a world for you.' A lecture given by a University gentleman was also very distinct. The lecture was announced to begin at 8.15 (New York time) and was still proceeding when I retired to bed at 2 a.m."

I regard the foregoing as a rather remarkable achievement, being obtained with a one-valve home-made Set, and the valves Cossor P.1. This valve I bought on May 19th last, and it has been in continual use daily since, and is still going strong."—H. S. JOHNSON, 13 Emery Street, Cambridge.

"I should just like to drop you a line to inform you that in June of 1923 I purchased two of your Bright Emitter Receiving Valves, and that both have since had over 4 hours per day for about 12 hours on week-ends of continuous use and are still giving me satisfaction."

For some time they were used in a transmitter with 600 A.C. filaments, and 600 A.C. plate passing through the aerial. (The valves). Should I should like to mention."

"I have had in (practically) continuous use for nearly fifteen months (i.e. the customary 2 or 3 hours on most nights) two Cossor P.1 Valves which are still using. Rightly or wrongly, I am inclined to think your formance is exceptionally high, if not somewhat so."

I shall be glad to mention has been in use in ordinary use (I mean in use to your knowledge). "The Lamp Mon."

"Thinking it might be of interest to you, I should like to congratulate you on the quality and durability of your Bright Emitter Valves. I have had in use (on an average of 14 hours per week) for twelve months three of your valves (my Set being a three-valve one), and can say without doubt they are as good to-day as when I first purchased them on March 7th, 1924. I can without difficulty tune in all the British Stations and most of the Continental, and have picked up America direct with great clearness."

When I tell my friends the length of time I have had your valves in use, they can scarcely credit it, knowing the short length of life some other makes possess."—FERN-D. TOTHILL, Richmond, Surrey.

"With reference to your advert. in 'Popular Wireless' about the length of life a valve should give, I should like to point out the results I have received with two of your Cossor P.1 Valves which I use as a detector and L.F."

The Detector Valve, No. F0471, which I bought twelve months ago has burnt over 2,000 hours, practically the whole of the broadcast hours during that period. The L.F. Valve, No. H3099, has burnt just over 1,000 hours in six months."

I think the above particulars speak very highly indeed of the efficiency of the Cossor Valves."—P. SMITH, 55, Portland Street, Walsall, Staffs.

"I need that in the current issue of 'Radio Times' several readers are testifying to the excellence of your Cossor Valves."

To state that on February 1st, I purchased a Cossor P.1 Valve, which has since been functioning for over 2,000 hours of use is a record (26 hours) set by EDWARD R. LEWIS, 81, St. Andrew Road, Brentwood, Essex.

"It is a pleasure that I write to you after which I think will be of interest to you."

On March 7th, 1924, I purchased two ordinary P.1. Bright Emitter valves from a local dealer and they have been in constant use (7 days per week) for the whole twelve months, and they are as good as new."

—BLACKHALL, 8 Leudgate Square, Epsom, Surrey.

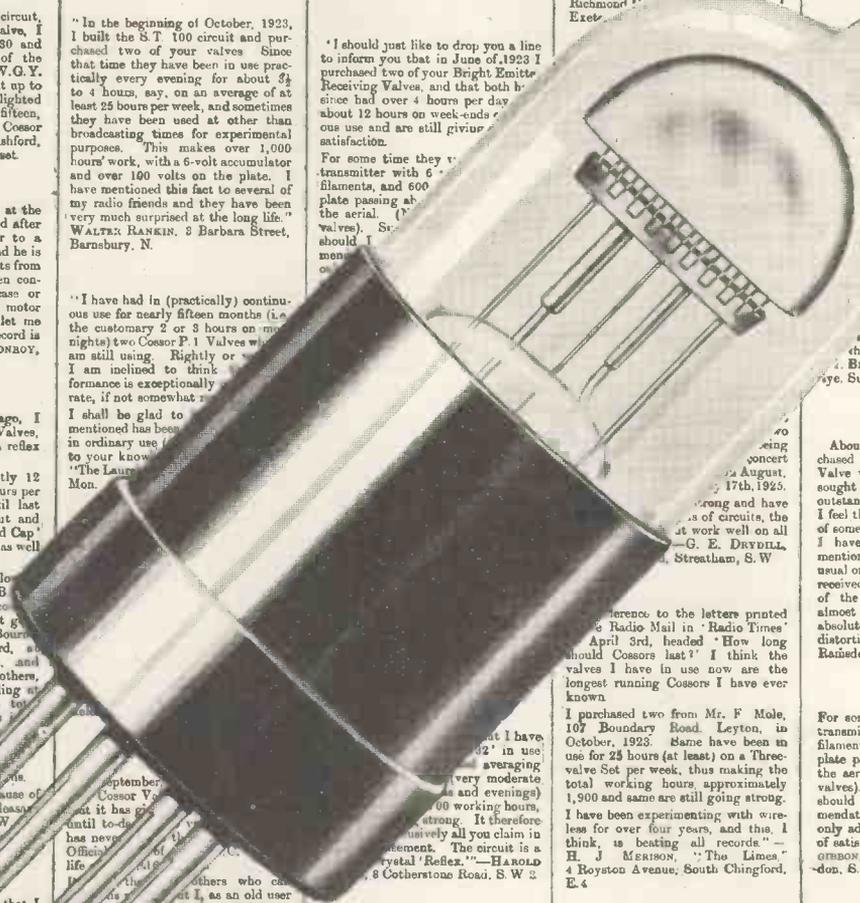
"About this time a year ago, I purchased a Cossor High Frequency Valve without any advice, for I had sought none, but merely owing to the outstanding reputation of your firm I feel that it is my duty to inform you of some of the excellent results which I have obtained from the above-mentioned valve. Employing the usual one-valve detector circuit, I have received concerts from every Station of the B.B.C. in Great Britain at almost loud speaker strength, and absolutely free from any trace of distortion."—C. A. FIELDING, 161 Ransden Road, Balham, S.W. 12.

"For some time they were used as a transmitter with 6 volts full on the filaments, and 600 A.C. volts on the plate passing about 8 to 9 amps in the aerial (No effect whatever on valves). Such a severe test as this should I think be sufficient recommendation for anybody, and I can only add my name to your large list of satisfied customers."—I. H. FRIZZGIBSON, 38 Twincross Road, Wimbledon, S.W. 20.

"In July, 1923, I bought one of your P.1 Valves which has been used ever since in a one-valve Dual Set."

According to my log, same had up to last November completed 1,500 hours use, and since that time has been used as a stage of L.F. your P.2, taking its place, and is still giving full amplification."

On this one valve I had logged just over 100 telephony stations, including seven American."—O. R. PONTING, 11 Woodcot Street, Redland, Bristol.



—now you'll choose the Cossor

Gilbert Ad. 2812.

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TRANSMITTING ON ONE METRE

(Continued from page 666)

in existence, but they are not marketed.

It will be seen in this circuit that the grid and plate of the valve are connected across the aerial and counterpoise, both of which consist of a piece of copper rod of approximately $\frac{1}{4}$ -metre long. Inductances are dispensed with, though, for experiments on wavelengths between five and ten metres, these can easily be wound from a length of wire. If the wire is stiff enough—as only one or at the most two turns will be needed—no former is necessary.

More Circuits

A circuit which will give interesting results on these wavelengths is shown in Fig. 2. The valve used here may be a four-pin valve, though it is advisable to remove the metal cap. A third circuit, Fig. 3, working on a more conventional principle is also shown.

Of course the fundamental difficulty experienced at these frequencies is in making the valve oscillate. This can only be solved definitely and with complete satisfaction by experiment. Several circuits are in existence which will solve this, but none is really reliable. Another difficulty is found in the insufficient insulation of the valve.

Aerial Systems

It does appear possible to construct a transmitter which will be independent of the length of the aerial system as low as twenty metres, but lower than that special types of aerial must be used. It will soon be found that an earth, in the accepted sense of the term, is not necessary. When using waves of one metre and less the radiation system becomes really a condenser. Two vertical copper rods, one acting as an aerial and the other as a counterpoise, form perhaps the best method known at present. Provided the extremities of both aerial and counterpoise are arranged so that the distance between them is exactly

half the wavelength one wishes to work on, no difficulty should be experienced in achieving effective radiation.

Whichever type of transmitter the experimenter elects to build, and he would be well advised to stick to a V24 valve in a straight circuit for a beginning, provided he takes care to see that there is an absolute minimum of metal about his apparatus, he ought not to have trouble. I have not dealt with the subject of transmission in detail as, using moderate power only, it does not present great difficulties.

Perhaps I should qualify that statement. Difficulties are presented, but they are not capable of solution by the amateur, for they exist chiefly in the matter of suitable valves and components.

It is in the hands of the manufacturers to overcome the obstacles in the way of producing of these.

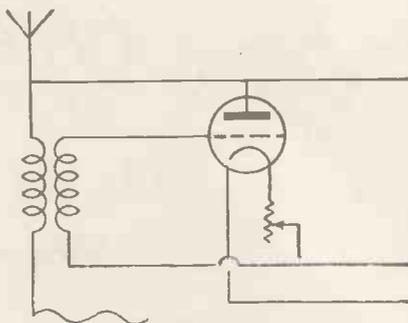


Fig. 3.—More Con.ventional Circuit.

Until that is done the practical experimenter is sadly handicapped.

As a conclusion I am giving a circuit (Fig. 4) which has been in use on my bench for some time and which will be found capable of transmitting speech over surprising distances provided the values of components are correct. The valve may be an ordinary four-pin valve. Provided the metal cap is removed, and this is not a difficult task if the operator is at all handy, it will be found that the valve will function. A word of warning is perhaps necessary here. The experimenter will discover for himself that considerably less high-tension is required when a valve is used in this way than would ordinarily be anticipated.

The plate of the valve is connected directly to the aerial and the grid to the counterpoise. Across the aerial and counterpoise is the high-tension battery, the plus lead going to the aerial. The microphone can be connected to this circuit in most of the conventional ways. I have tried several positions myself without having come to a definite conclusion as to which is the best. When last in use the secondary of the microphone transformer was connected in the grid circuit.

Ebonite Panel

This set was built on an ebonite panel, though glass would in all probability be better. I intend to try copper as soon as I can find the time.

The valve, after the metal cap had been removed, was attached in a novel manner. The pins were cut off close to the surface of the filling compound after the fine wires making connection with the elements had been detached. By soldering leads direct to the fine wires the valve will depend against the panel. A small support can easily be made if there is any fear of breakage. For keying it is advisable to connect the key in the filament circuit.

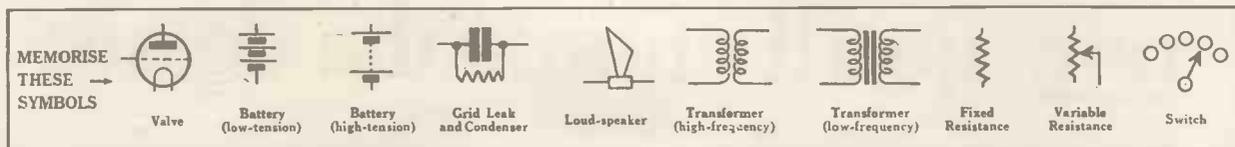
Much time and patience are required for a thorough investigation of the problems of ultra short-wave work.

Personally I doubt whether it is possible for anyone unable, like myself, to devote more than a limited time to wireless to make real headway. Even when time has been apportioned there remains the question of expense, which is not light.

Ease of Transmission

However, provided all things permit, I do propose myself to investigate seriously the possibilities of these short waves, and I can assure anyone who wishes to enter the field that he will not find it overcrowded so far as Britain is concerned, and also that he will be really astounded at the ease with which he can transmit and receive speech over distances hitherto impossible with a very limited power input.

E. C. D.



Get the *best* out of your set!

To get the best out of your set, put the best into your set. Fit the right valve for your individual needs.

The most efficient electrode system for one type of valve is not necessarily the best for other types. The electrode system of each type of the "Valve in the Purple Box" is the result of scientific determination of the best design for the conditions under which it is to be used.

A noteworthy example is

TYPE D. E. 3.

a general purpose valve for use with dry batteries, or 4-volt accumulators.

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Outstanding features:—

FILAMENT.

Although current consumption is only .06 amp., electron emission equals that of bright emitter taking over twelve times the current. The filament does not depend for its emission on a substance coated on the outside which rapidly wears away in use. The active material permeates the whole of the filament.

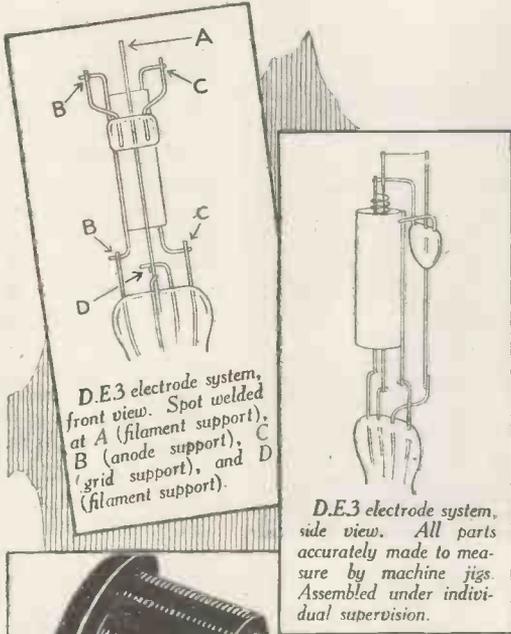
GRID.

Special machinery provides for abnormally high exactness of manufacture. Spiral grid, each turn welded to grid support. Full control over electron emission ensured.

PLATE.

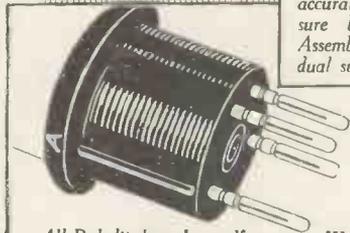
Most rigid construction employed (spot welding). Active portion of filament entirely enclosed.

The most economical valve in the World!



D.E.3 electrode system, front view. Spot welded at A (filament support), B (anode support), C (grid support), and D (filament support).

D.E.3 electrode system, side view. All parts accurately made to measure by machine jigs. Assembled under individual supervision.



All-Bakelite base. Low self-capacity. Wide collar at top (firm grip for inserting and withdrawing valve). Moulded rib on same side as anode pin (ready identification of anode pin, by touch. Obviates "burnout" due to incorrect insertion)

MARCONI VALVES

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THIS MONTH'S HEADING

THE photograph which I have used as a heading this month was sent to me by Joan Marcus, of Sutton, Surrey, who states that she gets much enjoyment out of wireless. The photograph shows Joan listening-in on the South Downs.

By the way, in the April issue of THE WIRELESS MAGAZINE, I offered a prize of 12s. 6d. for the best photograph of one of my readers taken while listening-in. The competition has not proved very successful, as so few photographs have come to hand—and what have reached me are not quite suitable—that I am compelled to refrain from making any award.

Readers should note, however, that I am always pleased to receive and consider photographs sent to me with a view of their appearing on this page. For all photographs used I will pay 7s. 6d.

CAN YOU SOLDER ?

THERE is no joint so good as a properly soldered one, and for this reason, when a wireless set is being constructed recourse should always be made to the soldering bit. After all, soldering is not a very difficult job and if the following hints are observed success should attend your efforts.

Keep your bit clean. Dirt and solder never agree.

Do not heat the soldering bit too much. If by any chance the bit becomes red hot remove all the tinning from it and retin.

To tin the bit clean the surface thoroughly and after heating it gently dip it in the flux, after which apply a little solder.

Use only resin or Fluxite. Spirits of salt will corrode your wiring in time.

Don't plaster either the solder or the flux on to the joint. Remember a little of either will go a long way.



to them the wiring up of the set should not prove difficult.—Clement B. Pulman (Bradford).

A CRYSTAL HINT

WITH a crystal set there is often some difficulty in adjusting the catwhisker when the carrier wave is being sent out from the local station without any accompanying signals. This means that one must wait until the actual broadcasting starts before a proper adjustment can be made.

The result of such a wait is that one often misses the title of the subject to be broadcast. If the "whisker" is placed in contact with the

A CRYSTAL SET WITH PLUG-IN COIL

CHEAP and easy to construct, the set described below is highly efficient and will cover any wavelength. In the original receiver the following components were used: ebonite panel 6 in. by 6 in., .0005-microfarad variable condenser, Igranic plug-in coil No. 35, an enclosed crystal detector, six terminals, and a coil holder.

The components are mounted on the panel as shown in the accompanying drawing. The dotted lines in the drawing illustrate the wiring of the set, and if reference is made

crystal, however, and the aerial terminal tapped with a moistened finger, a loud "plop" will be heard in the phones when a sensitive portion of the crystal is touched.

The louder the "plop" the better the contact between the crystal and catwhisker.—Ernest Shaw (Sheffield).

A NEW BOY BLUE

LITTLE Boy Blue, put down your horn
And please do not blow it except in the morn,
For wireless concerts soon will begin
And horn-blowing hinders our listening-in!

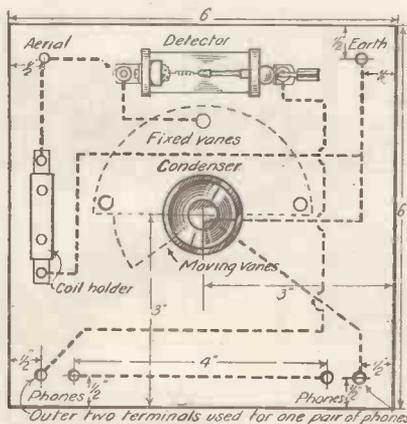
LESLIE M. OYLER.

THIS MONTH'S AWARDS

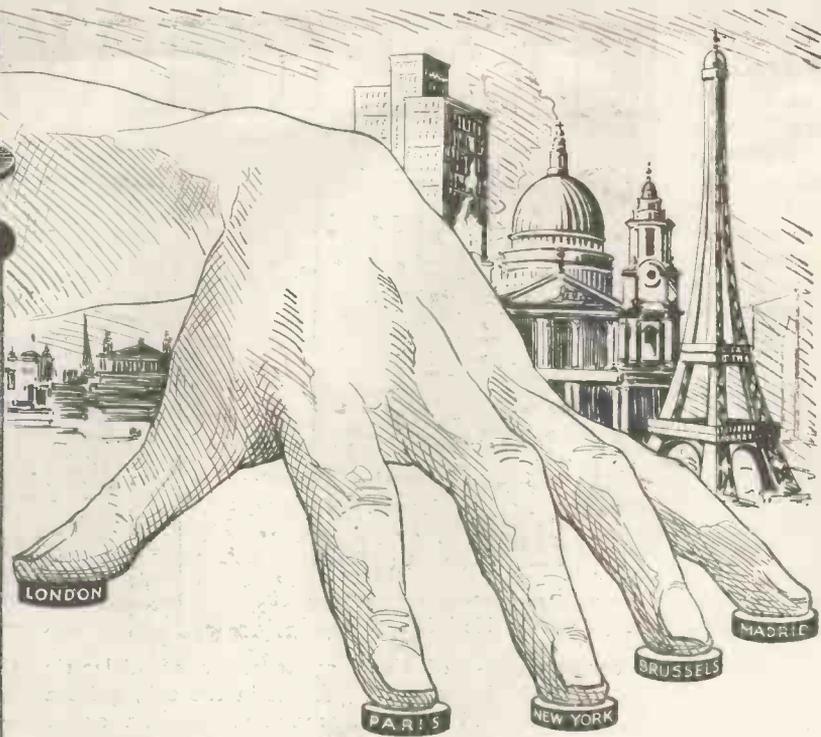
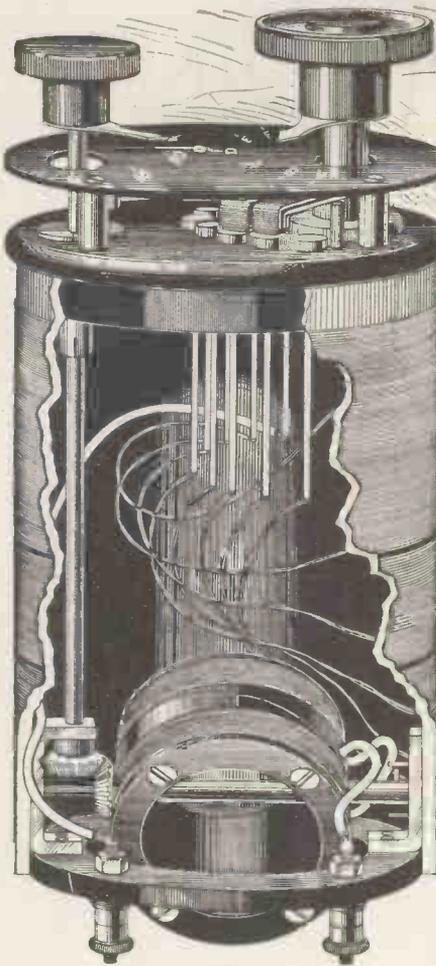
THE premier prize of 10s. 6d. for the best contribution received during the month has this month been awarded to C. B. Pulman, of Bradford, for details of the crystal set described on this page.

Other contributors whose contributions I have used will receive a prize of 5s. in due course.

LONDON is broadcasting Russian folk tales. Not with Russian whiskers on, we hope.



Layout and Wiring Diagram of Crystal Set.



All Wavelengths

Here we have a sectional view of the new *R.I.* Aerial Tuning Inductance with variable Aerial Reaction designed for panel mounting and covering a wavelength range of from 175-4,000 metres.

The unit is better and in addition is cheaper than a complete set of coils. It comprises a cylinder of paxolin on which is wound a number of turns of silk-covered wire, with eight tapping points leading to a special dead end switch fitted in a panel which is secured to one end of the cylinder. The aerial reaction is operated from the front of the panel by means of a fine bevelled gearing which gives a beautiful smooth action, allowing adjustment to the finest degree. A large black ebonite dial, suitably engraved with two scales, one indicating the tapping points and the other degrees of reaction, is supplied with each instrument, and can be used as a drilling gauge for fixing the unit to the panel of the receiving set.

This *R.I.* component ensures correct and efficient aerial reaction over the entire range of wavelengths in a manner almost impossible with plug-in coils. The special dead end switch entirely eliminates all energy loss, and when used in conjunction with a variable condenser it practically forms a complete receiving circuit.

THE **RI**
AERIAL TUNING
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PRACTICAL COIL WINDING

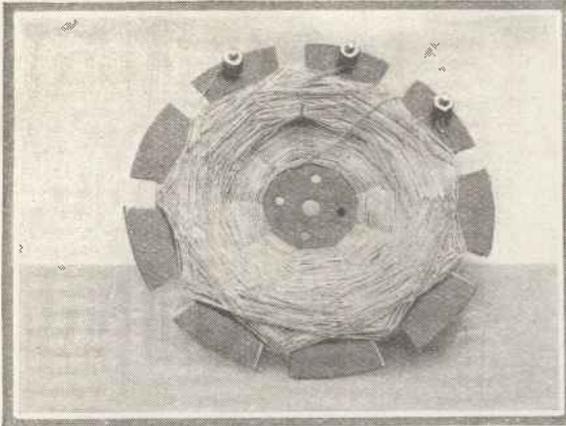


Fig. 33.—Coil with Single and Double Winding.

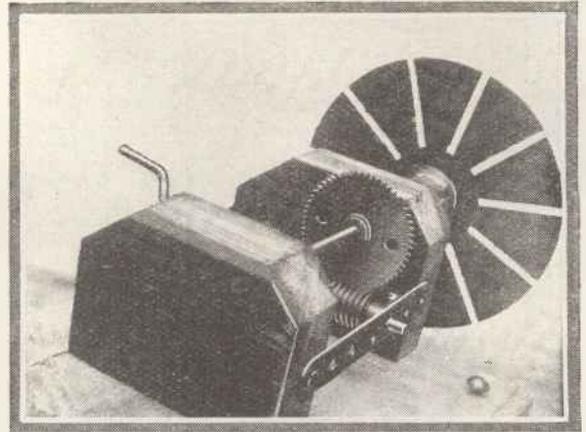


Fig. 34.—View of Worm-gear Winder.

THE disc former is a common support for a basket coil. It is usually a permanent support, i.e. it is used to wind the coil and remains to hold it in position on the receiving set.

Sizes of Formers

The sizes of the slotted formers vary from 2 in. to 4 in. in diameter, with the centre blank spaces from $\frac{3}{4}$ in. to 2 in. in diameter. It is obvious that it is necessary, where a large number of slots are employed, to increase the size of the centre hub, otherwise the slots will leave little or no material to support the wings or sectors.

Formers may be made out of thin cardboard, sheet ebonite or fibre. The writer has seen formers made of $\frac{3}{8}$ -in. wood, but this material is not to be recommended. Independent

of the large amount of dielectric material present in the coil, quite a lot of time may be spent on a former of this kind, only to have it split in two along the grain just as it is being finished.

dried out, shellac varnished, and hardened by baking. So long as the coil is to be finally employed in a dry room, the wire itself need not be varnished or waxed. Disc formers stamped out in fibre and ebonite are purchasable in various sizes.

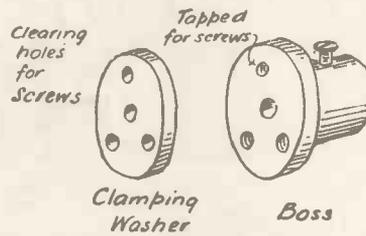


Fig. 37.—Clamp for Discs.

As in the case of the peg spider, the disc must be slit into an unequal number of parts, nine, eleven, thirteen, even twenty-five sectors may be employed.

If cardboard is used it must be

Single and Double Windings

The single or double formation already described for peg formers may be employed and, as shown in Fig. 33, coils with both systems of winding are to be found. The coil illustrated has three terminals with a tapping loop taken out to the centre one from the end of the inner single winding.

Owing to the narrowness of the slots between the sectors it would be a rather troublesome job for an amateur to make an automatic

(Continued on page 674)

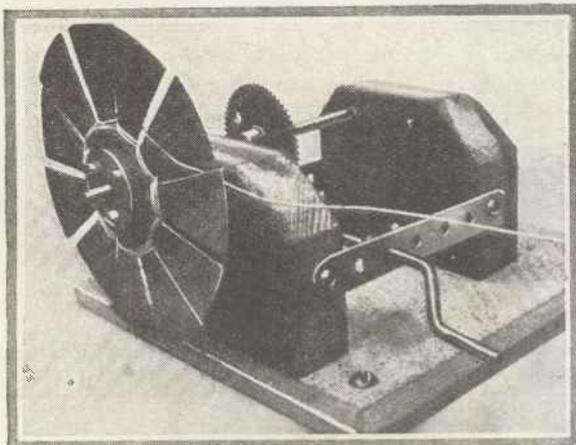


Fig. 35.—Another View of Winder.

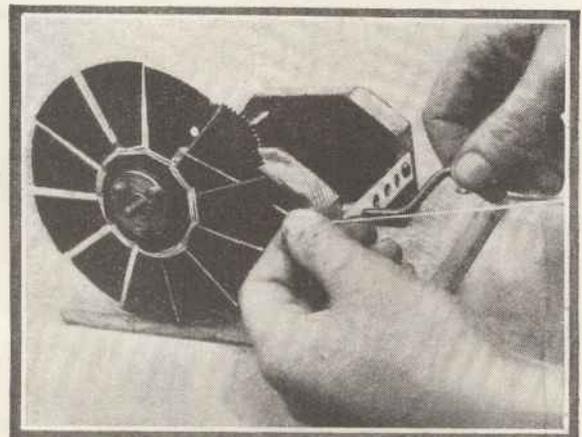


Fig. 36.—Winding a Coil.

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EDISWAN is the connecting link between your home and far-distant lands.

If you cannot get abroad—travel in your armchair with an Ediswan Loud Speaker—and reach still further with Ediswan Valves.

The era of general long-distance reception is here, and with the aid of Ediswan Valves the possibilities of your Set are unlimited.

Even if you have to replace inferior valves with Ediswan, the outlay will be worth your while—the mere turn of a condenser dial will “bring in” stations previously out of range.

Be proud of your Set—and make it worthy of your pride by adding the name of quality—

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R.	11/-	8/-	P.V. 2	35/-	22/6
A.R.D.E.	18/-	14/-	P.V. 3	22/6	22/6
A.R.O. 6	21/-	16/-	P.V. 5 D.E.	30/-	22/6
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Practical Coil Winding

(Continued from page 672)

winder for disc former coils, and therefore the hand method of interlacing is recommended. A spindle driven by a worm wheel is suggested, as shown in Figs. 34 and 35 (see also Fig. 17 *ante*). The former must run slowly to allow time to get the wire into the slots (Fig. 36). The bobbin holder of the style illustrated in Fig. 13 may be also pressed into service. To hold the discs on the spindle a simple clamp may be made on the lines of that used in the winder (Fig. 37). This comprises a flanged boss drilled for the spindle and provided with a set screw to grip the shaft and a

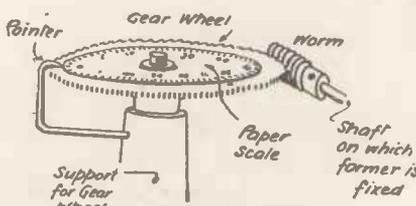


Fig. 38.—Simple Counter.

front removable washer plate to grip the former secured by two or three $\frac{1}{8}$ -in. or No. 4 B.A. screws or bolts.

A wooden boss of the same construction can be used where the requisite metal working tools are not available.

The slots in the former should be as smooth as possible. The edges of the stamped fibre and card formers are often rough and jagged when purchased, and the wire, in winding on, does not run easily to the bottom of the slots. It requires constant pressing down into place, which, of course, slows down the process of winding. The edges should therefore be rubbed smooth with glass-paper before commencing the winding operation.

Counting Turns

Where any form of winder is employed for making tuning coils, the addition of a counter is quite an easy matter, and is to be desired. Although it is not difficult where one of the stouter gauges of wire is used to count the turns or layers after a coil is wound, or during the operation, a mechanical device which will do the work automatically will relieve the operator of the necessity of counting. He can then give his undivided attention to the proper

disposition of the wire during the process of winding.

The simplest form of counter is to fit a worm on the spindle carrying the former (Fig. 38), and to mesh into it a gear wheel having the largest number of teeth that it is possible to get hold of—a clock wheel, for example. The worm wheel may be a short length off the screwed end of any suitable bolt. The thread must mesh more or less accurately. With an ordinary thread (single pitch) the ratio of the turns will depend on the number of teeth in the gear wheel. With a fifty-tooth wheel, the former spindle will rotate fifty turns to one of the wheel. A paper scale may be stuck on the gear wheel to rotate under any fixed pointer. The scale should be divided into spaces equal to the number of teeth in the gear wheel, and figured every five turns from a zero mark. A standard Meccano worm and a large gear wheel can, of course, be used; the e are obtainable almost anywhere.

In counting the turns it is best to work at the side of one of the pegs of the spider, or in the centre of one of the sector vanes in case of a disc counter. The total number of layers is equal to the number of wires visible on each side added together, less one.

Wire for Basket Coils

Very thin wire should be avoided for tuning coils owing to the resistance created. For the smaller coils of thirty to forty turns No. 22 to No. 24 gauge wire can be used. For larger 75 to 120 turns No. 26 gauge wire is suitable, while finer wire than No. 30 gauge should, if possible, be avoided.

H. GREENLY.

RIVALRY is said to exist amongst the Scottish stations. So that for Dundee's new series of talks on "Bees" we may expect Glasgow to come along with a stinging retort.

FROM Nottingham a professor has been speaking about the Romance of Trade. We always thought that romancing about trade was purely the province of the commercial traveller.

SEVERAL speculations have been made as to the identity of the man who will perfect television. We are giving away no secret when we say that he will certainly not be a married man.

Do You Get the Juice You Pay For?

THERE is an old saying to the effect that if you want a job done properly you must do it yourself. This particularly applies to accumulator maintenance. The general public is almost entirely reliant upon battery-charging stations for its filament current. There is no person who has greater scope for dishonest trading than a dishonest accumulator charger, and it is up to the amateur to see that he gets value for his money.

Beware the Voltmeter!

The only way to do this is to purchase an hydrometer, for a voltmeter does not show the amperage of a cell in spite of the fact that it often purports to show a voltage much in excess of the rated battery voltage. The writer has known unscrupulous battery chargers to keep a fast voltmeter in order to give the innocent customer the impression that his accumulators have been thoroughly charged.

The intelligent use of an hydrometer prevents such false representations. The small-capacity accumulator with its small orifice renders it necessary to employ an hydrometer placed inside a large glass pipette with a rubber bulb at one end and a tube at the other like an enlarged fountain-pen filler. The nose or tube of the instrument is inserted in the fluid electrolyte and sufficient drawn from the cell to allow the hydrometer to float freely inside the pipette.

Specific Gravity

The specific gravity of the acid as indicated by the hydrometer should be 1.2 to 1.21 when properly charged and, if the indication is much below this, the cells need further charging to bring up the gravity. When in use the specific gravity of a cell should never be allowed to fall below 1.17, otherwise it may be seriously damaged.

If the hydrometer is a reliable one, it offers an infallible method of checking off the thoroughness of the work of the charging station. A voltmeter will always show an increase in voltage over the maximum if the volts are measured immediately the cells are disconnected from the charging board.

A. J. C.



Upon the river's bank serene,
A fisher sat where all was green,
And looked it.

He saw when light was growing dim,
The fish, or else the fish saw him,
And hooked it.

He took with high erected comb
The fish, or else the story, home,
And cooked it.

Recording angels by his bed,
Weighed all that he had done or said—
And booked it.
ANON.

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that counts.'



1211

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675



What the Reader Thinks

At Last!

To the Editor of "The Wireless Magazine."

SIR,—I am glad to see stated in the May issue of THE WIRELESS MAGAZINE that there is hardly anything in the choice between L- and T- type aerials.

After some experimenting with aerials in the suburbs of London, I arrived quite definitely at this conclusion, but have had to wait some time before finding it definitely stated in print that such was the case.

I may say that the small variometer crystal set described in the same issue was run up with the help of a friend on the day after the publication of the magazine, and has proved most successful.

At a distance of $4\frac{1}{2}$ miles N.W. of London, with a good aerial and a fairly good earth, the crystal set alone (without amplification) brought in 2 L O at considerable strength on a medium-sized loud-speaker!

The crystal used was the new R.I. "P.M." detector, which was mounted below the panel.—H. Sinclair (London).

"The Goods"

SIR,—Congratulations on No. 4 of THE WIRELESS MAGAZINE. I have reduced my wireless library to one magazine per month now—and that is, without doubt, "the goods."

I should like to make a few passing remarks with reference to a new type of wireless trouble—in fact, a new specie of wireless maniac rampant just now, beside which oscillators and interference merchants fade into insignificance.

We in this progressive village are continually getting fresh crops of listeners and with each crop appears a "knowledge box." He is a dreadful chap to encounter—armed with his fortnight's crystal experience, and a pocketful of trader's pamphlets, he stalks about the district laying waste to all data and theories used hitherto. He hears *all* the stations

with the greatest of ease; his volume is unbearable; his aerial the highest and the longest.

The secret of his success, however, he withholds. He abounds in suggestions that would easily revolutionise wireless. Would you advise the formation of a local firing party?—"Condenser" (Earlestown).

On a One-valver!

SIR,—At present I am using an ordinary single-valve reaction set, and receive all the main B.B.C. stations, Radio-Paris, Eiffel Tower, Madrid, Copenhagen, Liepzig, Hamburg, Munich, L'École Supérieure, Le Petit-Parisien, and Hilversum, as well as a good many stations I have not yet identified.

As the days lengthen D.X. stations begin to drop off, and I shall not be able to log many more continental stations until next year, when I hope to get America (?).

Can any reader beat these results on a single-valve set?—D. S. Fountain (Horsham, Sussex).

More Appreciation

SIR,—I feel I must write and congratulate you upon the excellence of your new production. Particularly do I wish to thank the members of your technical staff who were responsible for the design of the two-valve Reinartz receiver described in the March issue.

I have made up many sets from descriptions given in various periodicals, but none of these have given me the same satisfaction and pleasure in handling as the set above-mentioned.

VALVES FOR LETTERS

Mullard Valves have been awarded to the writers of the letters printed on this page. The writers of the letters printed next month will receive Marconi-Osram Valves.

The current issue of the magazine is even better than the previous issues, and if quality be plotted on a time base then the slope of the quality-time curve is increasing. May the success of THE WIRELESS MAGAZINE continue.—J. Ward (Pinner, Middlesex).

With a Counterpoise

SIR,—I have erected a counterpoise, and although I am within 200 yards of 5 N G (Nottingham), with a fixed coupler without wave-trap, I can dim that station to a minimum, and bring in 5 I T and 6 B M with only a faint undercurrent from 5 N G.

This, I think, proves the selectivity of the counterpoise. I also find that distant stations come in far better since I have used the counterpoise.

With a home-made two-valver I have logged three French, three Spanish, one Italian, three German, three American, and all the B.B.C. stations.—J. Ironmonger (Nottingham).

The Need for Esperanto

SIR,—Most important stations give lessons or talks in English and other national languages, besides the language of the country of origin. This is well, and is a feature likely to increase in importance. It is, however, noteworthy that a glance at any list of Continental programmes will give a number of talks in Esperanto also.

Esperanto is, in fact, increasingly used for international communications.

It is, indeed, obvious that with the increasing number of national languages broadcast there must be felt ever more strongly the need for the neutral international language, easy for all peoples, understood and used throughout the entire world, which can be mastered in a small fraction of the time necessary for the acquirement of any national language.—M. O. Butler (Secretary, The British Esperanto Assn., London).

Wireless Femininities

(Continued from page 654)

fact that it's an infinitely pleasant part doesn't mean that a change of amusement wouldn't be wise.

Holidays are meant for outdoor, active pastimes, or for lazing, according to one's work—not, in my humble opinion, for doing the things one does at home. So why bother about ingenious temporary aerials—why not, for a brief while, make your own happy music of singsongs and laughter? Or, if you must have the kind that is manufactured for you even on holiday, take a portable gramophone—not that it's better than wireless, but just for a change.

The pleasure of coming back to listening-in evenings, after a week or two's abstinence from them, will be some compensation for being obliged to return to work.

Do Americans Hustle?

America, in using the word "radio" where we use "wireless," is following out her usual plan of always choosing for common use the longer of two available words. For, though "radio" is shorter to write than "wireless," it has an extra syllable and is longer to say.

The same tendency is apparent in such words as "elevator," "apartment," "automobile," "transportation," the English equivalents, "lift," "flat," "motor," "transport," being in every case much briefer.

The truth, so far as I discovered it during extensive travels in the United States some years ago, seems to be that the Americans talk hustle and practise it in a few spectacular ways, such as lightning lunches, but that it is the English who are the real masters of short cuts, lingual or otherwise. I found nothing more disconcerting in America than the fact that it is impossible to take a short cut anywhere, thanks to the right-angled principle on which their towns are built. Far from cutting off corners, streets laid out in squares create them. A. M. M.

MANY motor-cars will carry wireless sets this summer, it is said. And chars-à-bancs will carry their loudspeakers, as usual, it may be presumed.

The Pioneer

ALL too rarely the pioneer receives recognition for his great services to civilisation. Onward he trudges across the snowy wastes, seeking out earth's secrets for the benefit of his fellow-men . . . But Eureka—the pioneer of a new era in transformer design—won instant recognition. Its long lead in tonal purity, robustness of design, superb workmanship and exceptional amplification is still unchallenged. Your Set deserves a good Transformer—invest in a Eureka to-day.

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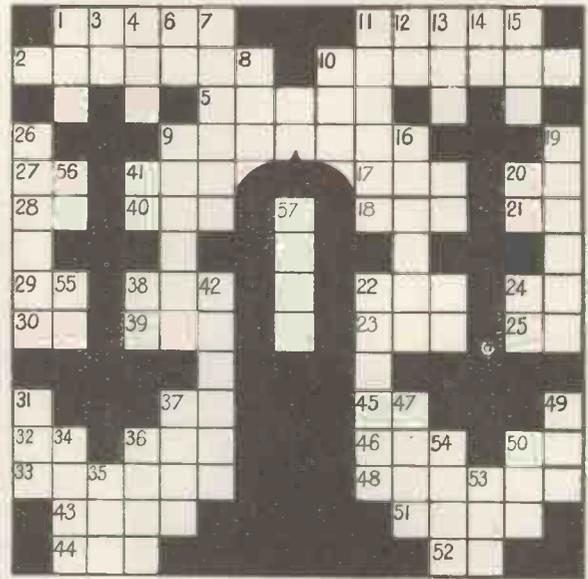
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Our Cross-word Puzzles

The puzzle we set our readers this month is the one compiled by Mr. C. Cater Turner, of The School House, Cranbrook, Kent, another successful competitor in our February contest. The pattern of the puzzle takes the form of a valve holder together with the aerial and earth symbols. It is not a very difficult puzzle, and readers possessing an average knowledge of wireless should not be long in arriving at its solution.

Please note that no prizes are offered for correct solutions of the puzzle given here.

On this page will also be found the solution of the puzzle given last month.



Mr. G. Cater Turner's Puzzle.

CLUES FOR THIS MONTH'S PUZZLE

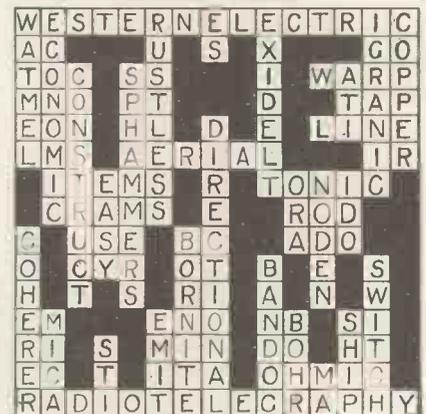
Down

- 1.—Strength of signals (abbrev.).
- 3.—Indefinite.
- 4.—Licentiate of dental surgery.
- 6.—Victorian Order.
- 7.—Electrical or otherwise.
- 8.—Receiver.
- 9.—Collector of 7 down.
- 10.—Half of name of wireless firm.
- 11.—What one's blood does when the local oscillator gets to work.
- 12.—For example.
- 13.—Australian stations heard here on a crystal.
- 14.—Double-barrelled.
- 15.—What a pirate is.
- 16.—One who does 11 across.
- 19.—What THE WIRELESS MAGAZINE does.
- 20.—Defender of the faith.
- 22.—What a rheostat should do.
- 24.—What sets are at 7 p.m.
- 26.—What a coherer does.
- 31.—Wireless manufacturers.
- 34.—Throw.
- 35.—American call sign.
- 36.—What wireless is not.
- 37.—Come in contact with.
- 38.—Thanks.
- 41.—Writtle letters.
- 42.—Useful in wireless.
- 47.—Rhyme.
- 49.—Made near by wireless.
- 50.—Paid annually.
- 53.—Samuel Taylor Coleridge.
- 54.—A pre-wireless prophet.
- 55.—Oscillating current.
- 56.—London letters.
- 57.—Appropriate.

Across

- 1.—Rectifier.
- 2.—Belonging to 2 L.O.
- 5.—Home at 2.30 a.m.
- 9.—Heard any day.
- 10.—WBZ on two valves.
- 11.—Transmits.
- 17.—Used in summoning family to listen.
- 18.—Closing down.
- 20.—French call sign.
- 21.—Low consumption.
- 22.—High-frequency valve top.
- 23.—Before.
- 24.—Secondary ter-

- minal.
- 25.—In the direction of Stockholm.
- 27.—Initial letter of 2 L.O.
- 28.—To find the next page in THE WIRELESS MAGAZINE (abb.).
- 29.—Chartered accountant.
- 30.—Where to learn technicalities.
- 32.—Modulated C.W.
- 33.—One who spoils reception.
- 36.—Can be done by wireless.
- 37.—One who discusses the licence problem.
- 38.—Condenser in the plate circuit.
- 39.—France calling.
- 40.—Attempt.
- 41.—Million (ohms).
- 43.—Notch in panel.
- 44.—Paris from London.
- 45.—Primary terminal.
- 46.—Assistance please.
- 48.—A question answered by THE WIRELESS MAGAZINE.
- 50.—Fourth note of octave in sol-fa notation (5 I T testing).
- 51.—What some sets are.
- 52.—Lower case (abbrev.).



Solution of Last Month's Puzzle.

Catalogues and Pamphlets

When writing for these Catalogues, mention
THE WIRELESS MAGAZINE, please.

LEAFLETS describing wavemeters, high- and low-frequency amplifiers and a host of other wireless components may be had from Leslie Dixon and Co., 9, Colonial Avenue, Minories, E.1.

Combined filament rheostats and variable grid leaks are fully described in a publication issued by the Igranic Electric Co., Ltd., 149, Queen Victoria Street, London, E.C.4.

The full range of Brown telephones, loud-speakers, amplifiers, etc., is described in the new catalogues obtainable from S. G. Brown, Ltd., Victoria Road, North Acton, London; W.3.

All interested in Loewe Audion valves should write for the folder describing these valves to The Audion Radio Co., 52, Dorset Street, London, W.1.

Ripaults, Ltd., of King's Road, St. Pancras, London, N.W.1, have recently issued a catalogue which contains full particulars of the Ripault components.

Readers contemplating the building of a Tropadyne receiver should write for a list of parts and prices to Will Day, Ltd., 18/19, Lisle Street, London, W.C.2.

Condensers, both variable and fixed, are fully described in a list obtainable from The Dubilier Condenser Co., Ltd., Ducon Works, Victoria Road, North Acton, London, W.3.

Fuller's United Electric Co., Ltd., of Chadwell Heath, Essex, will send a pamphlet describing their Redline "Leakfree" panels on request.

A new edition of the publication on Marconi-Osram valves may be had on application to the Marconiphone Co. Ltd., Marconi House, Strand, London, W.C.2.

Fuller's United Electric Works, Ltd., of Chadwell Heath, London, E., have issued a revised edition of their Sparta Radio Accessories List. Copies may be had on request.

A leaflet describing several useful types of steel aerial masts may be had from Hamilton May, Weybridge, Surrey.

The Ultronic Autocoupler, a new tuning device, is fully described in a leaflet obtainable from the Igranic Electric Co., Ltd., 149, Queen Victoria Street, London, E.C.4.

Beard and Fitch, Ltd., of 34, Aylesbury Street, E.C.1, makers of the famous Supersuccess transformer and other well-known components, will send a catalogue of their specialities on request.



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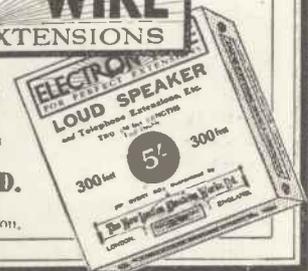
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If you have any difficulty in obtaining real ELECTRON WIRE, order direct from us. Extension Wire in 300 ft. lengths at 5/- (two lengths of 150 ft. twisted), or in 500 ft. lengths at 8/- (two lengths of 250 ft.)



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What Readers Think of Our Sets

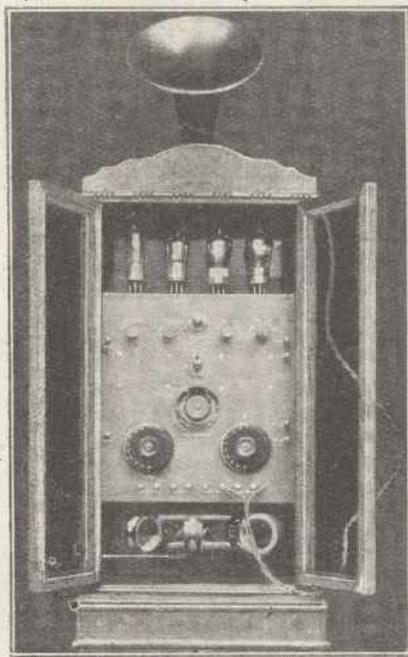
Special Reinartz Two-valver
I HAVE made up the special Reinartz two-valve receiver described in the March issue of THE WIRELESS MAGAZINE and have received on it practically all the B.B.C. stations and many Continental ones.

By adding a further stage of L.F. amplification all these stations come in on the loud-speaker.—Henry Drummond, (Glasgow.)

I get excellent loud-speaker results on the special Reinartz two-valver and have so far logged about twelve Continental stations, including Rome (1 R O).—A. F. Vince, (W. Norwood, S.E.)

Power Amplifier

I feel I ought to write and tell you how much I appreciate the description of the power amplifier in THE WIRELESS MAGAZINE for



Mr. E. Brewster's Four-valver.

May. The results obtained are really remarkable.

Stations, which before the amplifier was added could just be heard very faintly, now come in with a roar. I am very much struck with the total lack of distortion when

this amplifier is used.—D. B. Farr, (Ross-on-Wye.)

As Good a Set as Money Can Buy

Enclosed herewith are two photographs of "As Good a Set as Money Can Buy," made from the instructions given in the February issue of THE WIRELESS MAGAZINE. The results with the set are splendid.

I had no trouble in following the coloured diagram and the results were worth the trouble taken in making the set up. The .0005-microfarad and .00025-microfarad condensers are home-made and the cabinet, the size of which is 24 in. by 14 in. by 9 ins., I made myself.

The main panel is 13 in. by 13½ in. and the valve panel 13 in. by 3 in.—E. Brewster, (Watford.)

I have completed the set "As Good a Set as Money Can Buy" described in THE WIRELESS MAGAZINE for February, and am very pleased with its performance.—Samuel C. T. Gooding, (Friston, Saxmundham.)

A Reflex Set with Valve Detector

You will no doubt be interested to hear of the remarkable results I have obtained with the reflex set with valve detector described in the February issue of THE WIRELESS MAGAZINE.

The results are all the more remarkable in view of the fact that I am unable to erect an outdoor aerial and have to be content with a length of wire stretched across a room. In spite of this, however, I can tune-in Cardiff, Bournemouth, London, Birmingham, Manchester, Newcastle, Radio-Paris, Le Petit Parisien and several (as yet) unidentified foreign stations. Chelmsford simply comes in with a roar.

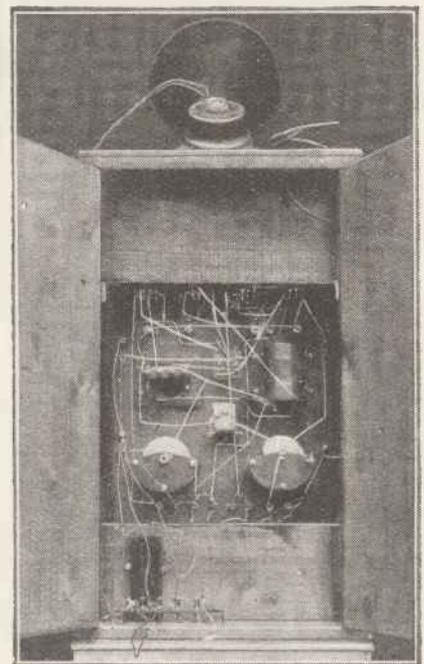
All the stations mentioned have been received with the set while using three pairs of phones. The set is very selective—5 X X and Radio-Paris can be tuned-in without a trace of each other—and quite stable, and for range and volume it will be hard to beat.—G. Attfield, (Swindon, Wilts.)

A Loud-speaker Three-valver

I hardly know how to describe my feelings when, on switching on for the first time the loud-speaker three-valve set described in the May issue of THE WIRELESS MAGAZINE, I received within an hour all the B.B.C. stations with the exception of Manchester. To say the least, I was very surprised—and delighted.

I was amazed at the strength at which the various stations came in, Bournemouth and Newcastle especially. The German stations, Le Petit Parisien and L'Ecole Sup. des Postes et Telegraphs were also tuned-in very loud.

All these results were obtained on an aerial comprising 60 ft. of Electron wire 20 ft. high. I have had some experience with various sets, but your three-valver wants some beating.—Edward P. Farr, (Dover.)



Back View of Mr. Brewster's Set.

THE broadcasting of Covent Garden Opera may be all right, but the microphone merchants will have to be exceedingly careful that they don't pick up any of the overflow from Covent Garden Market.

TWENTY-FIVE YEARS  MANUFACTURING EXPERIENCE

"ORMOND"

"ORMOND"

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Ormond Low Loss Condensers

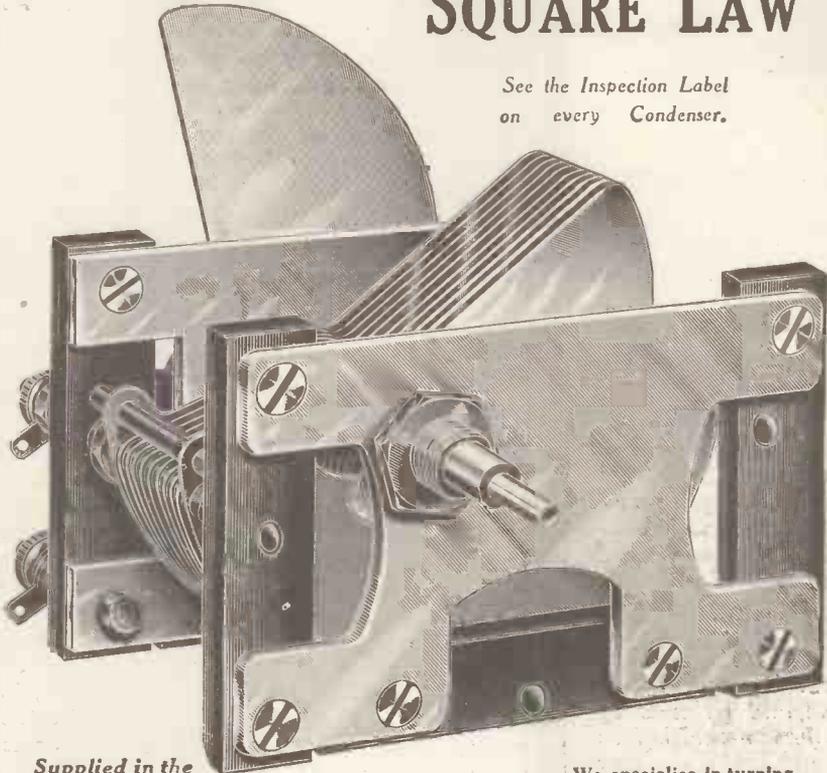
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- (6) Moving vanes and end plates are at earth potential.
- (7) One-piece knob and dial— supplied loose. Secured by 4 B.A. Set Screw.

This Condenser is fitted with optional soldering Tags, or Terminals, and can be supplied with or without Vernier as desired.

There is no variation in price, the prices being the same as our ordinary Square Law Condensers.



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Supplied in the following sizes:

Size	Price with Vernier	Price without Vernier
.00025	8/-	6/6
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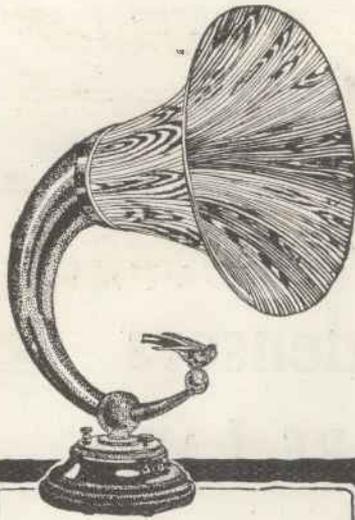
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Continental Notes

I REALLY do not know what has happened to "Radio-Belgique" of late. (Of course, one always blames the station before any accusation is levelled against a pet wireless receiver.) For some reason, I do not appear to be able to hold the transmissions for any length of time, and—believe me or not, as you please—it is a pity.

Some of the concerts broadcast by Brussels have been exceptionally good recently, and note should be made of Tuesday in each week, which is a gala night, and to the programme of which some of the most noted singers of the Theatre Royal de la Monnaie contribute.

As to reception in my district, I am inclined to believe that, on some occasions, I get interference from Malmoe on 270 metres, for I cannot realise that Joenkeoping, the "250-watter" relay, although on exactly the same wavelength as Radio-Belgique, should trouble me much. (Yes—we have no "super hets"!)

Those Abbreviations

In an article written for the benefit of amateur transmitters, a Belgian wireless journal recently published a list of abbreviations, as usually employed by ships' operators, for communication with other sea-borne craft.

For some reason, the most important of these "shorthand expressions" were omitted, but in other instances the equivalents were given in the French language. I could not help smiling when I read the translation of OM (old man) as Monsieur and OW (old woman) as Madame.

It struck me that the latter appellation would not be frequently used, but if literally transcribed and handed to the addressee of a telegram, might cause friction. For the benefit of foreign amateurs, I am inclined to suggest that other unofficial abbreviations could be adopted. "Pet" would need no curtailing, and "darling" might be conveyed by D G, but, in the latter case, confusion might arise; it might be thought that the transmitter was referring to a member of the canine tribe.

The English language has been so widely adopted by both professional and amateur transmitters the world over that it is hardly likely that either Ido or Esperanto would prove a serious competitor.

For purposes of communication our language is pithy, terse, and, perhaps, the most practical of all, as we possess the knack of using one single word to convey the full meaning of what other foreign tongues can only express in a "ten cylinder" periphrasis.

Spanish Transmissions

Listeners who pride themselves on their ability to tune-in Madrid nightly will shortly have more opportunities of listening to Spanish transmissions. Broadcasting has taken that country by storm, and if the plans of the "Union Radio" are carried out, stations will spring up like mushrooms all over the Iberian peninsula.

Madrid, Barcelona, Seville, and Valencia will boast of 4-8 kw. transmitters, and the following cities and towns will also be in the running: Corunna, Oviedo, Santander, St. Sebastian, Saragossa, Murcia, Pampeluna, Sagrono, Valladolid, Salamanca, Grenada, Cordova, Malaga, Palma de Majorca, and Santa Cruz de Tenerife.

Some of these may turn out to be relays, but I do not think that I have forgotten any, and, for your guidance, two which I have not mentioned, Cadiz and Bilbao, are already in operation. Up to the present, Germany has held the record for ambitious plans, but with Spain, as a healthy competitor, she will have to look to her laurels. Oh, what a congested broadcasting band! What is to be done about it? Wake up, Geneva!

On three occasions when I have picked up that charming voice which is borne on 1 RO's ether wave, I have heard a different station call. One night last week I took it down phonetically, and it sounded like: "La Radio Gostrina Roma di Italia." It certainly was not "Radio Roma" as it has been up to the present. Or was this for certain special occasions? *Chi lo sa?*

Broadcast Plays

The broadcast of plays on the Continent has become a special feature of the weekly programmes, but in most countries the transmissions have been made from the studios, as the same difficulties have arisen with the theatre managers as experienced on this side.

Taken all round, most of the foreign stations have been merely adapting stage productions for broadcasting, and, so far as I can gather, Paris alone has broadcast short thrillers specially written for wireless transmission. As a matter of fact, the policy adopted by the German "Rundfunk" does not appear to meet with general approval, and the listening public is complaining that it is somewhat "fed up" with classical comedies and tragedies.

As an innovation, Berlin (Vox Haus) has started a Junior Dramatic Repertory Company which interprets the masterpieces of Schiller and Goethe every Saturday afternoon.

Whether this will interest the licence holders is a moot point, as although such histrionic efforts on the part of the young Fritzes may be very laudable, the result must be somewhat similar to a production of *Hamlet* or *Julius Cæsar* by the Bindlethorpe-cum-Slusherton Amateur Theatres.

Out of courtesy, if invited, we do sit these shows out, as some near relatives may be included in the caste, but—do we really deserve it?

Complaints

Many complaints have been received by Brussels concerning the poor reception of its concerts in certain parts of Belgium. This will be remedied, in view of Radio-Belgique's decision to transfer the present 1½-kw. transmitter to Antwerp and to erect a relay at Liège, in order to feed the Walloon part of the country.

Until a new station of higher power is built on a site in the immediate neighbourhood of the Belgian capital, that city will have to be content with a 200-watt relay. It is quite on the cards that transmissions from Antwerp will come over the ether with much greater power, and that we may find ourselves listening to the Scheldt station with as great a facility as we do to concerts broadcast from Paris.

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Wire for Potentiometer

Q.—What gauge and how much wire must I use in constructing a 300-ohm potentiometer?—A. H. P. (Glasgow).

A.—Wind twenty-seven yards of No. 36-gauge enamelled Eureka resistance wire upon a wooden or erinoid bobbin 4 in. long and 1 in. in diameter.—L. A. C.

Loud-speaker Condenser

Q.—What capacity condenser do you advise for use across the loud-speaker terminals? I am using an Amplion junior model.—R. S. (Surrey).

A.—Different capacity condensers have varying effects upon the quality of the music reproduced.

Several capacities should be experimented with, but the best value for this make of loud-speaker has been found to be .006 microfarad. The design of the amplifier plays an important part in this matter.—L. A. C.

Reflex-set H.T. Condenser

Q.—In the reflex receiver described in the April number of THE WIRELESS MAGAZINE you specify a .5-microfarad condenser for H.T. As I am unable to obtain this capacity will you suggest a suitable substitute?—R. C. L. (London).

A.—Any large-capacity condenser may be used across the H.T. battery terminals of this receiver, a 1- or 2-microfarad Mansbridge type of condenser being quite suitable.—L. A. C.

Potentiometer Resistance for Four-valve Set

Q.—I am making the four-valve set described under the heading "As Good a Set as Money Can Buy." Will you please tell me the value of the potentiometer in ohms?—T. A. F. (N. Wales).

A.—The resistance of the potentiometer should be 300 ohms. A larger resistance instrument may, however, be used without detriment.—P. S.

Valve-crystal Reflex Set

Q.—What is the correct value for the anode tuning condenser for the highly selective valve-crystal reflex set described in the April issue of THE WIRELESS MAGAZINE?—M. N. (Dorset).

A.—Owing to a draughtsman's error the value given on the coloured plate was incorrect. This should read .0003-microfarad capacity, and not .0002-microfarad as shown.—L. A. C.

Points in Wiring

Q.—When wiring up a receiver, what are the important points to be borne in mind?—F. E. L. (Devon).

A.—Use thick tinned-copper wire, keep all wires as short as possible consistent with good spacing, solder all connections that cannot be clamped under terminals, do not use excessive flux when soldering, and always wire up the filament circuits first.

By following the last suggestion correct wiring of the filament circuits will be assured and, in addition, all other wiring carrying H.F. currents is raised above the panel.—L. A. C.

Tuning-condenser Capacities

Q.—Less than a year ago one was always advised to use a .001-microfarad capacity variable condenser for aerial tuning, whereas now one seldom sees an aerial tuning condenser rated above .0005 microfarad. What is the reason for this?—P. F. (Brighton).

A.—Tuning condensers introduce certain losses apart from faults in their design. It is necessary to employ some capacity in every tuning circuit in order to ensure a good oscillatory circuit, but apart from this consideration it is essential that the total capacity be kept as small as possible.

Greatest potential energy is obtained when the ratio of inductance to capacity is large.—X.

Correct Condenser Connections

Q.—I am building the four-valve set described in No. 1 of THE WIRELESS MAGAZINE, but am uncertain about the wiring up of the moving and the fixed plates of the variable condensers. Will you please advise?—T. P. (Manchester).

A.—The moving vanes of the aerial tuning condenser should be joined to the earth terminal and the moving vanes of the anode tuning condenser connected to + H.T.—L. A. C.

Valves for Reflex Receivers

Q.—What type of valve is best for use in a reflex receiver?—B. R. (Co. Tyrone).

A.—The best valve to use is a general-purpose valve. Generally speaking special H.F. valves have a short straight portion to their characteristic curves and are not suitable for low-frequency amplification.

Special low-frequency valves are usually designed with large electrodes which give rise to a fairly large internal capacity and are, therefore, unsuitable for high-frequency amplifying duties. The general-purpose valve is a compromise between the two.—L. A. C.

Direction of Aerial

Q.—To which end should the lead-in be attached for an aerial that is directional for 2 L O?—S. B. (Peckham).

A.—The lead-in wire should be connected to that end of the aerial nearest to the London station, but on no account join the lead-in wire to the end of the aerial remote from the house.

For ordinary purposes it may be assumed that the directional properties of a standard P. M. G. aerial are negligible and not worth the trouble taken to obtain them.—L. A. C.

"Hoop" Aerial

Q.—Do the P. M. G. regulations allow the use of a "hoop" or cage aerial by amateurs, and are such aeriels advantageous for reception purposes?—P. B. (Surrey).

A.—Any type of aerial may be employed provided that the overall length (including lead-in) does not exceed 100 feet. Therefore any number of wires may be used.

However, such aeriels have a large capacity and are inefficient for reception purposes. They are largely used for transmitting.—L. A. C.

LET US HELP YOU

IN operating or constructing a set you may possibly meet with some difficulty that you cannot solve yourself. It may be something to do with bad reception or you may be in difficulty over some connection.

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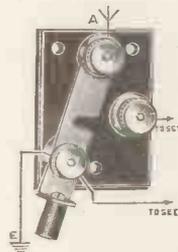
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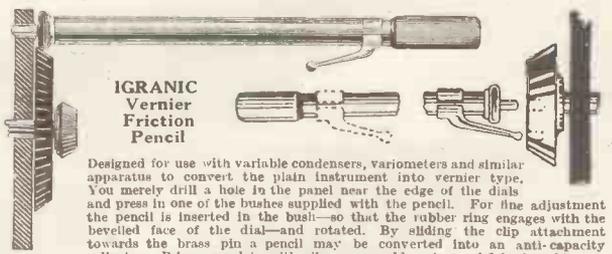
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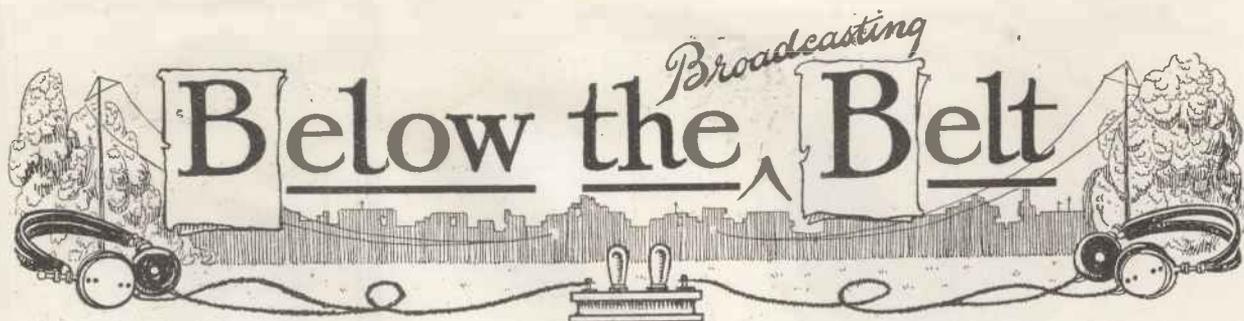
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IN all short-wave receivers simplicity of design is a feature that it is well to keep the attention fixed on during the process of building. Also it saves a great deal of annoyance and disappointment if one realises from the start that rough-and-ready "hookups" are very little use for experimenting with.

Every experimental circuit must be made with as much care as though it was the final effort and expected to "stay put" for many months, if not years.

The reason is, of course, because very high-frequency oscillations are difficult to deal with, and to keep in their proper place in the circuit.

The higher their frequency the more "skittish" do these high-frequency oscillations become. The frequencies at which a few professional, and many amateur, transmitting stations are now working are very high indeed.

Frequency of Oscillation

Since wavelength, oscillation frequency, and the velocity of propagation of wireless waves are governed by the ordinary wave rules and are intimately associated one with another, it is easy to find the frequency of oscillation at any wavelength.

The velocity of propagation, or the speed with which ether waves travel, is three-hundred-million metres a second (300,000,000). Divide this figure by the wavelength, and you have the frequency of oscillation. For instance, at 300 metres the wave is oscillating at one million times a second, since that is the answer when 300,000,000 is divided by 300.

The following short table will enable you to visualise the relation between wavelength and oscillation frequency on the wavelengths below the broadcasting belt.

WAVELENGTH.	FREQUENCY.
300 metres	1,000,000 cycles per sec.
150 "	2,000,000 " " "
100 "	3,000,000 " " "
50 "	6,000,000 " " "
25 "	12,000,000 " " "
15 "	20,000,000 " " "
10 "	30,000,000 " " "
5 "	60,000,000 " " "

Short-wave Reception

As a result of experiments I have been carrying out recently, I am able to tell you that using ordinary four-pin type valves and exercising reasonable care in placing the components, so that grid and plate leads are as short as possible and not parallel, it is possible to get down to a wavelength of about 25 metres.

It is likely that very skilful or very lucky constructors may succeed in getting a little lower than that; but it will not be much lower, because at about the frequency indicated by 25 metres the inter-electrode capacity of the valve begins to play a very important part.

To get lower you must use special low-capacity valves. Either the V 24 or the D E V valves are the best; but the ex-R.A.F. C type is not to be lightly passed by if the pennies have to be counted. I have also heard that the Myers valve is quite serviceable on short waves; but I have not tried it.

And now I can hear some questions. They are all the same. "What is there to be heard on these ultra-short waves?" Well, down on 20 metres or thereabouts there is a very great deal of most interesting work now going on, mostly by American amateurs, at the time of writing. And their signals can be heard in this country in broad daylight.

The chief amongst these pioneers is U 1 X A M, the station owned by that famous experimenter, Mr. Reinartz, inventor of what is, in my opinion, one of the very best circuits

for short-wave working. You may also hear some continental stations and a few of our own stations working with them.

It was on 20 metres that Mr. E. J. Simmons, G 2 O D, and the Australian amateur, A 2 C N, recently performed their great feat of establishing communication and working with one another in broad daylight. That is to say, it was daylight at both stations.

There is work going on even lower than 20 metres. On about 16 metres I have heard two stations that I failed to identify, and on just under 15 metres I heard one afternoon a station, with great power, sending "A B C" repeatedly. Whether this is a call sign or merely a test sign I do not know.

On Five Metres

On very low wavelengths, between five and ten metres, some of the wireless lighthouses work; but all that most people hear when they do manage to get as low as five metres is the spark transmission from the ignition coils of motor-cars and motor-cycles!

The higher the frequency of the signal to which we desire to tune the less must be the capacity and inductance we use; that is to say, the smaller must be our condenser and the fewer the turns of wire in our coil.

It will be readily understood that many of the capacities existing between wires used in connecting up parts of the circuit are actually capacities in parallel with that of the tuning condenser, and, therefore, they are raising the value of the tuning condenser. That is why, in some sets, using a tuning coil that consists of only a single turn of wire, it is impossible to make the set oscillate below some comparatively high wavelength, say twenty-five metres.

There is so much accidental capacity in badly placed leads, and

things of that sort, that the product of capacity and inductance is still quite big. For any given coil the lower the wavelength we wish to use the less must be the capacity of the condenser. If, with the condenser vanes completely disengaged, we still have a large remaining capacity in this circuit, our low limit of tuning is held up by the sum of the inductance of the coil and the capacity of the rest of the associated circuit.

That is the reason why the utmost care must be taken in design, and why tuning coils, condensers, and everything else, must be of the very best quality. Particularly must the condensers have low minimum capacities. If they haven't we may find ourselves in a difficulty the exact reverse to the one we have just discussed.

It is quite possible to design a very good circuit, have the very best coils, with well spaced leads, low-capacity valves, in fact everything as it should be, and still be held up at about 20 metres owing to the remaining capacity of the condenser being a comparatively "huge" amount.

In respect of minimum capacity, the so-called "square-law" variable condenser has frequently better characteristics than the ordinary variety and has, as well, the open scale near minimum capacity which is its special feature. It is as well if, besides being "square-law," the tuning condenser is made to have low losses and a specially low minimum capacity. In my opinion British manufacturers are not yet paying sufficient attention to these points.

5 Y M

"THE PICNIC SET"

OWING to a slip in wiring, there is a slight mistake in the wiring diagram of the Picnic Set described (page 507) in our last issue.

The end of the vernier condenser shown connected to L. T. - should be connected to L. T. +. Although the set will work if wired as shown, it is desirable to make the alteration.

WHEN Parliamentary broadcasting begins, listeners should remember that any reference to "another place" merely means the House of Lords; not the place where politicians would like to consign one another.



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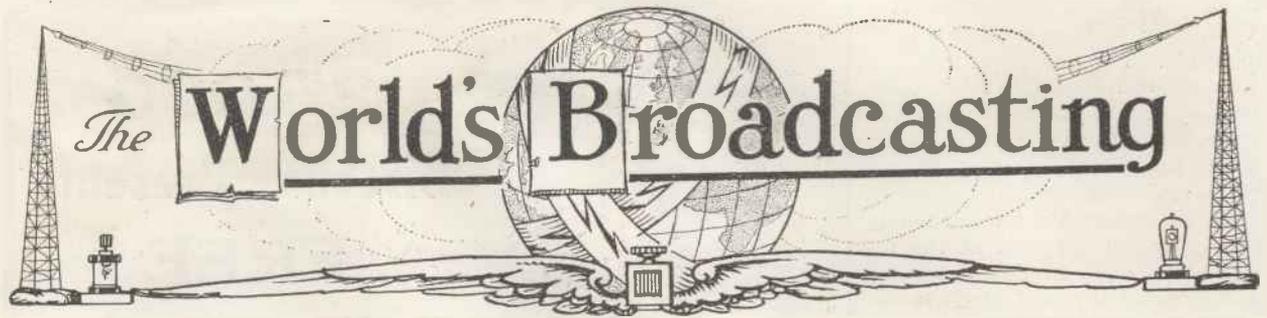
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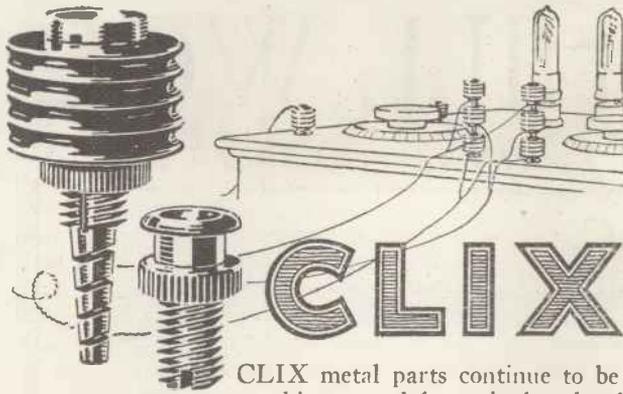


PRINCIPAL EUROPEAN STATIONS

GREAT BRITAIN		
Station	Wave-length	Call Sign
Aberdeen ..	495 ..	2 B D
Belfast ..	435 ..	2 B E
Birmingham	475 ..	5 I T
Bournemouth	385 ..	6 B M
Bradford (relay) ..	310 ..	2 L S
Cardiff ..	351 ..	5 W A
Chelmsford ..	1600 ..	5 X X
Dundee (relay) ..	331 ..	2 D E
Edinburgh (relay) ..	328 ..	2 E H
Glasgow ..	420 ..	5 S C
Hull (relay) ..	335 ..	6 K H
Leeds (relay)	346 ..	2 L S
Liverpool (relay) ..	315 ..	6 L V
London ..	365 ..	2 L O
Manchester ..	375 ..	2 Z Y
Newcastle ..	400 ..	5 N O
Nottingham (relay) ..	326 ..	5 N G
Plymouth (relay) ..	335 ..	5 P Y
Sheffield (relay) ..	301 ..	6 F L
Stoke-on-Trent (relay) ..	306 ..	6 S T
Swansea (relay) ..	481 ..	5 S X
AUSTRIA		
Graz (relay)	404 ..	—
Vienna (Radio Wien) ..	530 ..	—
BELGIUM		
Brussels ..	265 ..	—
CZECHO-SLOVAKIA		
Brünn ..	1800 ..	O K B
Prague (Strasnice)	570 ..	—

DENMARK		
Station	Wave-length	Call Sign
Copenhagen (Kjobenhavns-Radiofoni)	775 ..	—
Lyngby ..	2400 ..	O X E
Ryvang ..	1190 ..	—
ESTHONIA		
Reval ..	350 ..	—
FINLAND		
Helsingfors ..	370 ..	—
FRANCE		
Eiffel Tower	2200 and 2650	F L
L'Ecole Sup. (Paris) ..	458 ..	P T T
"Le Petit Parisien"	345 ..	—
Radio-Paris	1750 ..	C F R
GERMANY		
Berlin (Vox Haus) ..	505 ..	—
Berlin (Witzleben) ..	500 ..	—
Bremen (relay)	330 ..	—
Breslau ..	418 ..	—
Cassel (relay)	288 ..	—
Dresden (relay)	280 ..	—
Frankfort-on-Main ..	470 ..	—
Hamburg ..	395 ..	—
Hanover (relay)	296 ..	—
Königsberg ..	463 ..	—
Königswusterhausen ..	1300 ..	L P
Leipzig ..	454 ..	—
Münich ..	485 ..	—
Munster ..	410 ..	—
Nuremberg ..	340 ..	—
Stuttgart ..	443 ..	—
HOLLAND		
Amsterdam	2125 ..	P C F F
Bloemendaal	345 ..	—
Hilversum ..	1060 ..	H D O

HUNGARY		
Station	Wave-length	Call Sign
Buda-Pesth (Csepel) ..	950 ..	—
ITALY		
Rome ..	425 ..	I R O
Milan ..	545 ..	S I T I
NORWAY		
Aalesund ..	515 ..	—
Oslo ..	380 ..	—
POLAND		
Warsaw ..	385 ..	P T R
RUSSIA		
Moscow (Cent.)	1450 ..	—
Moscow (Sokol-niki) ..	1010 ..	—
Moscow (Trades Union Council)	450 ..	—
SPAIN		
Barcelona ..	325 ..	E A J I
Bilbao ..	415 ..	E A J 8
Cartagena ..	300 ..	—
Madrid ..	392 ..	R I
Seville ..	350 ..	E A J 5
SWEDEN		
Boden (relay)	2500 ..	S A S E
Falun (relay)	370 ..	S M Z K
Gothenburg	290 ..	S A S B
Joenkoeping	265 ..	S M Z D
Karlstadt ..	370 ..	S M X 9
Malmoe (relay)	270 ..	S A S C
Norrkoeping	260 ..	S M V V
Stockholm ..	427 ..	S A S A
Sundsvall (relay) ..	545 ..	S A S D
Trollaattan (relay) ..	345 ..	S M X Q
SWITZERLAND		
Lausanne ..	850 ..	H B 2
Zurich (Höngg)	515 ..	—



CLIX

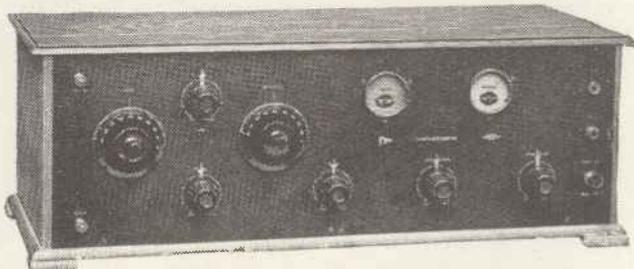
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Before deciding on your Super-Het., send two penny stamps for our large Keystone Folder showing how the Super-Het. works and how economical and easy it is to build one with Keystone parts. Remember, the Keystone Super-Het. will enable you to tune out your local station and receive a distant one within ten metres of its wavelength. Only a Super-Het. can do this.

Experimenters should send 3d. for our large 48-page Catalogue of Components. Set builders should get our Pilot Chart of 32 easy-to-build Receivers, post free 3d. Have you read Peto-Scott's Wireless Book, post free 1/5?

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"Polar-Twin" will operate a loud speaker, with an outside aerial, at a distance of 60 miles; or with an indoor aerial at a distance of 15 to 20 miles from a main Broadcasting Station. With an outdoor aerial of average efficiency it will receive all British Stations and many Continental ones on the Headphones. It will also receive American Stations, with a good aerial and careful tuning.

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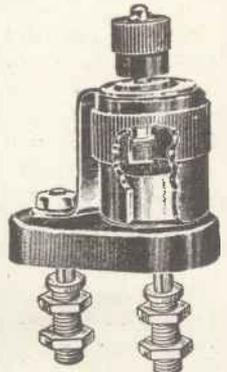
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AT 2 SAVOY HILL, W.C.2.

JUST as the differences between the B.B.C. and the theatrical managers were on the eve of settlement, the efforts to arrive at an amicable arrangement for the broadcasting of the Covent Garden Opera Season were practically nullified by the limitation of the broadcasts to two—one of German and the other of Italian Opera.

This anti-climax was due to no fault of the broadcasting officials, who were thoroughly cognisant of the popularity of last season's broadcasts, and aimed to secure wider concessions this year. It cannot be alleged that the broadcasting of grand opera would prejudice box-office receipts, any more than that the financial position of the theatre will be affected by the wireless transmission of a part of a play.

Indeed, the play depends for its success to a large extent on visual judgment and not on oral effects. The B.B.C. rigidly maintains that the theatres will be helped and not hindered by the excerpts which are broadcast. The experience of the gramophone companies has gone a long way towards influencing the theatrical managers as to the value of broadcasting as an aid to bigger business.

It is hoped that it will be possible to transmit excerpts from plays that will not be limited to non-essential passages, but will convey to the listener a vivid impression of the meaning and moral of the performances; to create that degree of interest which will induce listeners to go and see for themselves; and to raise the tone of broadcast programmes by the introduction of the elevating influences which the modern stage supplies.

Developments at 2 L O

The provision of new studios at headquarters which, by the time these lines are in print, are expected to be ready for service, will add appreciably to the quality of the transmissions from 2 L O, while at the same time foreshadowing the development of a service of alternative programmes.

For too long a period we have been restricted to one main studio and a small studio in which accommo-

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

tion has been extremely cramped, to the discomfort of artists and officials. Indeed, the smaller studio has been useful merely for talks, the Children's Corner, rehearsals, and what may be termed "one-man shows."

The Harassed Director

Frequently a harassed station director has had to exercise considerable ingenuity to fit in the various "turns," while the announcer has been called upon to display his agility, first by dashing upstairs to the smaller studio to read the news and then by speeding downstairs to the main studio to announce an orchestral item.

With the completion of a new large studio, with a special room for talks and two additional studios for rehearsals and auditions, the problem of the accommodation requisite for the various kinds of broadcasting work has been solved.

Resonance will be regulated in the new studios by the use of cords working on pulleys to raise and lower the draping material, in order to increase or lessen the echoes as required; and the old defective system of transmitting speech and music at one vibratory level, that can be influenced only by amplification, will be eliminated.

Simultaneously the B.B.C. is considering the question whether plays should be given with a visible audience, to assist the artists in reaction, to lend the inspiration that applause naturally begets, and to convey to the performer a rather more realistic impression of a public performance.

It is also essential that the B.B.C. should have permanently at its disposal an outside hall in which a certain number of concerts may be given regularly, instead of at the studios, and at which an audience shall be present, in order to create a better atmosphere.

The recent public references to the probable formation of a new broadcasting company, which was

described as a rival to the B.B.C., had at any rate one useful effect, namely, in destroying the fallacy which appeared to be widely held that the B.B.C. was a monopolistic concern. Prior to December 31st, 1924, the date of expiry of the original agreement between the Postmaster-General and the B.B.C., the position was that if the Company supplied a satisfactory service and was willing to erect additional stations where the Postmaster General considered them necessary, he would not license any other broadcasting service up to the end of the year 1924.

The Postmaster's Right

After that date, however, under a supplementary agreement made on October 1st, 1923, the Postmaster-General reserved the right not only to license other organisations to provide broadcasting stations in any town or district where the B.B.C.'s service was considered inadequate (particularly if the B.B.C. was not prepared to provide such stations); but he also reserved the right to grant licences to any person other than the B.B.C. to carry on services additional to the B.B.C. service. The Post Office might also allocate wavelengths to any new undertaking in such a manner as to avoid interference with the B.B.C. services.

No Monopoly

Monopoly, therefore, is the last word to be applied to the B.B.C.; for the Company obviously has not the sole power of dealing in anything, and it has no exclusive command over broadcasting facilities, although it has generally been regarded as the only organisation possessing the necessary facilities for carrying on a broadcasting service. With that point in mind, it was recognised from the outset that some system of unified control was desirable, and it is now common knowledge that the B.B.C. has made no improper use of the confidence reposed in it under the terms of its licence from the Post Office.

While the B.B.C. makes no claim and never has claimed the right to control broadcasting, it has set up certain ideals which it has striven continually to maintain. The ideal

WHAT THE B.B.C. IS DOING (Continued from preceding page)

of public service is in the vanguard of its campaign, and it will welcome any genuine effort to better the service for the benefit of listeners, whether such effort originates among individuals who are interested in wireless as a new and wonderful achievement, or among others who think that they can do better work for the public than the B.B.C. is doing.

The B.B.C. will, however, oppose with all the forces at its disposal anything which is destructive of its ideals, or which in conception bears evidence that it may become the means of worsening conditions for the ordinary listener. The latter must, above all else, be provided with a satisfactory service on an economic basis, a service that, through unified control, avoids the grave danger of chaos arising out of a multiplicity of broadcasting authorities, such as we have seen in America, with a consequent lowering of standards.

In brief, the B.B.C. is keenly interested in any new development

that comes along, provided it is genuine and is not antagonistic to the B.B.C. ideal of maintaining the public service.

Education by Broadcast

Can instruction be assimilated by means of broadcasting lessons to school children? The answer is a decided affirmative, and the B.B.C. is encouraged by the results so far achieved. At the end of two terms the number of schools which asked for school programmes rose from 200 to 500. The following analysis shows in essence how the courses are divided:—

Music	..	9 schools.
		1 home student.
Countryside	..	24 schools.
		1 hospital.
		2 home students.
Wireless Lectures		18 schools.
		5 home students.
Charles Dickens		32 schools.
		1 hospital.
		1 home student.

Travel 23 schools.
2 home students.

The above figures are based mainly on the results obtained by sifting the essays submitted.

So far as the evening talks are concerned, the B.B.C. has not only to consider the subject matter of the talk, but the voice and style of the speaker, and his personality. It is, therefore, necessary to work on the principle that a talk shall satisfy two or three cardinal conditions, such as interesting subject matter, an agreeable voice, and a well-known personality.

The world of listeners will not be taken by storm at the first or second assault in the matter of educational talks.

It has, indeed, been clearly proved by the correspondence received at headquarters that the broadcast talk is becoming an indispensable feature of the evening's entertainment, and is worth exploiting.

SURPRISING—

the difference this can make to your reception!



IN everything it is true that the little things count. In radio most certainly. This we realised when designing the Watmel Variable Grid Leak, with the result that the special attention given to details in its construction makes it perfection. Take, for instance, the improvement illustrated.

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Watmel

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Notings on the Month's Progress

THE extraordinary distances covered by low-power transmissions on wavelengths between 20 and 100 metres has thrown some new and unsuspected sidelights upon the action of the so-called Heaviside layer. In the first place all radiation is assumed to be a mixture of two types of wave, one of which is earth-bound, that is, it moves along the surface of the earth much as a high-frequency current is focused around a conducting wire, whilst the other is a space wave proper, travelling freely in space after the fashion of a ray of light.

In the case of long-wave transmissions of, say, 2,000 metres and upwards, the proportion of earth-bound to free energy is much greater than it is with the shorter wavelengths, these being radiated almost entirely as free waves. If it were not for the existence of the Heaviside layer, the free waves would not follow the earth's curvature for more than a very short distance, but would pass outwards into inter-stellar space and be lost for ever.

The late Dr. Heaviside's theory was that the layer reflects such waves back on to the earth's surface just as a mirror reflects light. Sir Joseph Larmor on the other hand maintains that a true reflecting action is impossible, but that the waves are subjected to a progressive refraction or bending effect as they pass through successive zones of the layer having different densities. The main curvature of the layer being the same as that of the earth, a certain proportion of the free waves are finally bent over until they emerge and travel downwards again to the earth's surface.

Recent Investigations

As the result of recent investigation it has been found that the range of reception for a given wavelength, say of 30 metres, varies in such a manner as to suggest that the height of the layer alters in a more or less definite cycle during the course of the day and night. For instance, using a low-power transmitter and a fixed wavelength,

maximum strength of reception may be obtained at a distance of 2,500 miles at noon. At six o'clock the point of maximum reception has increased to a distance of 3,500 miles, whilst at midnight it has increased to 5,000 miles.

The assumption is that the average height of the Heaviside layer is gradually increasing during this period, and that the angle of reflection or refraction changes accordingly, thereby concentrating the transmitted energy at a more distant spot.

It is a significant fact that there exists a practically silent zone extending between the distant point of maximum reception and a point within 30-40 miles of the transmitting station. Within these limits the radiated energy is temporarily lost. In fact it is following its elevated path to and from the Heaviside layer.

Wireless Fire and Burglar Alarm

An ingenious "wireless detective" system is at present being developed by M. Leroy, a French engineer. The method is based upon the fact that the frequency of an oscillating circuit is changed when any alteration takes place in its inherent capacity.

If, for example, a strong-room is surrounded by one or more turns of wire forming part of the plate circuit of an oscillating valve tuned to a given frequency, the entry of a burglar or unauthorized person will alter the natural capacity of the circuit, and the detuning effect can be detected by heterodyne and made to close a local relay, so as to ring an alarm bell in another part of the building, or at the telephone exchange.

The same principle can be used to sound a fire-alarm automatically, as soon as the abnormal temperature modifies or destroys part of the open capacity area inside the oscillatory loop. Similarly an aviator can be given warning should he fly too near the ground at night or in foggy weather. Proximity to the earth's surface increases the

natural capacity of an open oscillatory circuit mounted on the wings of the machine, and the change in beat frequency (or the alteration in plate current alone) is used to close a local circuit and so light a "danger" lamp.

The Supersonic Master-patent

In view of the increasing popularity of the super heterodyne receiver, considerable interest attaches to the claim made by the Western Electric Co. to control the basic patent rights covering the broad principle of supersonic amplification. The invention of the "super het" has been commonly attributed to Professor Armstrong of super-regenerative fame, but according to the latest development credit must now be given to M. Lucien Levy, a well-known French wireless engineer.

M. Levy bases his right to priority on the British Patent No. 143583 dated in August, 1917. This corresponds to the patent originally filed in France on the same date, whilst his American rights are covered by another patent dated a year later.

Armstrong's French patent relating to super heterodyne reception carries a date in December, 1918, a similar priority being given to the corresponding English patent, whilst the American specification is dated two months later.

The result of recent litigation in America confirms the priority claimed by M. Levy. It is, however, to be noted that the judgment was given by a District Court and is probably open to appeal, in which case it is premature to assume that the last has been heard of this matter.

Distant-control Railways

Although no purely automatic system, however perfect, can take the place of human intelligence, it is interesting to note that, according to Mr. G. Allen of the American Westinghouse Co., it is now quite possible to operate an electric train system completely by distant control.

Using a series of local relay circuits controlled by a master switch responsive to radio-frequency im-

JOTTINGS ON THE MONTH'S PROGRESS (Continued from preceding page)

pulses, a train can be automatically started from a station, run at full speed over a clear track, slowed down or stopped in accordance with the intermediate settings of the track signals, started up again when the signals give a clear track, and finally brought to rest at a station, the passenger exit doors being simultaneously opened.

The distant-control currents are of radio frequency. They are not actually radiated as wireless waves, but are superposed on the high-pressure currents flowing in the power-supply lines, from which they are separated out at the desired points by suitable filter-circuit shunts. The technique is much the same as that used in the so-called wired-wireless system of distributing broadcast programmes over the electric-light supply network in large towns.

The advantage of this method lies in the fact that the high-frequency currents are concentrated along the power line at the points

where each switch is located, thus making the train control more certain than could at present be secured by ordinary wave energy radiated through space.

A Water-jet Aerial

The French admiralty have been making experiments with the use of a column of sea water as a radiating aerial. The water is drawn in from the sea by pumps and shot upwards into the air for a distance of from 30 to 40 feet. Owing to the conducting qualities of salt water it was found possible to transmit messages over a distance of eight kilometres in this way.

The experiment is reminiscent of a somewhat similar proposal made some years ago. In this instance a beam of ultra-violet light-rays was suggested as a means of rendering conductive the air through which the ionizing rays passed. Radio-frequency current fed to the column of air would then be radiated outwards as from an ordinary metallic aerial.

In spite of the low factor of efficiency shown by the French experiments there seems to be room for some interesting developments along these lines in the future.

B. A. R.

"THE Company Sergeant-Major," which was sung from 2 L O a few weeks ago, must have been a tester for all but the best loud-speakers. Now that summer is coming in, we shan't want the B.B.C. to broadcast any weather forecasts. We know quite well what to expect, thank you.

ONE hotel is having a loud-speaker in every room. To be switched on at the moment of dropping the collar stud under the dressing-table, we suppose.

If you have not learnt morse, says an amateur, you lose half the fun from your set. And as soon as you start learning the dot-and-dashed stuff, you lose the other half.

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Featherweight	4/9
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Special Line	7/9
Aluminium	8/6
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All Valves posted purchaser's risk.

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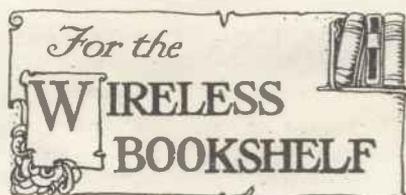
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"International Radio Manual"

AT the International Amateur Radio Congress held recently in Paris it was decided to adopt Esperanto as the official auxiliary language. It was also unanimously decided to recommend the study and use of this language for wireless communication between amateur transmitters.

In view of this we have pleasure in drawing the attention of our readers to the "International Radio Manual"—a bright little book written by Mr. H. A. Epton, F.B.E.A., and published by the British Esperanto Association, Inc., 17 Hart Street, W.C.1, price 6d.—which should enable anyone to acquire a working knowledge of this international language in a very short time.

At present no fewer than seven-

teen Continental broadcasting stations regularly use Esperanto, so that it behoves the mere listener, no less than the transmitter, to have at least a little knowledge of this medium which seeks to destroy the barrier of language diversity.

"Tuning Coils and Methods of Tuning"

The first of a series of books which collectively will cover the whole field of wireless reception, "Tuning Coils and Methods of Tuning" (published by Iliffe and Sons, Ltd., London, price 2s. 6d.) is a handbook which will appeal to all who make their own coils.

It is questionable if any other publication dealing with this subject contains as much useful information as does this book, which enables one to wind any type of coil from the simple slider to the latest Lorenz type.

Among other useful information in the book are chapters on condensers and inductances, methods of tuning, and the design and construction of coils, the last chapter containing many characteristic curves of different types of inductances. In each case a formula is given for arriving

at the wavelength of the particular coil described.

"The Marvels of Modern Physics"

There is no more fascinating study than that of physics, and more books have probably been written around this subject than any other. Yet, despite its fascination and the wealth of knowledge available, there is no subject of which the general public is so lamentably ignorant.

If we look for a reason for this ignorance we shall, no doubt, come to the conclusion that much of it is due, not to the subject, but to the manner in which the subject has been treated. It has been left to Mr. Joseph McCabe, the author of several well-known scientific books, to tell, in his latest publication, "The Marvels of Modern Physics," of the marvellous work of modern physicists in a way intelligible to all.

A feature of the book, which is published by Watts and Co., London, price 2s. 6d., is the total absence of all unnecessary highly scientific language. It is a book that can be read and understood by the average schoolboy.

WAVELETS

WE hope that the highbrows don't object to the Edinburgh horticultural talk on the ground that the language is too flowery.

WE notice that a professor named Biffon gives the farmers' talks from 2 L.O. Robbing' Dean Inge of a job, we call it.

A LEEDS professor is going to lecture on "The Association of Poetry." Its association with other forms of crime, we suppose.

A SCIENTIST says we shall soon have trains operated by wireless. But pessimistic tube travellers suspect that they won't escape an occasional jamming even then.

AIRMEN have adopted the word Mayday as an international call of distress. We hope they call one another early, in accordance with ancient custom.

MORE bagpipe performances have been suggested as a means of brightening the programmes. Who'll help to form a Society for the Prevention of Cruelty to Listeners-in?

A SPECIAL station to broadcast M.P.'s speeches would cost £30,000. Now, if it were a case of paying that sum *not* to hear them—

COLLIERY bands have been broadcasting from Nottingham. "Old King Cole" ought to be a popular item in their repertoire.

A SHREWSBURY amateur has transmitted to America on two watts. "What's yours?" was not one of them, needless to say.

EVERY family can have a loud-speaker nowadays, says an expert. Unfortunately for the mere males—most families have.

MAH JONGG lessons are being broadcast on the Continent. Highbrow stuff again. Why can't they give us ha'penny nap?

A RECEIVING set designed as an umbrella is the latest novelty. We wonder whether it objects to playing "It ain't gonna rain no more."

If parliamentary proceedings are broadcast, we understand that the B.B.C. will supply special insulators for use during the performance of the Clydeside contingent. When these are used, there will be no possibility of sparks issuing from the phones.

GLASGOW wireless fans recently raised £300 at a bazaar. There must have been more English visitors in the city than usual.

BY wireless, punters are now able to hear the clatter of racehorses' hoofs on the course. What they would prefer, however, is to hear the jingle of the bookmaker's "oof."

ASKED why he objected to the installation of loud-speakers in the smoking-room, a member of one of the West End clubs retorted: "It makes it sound too much like home."

CAPTAIN ECKERSLEY thinks the future of wireless lies largely in robust receivers. This means the Yanks will have things nearly all their own way.

LONDONERS will soon be able to learn by wireless when one of their famous fogs is approaching. They would much rather listen to something which told them when it was departing.

WE are asked by one expert writer to remember that a junior loud-speaker can fill a dance hall with music. We have one in the flat above us that fills the whole building, especially during its teething season.

Soldering at Wembley

SUCCESS in amateur soldering depends, in our experience, on two things in particular and perhaps many in general. The two particular things are the bit and the cleanliness of the job. It is very difficult, if not impossible, to solder dirty surfaces together, and the amateur soon grasps that fact.

A great difficulty, though, he finds in the choice, and particularly the heating, of the bit. Heating a bit in a fire is generally destructive of the tinned surface and also of the bit itself. Every amateur is driven to some expedient or other, only more or less successful, unless he possesses just the right device.

A very excellent type of bit, with which most successful heating can be done, is the self-contained gas-heated type.

Visitors to Wembley this year can see it in operation for themselves in the Co-operative British Empire Gas Exhibit in the centre of the Palace of Industry, which occupies more space than could

possibly be given it last year, and is in every way more attractive.

Many detailed exhibits, comprising both economical and labour-saving devices, are shown in appropriate settings, and so wide is the application of this smokeless fuel that it is possible to see how gas is applied in providing central heating and a labour-saving kitchen in Canada; the heating of a nursery and the hot water for a children's bathroom in Australia; labour-saving smokeless fuel instead of coal in a typical Dutch fireplace in South Africa; means for ice-making and hot baths in India; and the heating of a boudoir-bedroom in New Zealand.

Gas furnaces, crucibles, ovens, etc., used in the industrial processes employed for the manufacture of motor gears, false teeth, printer's type and engraver's dies, buttons, pottery, sweetmeats, feathers, wireless parts, etc., are shown, and help to indicate how from cradle to crematorium, gas—"the spirit of coal"—plays an essential part in providing man's necessities, utilities and luxuries.

Detector Damping

IN the case of a crystal detector better results can often be secured by branching the crystal across only a part instead of the whole of the aerial inductance. The reason for this is that the crystal path acts as a high-resistance shunt which prevents the aerial currents building up to their maximum amplitude. This effect is called detector damping.

The fewer the turns of aerial inductance bridged by the crystal the less will be the total damping effect, and the higher the aerial efficiency and selectivity. On the other hand, the voltage across the crystal will obviously be diminished, so that maximum signal strength depends upon a judicious compromise, which is best ascertained by actually listening-in.

Usually a tapping across two-thirds of the aerial windings will give the desired result. The same considerations apply in the case of a valve having a positive grid potential, that is, where an appreciable grid current flows.

B. A. R.



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"The Wireless Magazine" Buyers' Guide

The announcements below mentioned will be found in the February-July issues.

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The Picnic Set, which was adequately described in the June issue of "THE WIRELESS MAGAZINE," is available for all.

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This case is made of the best West Indian Mahogany by skilled cabinet makers, and the fittings are brass, heavily nickel-plated. The cabinet is neatly designed and skilfully laid out for strength and portability. Its dimensions are 13 ins. x 4 ins. x 9½ ins., and it weighs only 5 lbs. It is beautifully finished and polished.

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