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No. 89. Vol. IV.

SCIENTIFIC ADVISER: SIR OLIVER LODGE, F.R.S., D.Sc.

February 9th, 1924.



Mr. D. C. Gordon, a South African - wireless amateur, using his - home-made receiving apparatus.

FEATURES IN THIS ISSUE.

Broadcasting in Bournemouth.
Low Capacity Components.
A New Loud Speaker.

The Sheffield Relay Station.
Constructing a Simple Valve Set.
Amplification and Range.

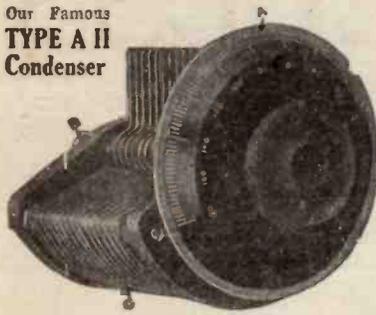
How We Communicated with America. By 2 S Z.

Music for All. By Percy Scholes (the B.B.C.'s Music Critic).

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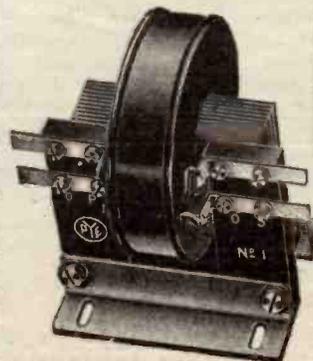
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CAMBRIDGE.

POPULAR WIRELESS

AND WIRELESS REVIEW.

February 9th, 1924.] THE RADIO WEEKLY WITH THE LARGEST CIRCULATION. [Every Friday, Price 3d

Technical Editor :
G. V. DOWDING, A.C.G.I.

Editor :
NORMAN EDWARDS, A.M.I.R.E., F.R.G.S.

Scientific Adviser :
Sir OLIVER LODGE, F.R.S.

TOPICAL NOTES AND NEWS.

A Continental Evening.

IT is to be hoped that the B.B.C. will soon arrange a "Continental evening." I am sure that listeners would appreciate another programme from our friends across the Channel. From the large number of letters we receive in this office, I gather that a Continental programme now and again would prove very popular.

Very Uninspiring ?

CAPTAIN WEST has received several requests for more American programmes, and, strange to relate, numbers of enthusiasts have asked if they can have a look round the spot where America was picked up—Biggin Hill. I advise such enthusiasts to visit their local mortuary, and put a wireless set on the table therein, and this will resemble the Biggin Hill Hut very closely indeed.

The King and Wireless.

I HAVE learned that His Majesty the King has become greatly interested in broadcasting. Some time ago the Prince of Wales had a set installed, and this example has been followed by their Majesties. A friend of mine at court tells me that in all probability his Majesty will broadcast in the near future, but there are still various difficulties which prevent the listeners hearing their monarch speak by wireless.

Transmitting During B.B.C. Hours.

IN answer to the large number of letters I have received on the question, "Are amateurs allowed to transmit during broadcasting hours?" I have made inquiries from reliable sources, and am in a position to state that amateurs are entitled to experiment with their transmitting sets during broadcasting hours, provided they work on a 150 to 200 metres wave-length. The use of the 440 metre wave-length is now prohibited.

A New Station.

TALKING to Mr. H. Bishop, the assistant engineer of the B.B.C., he tells me that the B.B.C. are now engaged on the erection of a relay station at Plymouth, similar to the relay station at Sheffield. Also he has sent engineers to Edinburgh, to look for a suitable site for a station in that city. I am informed that the Edinburgh station will be of a similar kind. Beyond putting relays at Sheffield, Plymouth, and Edinburgh, there

is no reason why relays should not be erected wherever the need arises.

The "Silent Staff."

THE rapid growth of the "silent staff" has necessitated the altering of the old members' positions. For instance, Captain West is now chief engineer of the Development department, and Mr. Bishop, assistant chief engineer of the Engineering department. I am also told that Mr. Litt will have a title of more importance. I can remember when the "silent staff" had only about a dozen men, all of whom I know well, but of late the staff has grown to about fifty. I am afraid

good sign, and surely we need it in these hard times.

Edgar Wallace Disagrees.

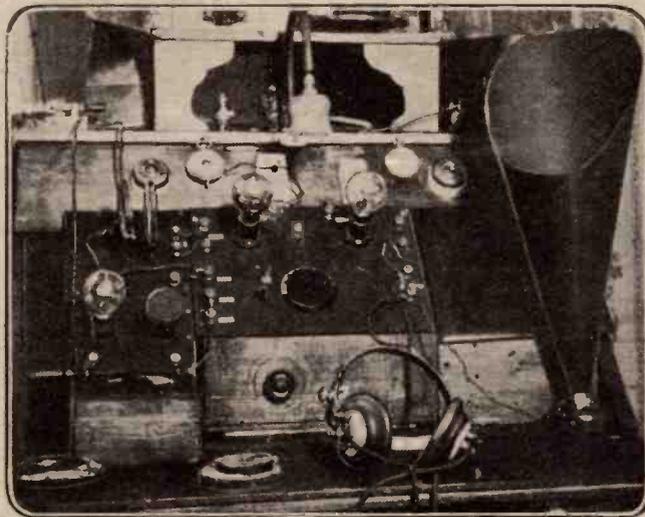
A LETTER from the well-known author and journalist, Mr. Edgar Wallace, states that he disagrees with Mr. Nigel Playfair, that there is scope for authors in B.B.C. plays. He does not think that broadcasting is a good medium for the authors of to-day, and that such plays would be successful. I know others who agree with him, more or less, that as soon as the novelty wears off, plays will become extremely unpopular. I disagree with this view. The B.B.C. has already proved that plays like the "Comedy of Danger," and Shakespeare's plays are popular. Still, we will take Mr. Asquith's advice and "Wait and see."

Wireless in the Argentine.

THE new wireless station which has been built at Monte Grande for the purpose of placing the Argentine in direct wireless communication with North America, Europe, and the far East, was officially opened recently, when an inaugural message was sent from the President of the Argentine to King George V. Direct service will be carried out between Monte Grande, New York, Paris, and Berlin. It is intended to extend this service to England as soon as possible, but we do not possess a wireless station sufficiently powerful to communicate with South America, therefore this service cannot be brought into operation until we possess a suitable station in this country. The power of the Monte Grande station is 800 kw.

What Do Women Want ?

DO women really know what they want ? This is the question which is being asked in connection with broadcasting. The B.B.C. has appointed a committee to investigate what women want in the Women's Hour on the microphone, and what time they want it. Many suggestions have been advanced, but no satisfactory conclusion has been arrived at. The committee comprises women only, and they are now left to decide for themselves what they do want. The best suggestion I have heard so far, is that the B.B.C. should broadcast first thing in the morning, as the husbands take possession of the papers and it is impossible for the wives to get into



An efficient set constructed by Mr. R. Redfern of 35, Keppel Rd., Chorlton-cum-Hardy, Manchester.

that they will not be quite so silent if their number still increases.

B.B.C.'s New Offices.

TALKING of growth, the "silent staff" is not the only department that is growing; the general office is doing its best to keep up with the engineers, and it has been necessary for the B.B.C. to build new general offices, which are, of course, attached to the present building, but run along the Embankment.

"P.W.'s" Growth.

I MUST not forget to mention that "P.W." has also grown. We have had to add to our staff, as the number of queries and editorial correspondence has increased enormously, and leaving little doubt that "P.W." is the leading wireless journal. I am always pleased to hear that people have found it necessary to increase staffs; it's a

(Continued on page 874.)

NOTES AND NEWS.

(Continued from page 873.)

conversation with them. Personally, I have had no experience on this point, but some friends of mine say that this is the case.

Good News!

READERS will be pleased to hear that Mr. G. M. Payne, our cartoonist, is rapidly recovering from his recent illness, and after a few weeks' convalescence will recommence enlightening "P.W." with his inimitable cartoons. In a letter to me he promises to do so with "renewed zeal," so that we may look forward with keen anticipation to his return.

Wireless in the "Circle."

EARLY arrivals at the Winter Garden Theatre to see "The Beauty Prize" are now entertained with the concerts from 2 L O. A loud speaker is placed somewhere in the "circle" and the broadcast music can be heard distinctly all over the building.

Claims to Greatness.

WIRELESS plays an important part in the "Beauty Prize," and had it not been possible to send a wireless message to the liner *Idiotic* (as Leslie Henson calls it), we should not have been treated to such a happy ending. Leslie Henson also tells us that he is a good athlete (his grandpa won the egg and spoon championship for South London), a wonderful poet, a charming writer, and that he has received Cardiff twice on a crystal set.

Crinoline Days.

I HAVE seen many scenes in the 2 L O studio, but none so beautiful as that presented by the famous screen "stars," Miss Alma Taylor and Miss Betty Balfour. Miss Taylor has to appear every night at the theatre where the film, "Comin' Thro' the Rye," is being shown, and the dress she wears, a crinoline and the old-fashion style of hairdress, lent beauty to the well-decorated studio. Miss Balfour behaved in the studio as though she were on the screen. Her facial expressions were most amusing when Mr. Palmer gave out the news; it was as much as we in the studio could do to keep a straight face.

The Mock Trial.

I WAS more than pleased to see Dame May Whitty and her husband, Mr. Ben Webster, in the studio again. I watched them perform in the "Mock Trial," which would have been a greater success had more trouble been taken by the producer in

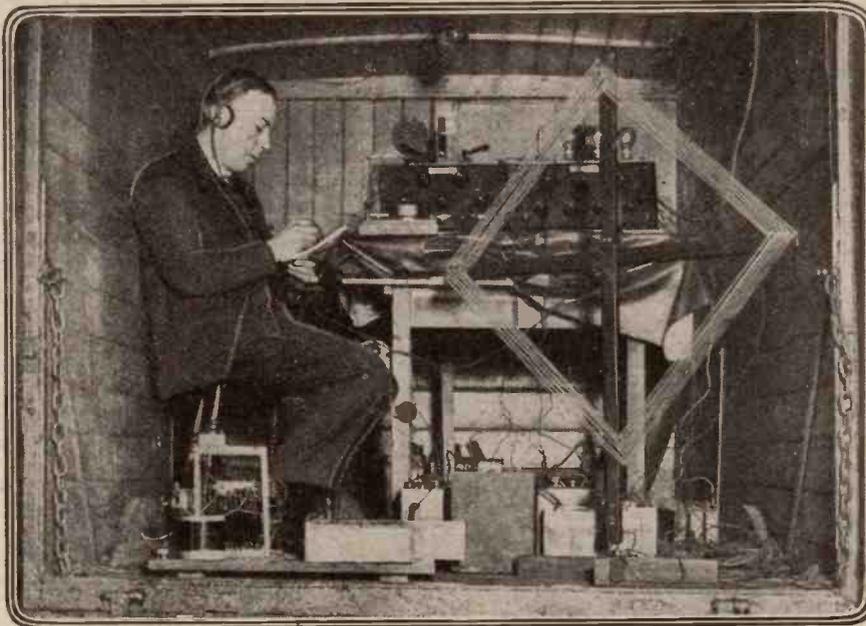
getting artistes with a marked difference in their voices. It was very difficult to tell the difference between the voices of the Counsel for the Plaintiff and the Judge, and perhaps a pause between each speech would have been an advantage.

Dickens Broadcast.

DAME MAY WHITTY told me that she thought little talks on Dickens would be appreciated, as some of the Fireside Stories would broadcast better than many plays that have been produced in the past. I have heard Dame May and Ben Webster give excerpts from Dickens, and without hesitation acknowledge them as "masters" of this class of work. Perhaps the B.B.C. will consider her proposal.

Liverpool's Relay Station.

A PETITION to the new P.M.G., from the wireless enthusiasts of Liverpool, asking him to give permission for the B.B.C. to establish a relay station in that city, has been started. The petition may be signed at most of the Liverpool



The wireless "detective" van placed in commission by Mr. P. R. Coursey, Secretary of the Radio Society of Gt. Britain and "2 O M" for tracking "oscillators" and other sources of interference.—(Daily Mail.)

wireless depots within the 15-mile radius. Any wireless dealer who requires a form for the signatures should apply to the Editor of "The Liverpool Daily Courier."

Arthur Bouchier's Views.

I WAS with Mr. Arthur Bouchier when he broadcast an account of the "Robert Louis Stevenson Club." He seemed to enjoy the experience, although this was not his first attempt at broadcasting. The last time he broadcast from 2 L O was on Shakespeare's birthday. Like most actors and actresses I have seen broadcasting, he gesticulated and became quite dramatic when he spoke of the great author. At the conclusion of his speech he told me that, in his opinion, wireless is the biggest benefactor this country has ever had.

"I don't hold with the views of theatre managers on the broadcasting problem, except on one or two things which they have a right to object to," he declared.

Wireless Time Signals.

ARRANGEMENTS have now been completed to relay the time signals from Greenwich Observatory. The signals will be given at every hour and half-hour, and will not in any way interrupt the performance. Captain Eckersley tells me that Greenwich has arranged to relay their best clock over the land line to 2 L O, which will in turn be broadcast from all stations. The first signal is expected in about three weeks' time.

Indians to Broadcast.

I HAVE successfully made arrangements with the B.B.C. for the "Last of the Red Indians," who are appearing at the London Pavilion, to broadcast a war song from 2 L O in the Children's Hour, on February 19th. Many attempts were made to get them to broadcast, and it was not until their "white chief" explained carefully what broadcasting was that they agreed to come. It was quite a performance for anyone to watch Colonel Macoy, their chief, interpreting my description of the studio and what it all meant. But the children will have a treat on the 19th, when they hear a real Indian war song, given by real Indians.

Theatrical Comedians to Broadcast.

TALKING to Billy Merson, the well-known comedian, in his dressing-room recently, he told me that he thought that if the B.B.C. were to invite the theatrical artistes to broadcast lectures, the managers or producers could not object. The theatrical contract does not mention that artistes are not allowed to give lectures; what they are not allowed to do is a turn from their repertoire. Why not give a lecture? Perhaps we may see in the papers that George Robey will give an address on "How to Shurrup Strikes," or Billy Merson on "Should Ladies Wear High Heels?" I can imagine these well-known artistes and others amusing the thousands of listeners all over the country.

Unice "Caractus's" Book.

CAPTAIN C. A. LEWIS has sent me a copy of his book, "Broadcasting Within." This well-written account of the broadcasting company's activities will help the public to realise that broadcasting is by no means as simple as we would like to believe. I would strongly advise all readers of "P.W." to read this interesting work.

ARIEL.

A NEW LOUD SPEAKER.

By OUR EUROPEAN CORRESPONDENT.

A recent discovery in magnetism has given rise to a new type of loud speaker that is said to be extremely sensitive, and to give very pure reproduction.

IT caused a considerable sensation when, some time ago, the Danish physicists Alfred Johnsen and K. Rahbek published details of their new discoveries in magnetism. Hitherto it was considered



Fig. 1. The loud speaker is totally enclosed.

that only certain metals such as iron and nickel, possessed magnetic properties. Johnsen and Rahbek proved by their experiments that there exists also a magnetic attraction between metals and stones, or rather between conductors and semi-conductors of electricity.

Magnetic Attraction.

This new knowledge can easily be demonstrated by the following experiment: In Fig. 3, H is a semi-conductor, a stone such as slate or Solenhofen, well known by its usefulness for lithographical purposes. Its surface is a circle of 20 square centimetres, it weighs 70 grammes. Its base is covered with a layer of metal B, which is connected with one pole of a source of continuous current, such as a dynamo or a battery of 220 volts. The stone, the surface of which is perfectly plain, is covered with a plate of brass, M. This plate is to be connected with the other pole of the direct-current source. The two lines connecting the poles of the dynamo with the stone and the plate are each connected through a resistance of 100,000 ohms.

Normally the brass

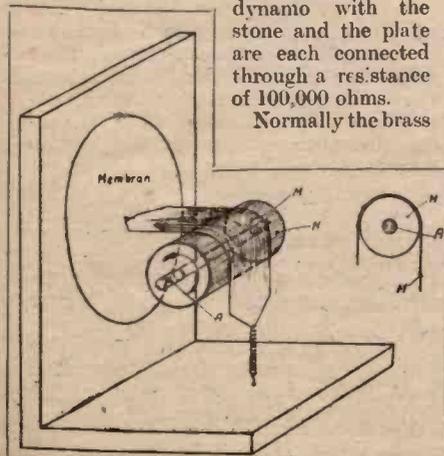


Fig. 2.

plate does not tend to cling strongly to the stone, any clinging observed is due to adhesion, but when the plate is connected with the free end of the second 100,000 ohm resistance, so that the circuit is closed, the plate M clings to the stone, H. The same phenomenon can be noted if the experimenter touches with one hand the plate M and with the other one the free end of the resistance. At the same moment when he takes his hand from the resistance the stone falls down, whilst if the circuit is closed, a direct current of about one micro-ampere flows through the line.

A Novel Principle.

Johnsen and Rahbek have proved by experiments that this attraction is magnetic and that it is always present when a current of very low intensity flows through conductors and semi-conductors of electricity.

The phenomenon just described has been taken advantage of by the Dr. Erich F. Huth

Fig. 3, and that the metallic axle A is equivalent to the tin foil B of the same figure. The metal sheet M corresponds with the brass plate M in Fig. 3.

In the new loud speaker the cylinder H is revolved by an electric motor. The currents caused by the receiving element are conducted to the axle and metal sheet. The metal sheet is attracted with varying strength to the cylinder in accordance with the modulation of the speech. In this manner the diaphragm is made to oscillate so that sounds are loudly reproduced.

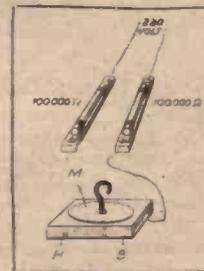


Fig. 3.

Small fluctuations of current are capable of producing very loud signals by this means.

Considerable Amplification.

Fig. 4 shows the new loud speaker in a case, the interior of which is divided into two parts by a vertical plate. The right part contains the electro motor and the left the agate cylinder and the metal sheet.

The latter is connected to the diaphragm which is fitted to a resonance box, and to this the horn is connected. Fig. 1 shows the loud speaker closed. This loud speaker gives astonishing results in respect of clearness and loudness of the tone.



Examples of the largest and smallest loud speakers of the conventional type.

in the construction of a new loud speaker. The manner in which this loud speaker operates can be clearly seen in Fig. 2. H is a cylinder of stone, in this case of agate, which rotates round a metallic shaft going through its axle. This cylinder is covered partly by a metal sheet M, which is fixed with the aid of a small spiral spring to the base-plate of the frame. The other end of the metal sheet is connected to a diaphragm, fastened in the vertical plate of the frame. It is easily to be seen that the agate cylinder H corresponds with the stone H in our

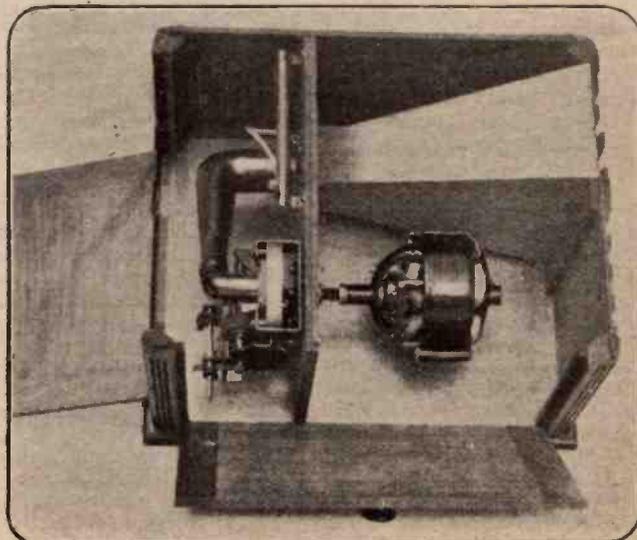


Fig. 4. The arrangement of the mechanism.

BROADCASTING IN BOURNEMOUTH.

6 B M, although it is the youngest of the main B.B.C. stations, has made such strides during its comparatively short existence that it is now one of the most popular in the country, and the following article assists one to realise to what extent local enthusiasm and ambition has figured in its progress.

THE phenomenal interest that is being shown in Bournemouth by the public in the development of 6 B M and its programmes is but a re-echo of the great enthusiasm which followed the opening of the other B.B.C. stations, but the attitude of the local public is notable in that it has changed in a few short months from one of ill-concealed indifference, or in some cases open hostility, to one of whole-hearted welcome and support. One might almost say that Bournemouth was on her dignity when first the possibility of a broadcasting station was announced, but after a few feverish nights of public demonstration the tide turned, and a wild rush for sets threatened to clear the local retailers of all their stocks. From a trade point of view Bournemouth has easily taken first place among the provincial broadcasting centres in the matter of the great number of complete sets which have been sold.

Rapid Progress.

Local listeners were at first satisfied with participating in the apparently mystic means of receiving entertainment, but Bournemouth's traditional love of good music and high-class performances soon came to the front, and probably the high quality of the Bournemouth programmes is as much due to the public demand for the best as to the splendid organisation of Mr. Bertram Fryer and his assistant station directors.

Apart from the rapid progress which has been made in the programmes themselves, the technical features of the station have received the continual attention of the engineers. No stone has been left unturned in the improvement of the transmissions, and they have reaped a rich reward.

Civic Support.

Another factor which has undoubtedly helped to bring broadcasting to such a proud position in Bournemouth is the hearty support which has been accorded to it both by the present mayor, Dr. T. Bodley Scott, and the deputy mayor, Alderman C. H. Cartwright. The latter, it will be remembered, performed the opening ceremony on October 17th, and during the previous week was present at a great meeting of the Bournemouth and District Radio and Electrical Society, when "Ariel," of this journal, was officially welcomed to the town. Dr. Bodley Scott, a gentleman renowned as an advocate of progression in all walks of life, shows a deep interest in radio, and his words at the opening of the Radio and

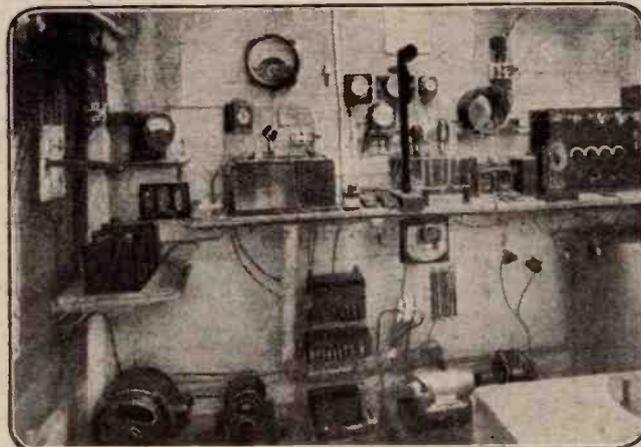
Electrical Exhibition and Convention in November last are worthy of note.

"It will bring all the world closer together. It will make for unity and co-operation—the real watchwords of the future. It will make for the better fellowship of men and nations, and so, I hope, lead on to that reign of peace which we all pray for and long for."

Equipping the Schools.

The attendance at this exhibition at once indicated the enthusiasm with which wireless had been received. During the evening hours huge crowds passed through, and the optimism then occasioned by the great number of inquiries has since been more than justified.

If wireless needed any further stimulus in Bournemouth, the exhibition, by its useful and instructive character, provided it.



2 I L, the efficient amateur station controlled by Mr. H. R. Goodall, of "Fernlea," Winchester Road, Bassett, Southampton.

The Bournemouth Education Committee have recognised what a great power for good the local station can be as regards the instruction of the school children, and already many of the leading schools are equipped with very fine installations. These schools are kept open until 7.30 p.m., and the instructional classes are supervised by responsible and qualified teachers.

Demand for Licences.

Every day sees the erection of new aerials in the district, and the number of these provides a sure indication of the growth of local interest. The aerials are of all varieties, from short single wires stretched between perilously thin poles to the more elaborate double-span variety complete with outside insulators. The Post Office report that the demand for

licences is steadily maintained, proving that the boom is no mere "flash in the pan."

The question has often been asked, Why are concerts by the world-famed Bournemouth Municipal Orchestra not broadcast from 6 B M?

Sir Dan Godfrey is not opposed to the idea, but his committee take a different view. They hold that if the concerts were broadcast the attendance at the actual performances would suffer. There is little doubt that a transmission of items by this orchestra would be made a simultaneous one by the B.B.C., thus giving Bournemouth an advertisement worth thousands of pounds, and there is a general feeling locally that the committee is laying itself open to a charge of following a short-sighted policy.

The afternoon transmissions from 6 B M are very popular, and it is foreshadowed that there will be interesting developments in this direction in the near future. The scholars' hour also is much appreciated, and will be extended later on. The popularity which this feature has achieved in Bournemouth leads one to speculate on the vast possibilities of a central organisation controlled by a special educational board in London. It is obvious that this method of teaching has the great advantage of bringing the eminent professors within the reach of all—a privilege which the average elementary schools can scarcely hope for. Another item which will probably be included in the Bournemouth programmes shortly is a special "farmers' talk."

The Bournemouth station covers a very wide agricultural area, and from the letters which have been received from these districts there is little doubt that such a feature would be a great success.

An Additional Attraction.

Bournemouth is favoured in occupying a very high musical status, while as a seaside resort the town probably offers a stronger appeal to the artistes who provide the concerts than the less attractive inland and industrial centres. These circumstances combine to strengthen the opinion largely held that Bournemouth is destined to figure very prominently in the progress of British broadcasting.

Another question that is arousing considerable interest at the moment is what effect

the broadcasting station will have on Bournemouth as a pleasure resort. Business authorities believe that it will serve as an additional attraction to visitors, especially in the winter months, while the concerts themselves will undoubtedly prove a wonderful advertisement.

Probably the most startling evidence of the wonderful popularity of broadcasting in Bournemouth came to light at a recent meeting of the borough council, when one of the members opened a discussion on the very serious drop in receipts at the Winter Gardens.

This loss during the past quarter (in other words, since the opening of 6 B M) was no less than £1,700, and the councillor hinted that this state of affairs could probably be traced to the radio boom which was sweeping the district.

DELIBERATELY DESIGNED—

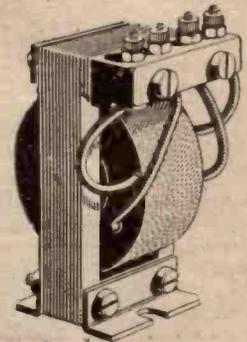
COSMOS RADIO COMPONENTS



"COSMOS" FILAMENT RHEOSTAT
made in two standard patterns constructed with phosphor-bronze contact arm ensuring reliable contact. Resistance is carried on a porcelain former absolutely unaffected by heat.
Supplied complete with terminals, screws, dials and knobs, suitable for back of panel or face of board.
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For one valve (6 ohms) **4/-**

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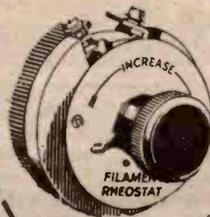
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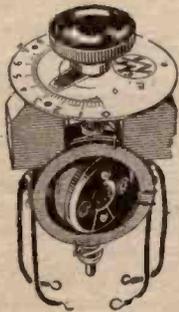
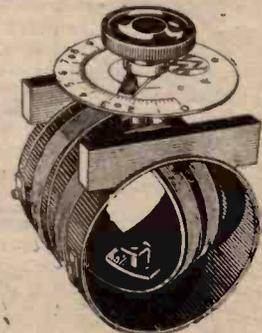
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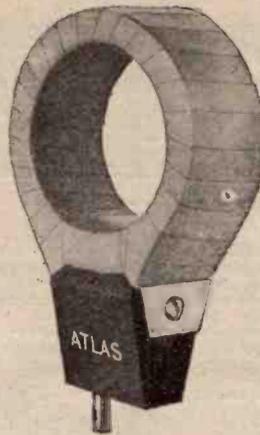
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AMPLIFICATION AND RANGE.

By COLIN H. GARDNER, F.R.A. (Midland Organiser of the Radio Association).

The article below gives some very clear and concise information upon the subjects of high and low frequency amplification, and amateurs adding amplifiers for the first time will find the article extremely useful.

IN any radio receiver we have two types of electric currents present. One is an oscillating current, and the other a direct current. The first is in the aerial-earth and tuning circuits, and the second in the telephone circuits.

Because the oscillating current changes its direction many thousands of times a second, we usually call it a high-frequency current, and the other current we call a low-frequency current. It follows that we can magnify or amplify, as we more commonly say, either the high or low frequency currents to obtain the desired strength of reception, and each type of amplification has its own merits.

H.F. Amplification.

In the first place, it is possible for a state of affairs to occur in which oscillations are present in the aerial-earth system, but these are so weak that they will not operate the valve or crystal used for rectifying them. Fortunately for us, a very weak oscillation indeed will operate the valve when used as an amplifier, and we can thus amplify the oscillations to sufficient strength to operate the rectifier. This process is known as high-frequency amplification, and has the effect of making audible stations a long distance away which previously set up such weak oscillations in the aerial that the rectifier was not operated. On the other hand, the extra strength obtained from a nearby station is not very great.

High-frequency amplification is therefore useful for increasing the range of a set. Where an indoor or frame aerial is in use, high-frequency amplification is almost essential if the set is to work efficiently, as such an aerial "collects" such a small amount of energy that the detector is very rarely operated efficiently if no such amplification is used. With an outdoor aerial one stage of high-frequency amplification with reaction will fetch in broadcasting from distances of over 150 miles. Two stages will usually allow of the user receiving any British broadcast station anywhere in Great Britain. Three stages of such amplification are generally too difficult to manage and are not utilised in commercial broadcast receivers, though there are a few exceptions to this rule. If three stages are used reaction is usually dispensed with.

Low-frequency amplification has the effect of magnifying the rectified current, and we may therefore say that low-frequency amplification increases the strength of a station which is already strong enough to operate efficiently the detector.

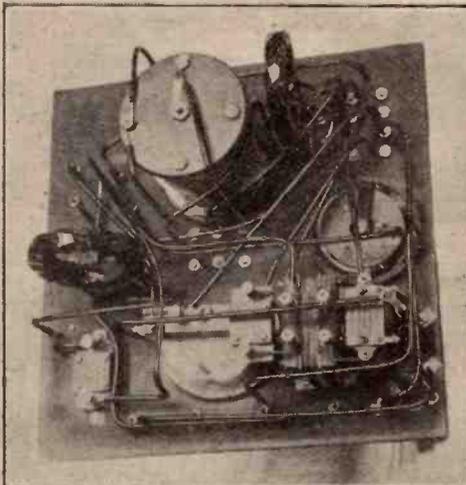
Increasing Signal Strength.

For use in an ordinary living-room one stage of low-frequency amplification is often all that is necessary to operate a loud speaker, but two stages are advisable for demonstrations out of doors or in large halls. There are two types of low-frequency amplification and there is no very strict line between

them. The second type that we refer to is what is generally known as power amplification. This type of amplification is used where very loud music or speech is required. Special valves are used, and a 150 to 300 volt battery is generally used in place of the usual 60 or 90 volt battery.

Grid Bias.

For reasons which will be explained later a small battery known as a grid bias battery must be used under such circumstances, and it may be taken as a good rule that any type of low-frequency amplification may be improved by the use of such a battery. This is a point worth noting when purchasing a set.



The "P.W." Combination Set constructed by Mr. A. G. Fisher, "Hampshire," Dryburgh Avenue, Rutherglen, near Glasgow. Some wonderful long-range results have been obtained on it.

The purpose of this bias battery is to make the signals distortionless. It does not run down in use any quicker than if it were placed in a drawer doing nothing, and it is preferably adjustable in steps, as any change in the type of valve used or the value of the high-tension battery requires a corresponding change in the value of the grid bias battery.

Capabilities of Receivers.

We may thus summarise the performance of a set roughly as follows:

	HEAD- PHONES.	LOUD SPEAKER.
Detector only	30 miles	—
Detector and 1 L.F.	40 miles	5 miles
Detector and 2 L.F.	45 miles	15 miles
1 H.F. and Detector	150 miles	5 miles
2 H.F. and Detector	300 miles	15 miles
1 H.F., D. and 1 L.F.	200 miles	100 miles
1 H.F., D. and 2 L.F.	250 miles	150 miles
2 H.F., D. and 2 L.F.	400 miles	300 miles

These are for a normal aerial, but under favourable conditions these ranges may be doubled, or at night-time even multiplied by three. Where H.F. is used it is taken for

granted that the instrument is fitted with reaction otherwise no reaction is used.

Using a frame aerial with sides about two feet long, the ranges are approximately as follows:

	HEAD- PHONES.	LOUD SPEAKER.
1 H.F., D. and 1 L.F.	50 miles	10 miles
2 H.F., D. and 1 L.F.	100 miles	20 miles
2 H.F., D. and 2 L.F.	150 miles	50 miles

All the above are considered as being for the British broadcasting stations under normal conditions.

Sets employing two stages of high-frequency amplification are a little more difficult to manipulate than the others. Low-frequency amplification does not add to the difficulty of manipulation, but is inclined to produce distortion if more than two stages are used. High-frequency amplification tends towards selectivity. In other words, it is easier to cut out your local station. In this respect, the use of reaction is also a help, but if selectivity is to be obtained it is most important that the aerial-earth system has as low a resistance as possible. This most appreciably sharpens up the tuning. The writer has often had complaints of the difficulty of cutting out the local station when he has been aware that the instrument in use is easily capable of doing so, and in nearly every case has this been due to a badly designed aerial-earth system.

Quality of Signals.

Where low-frequency amplification is used an opportunity occurs for the designer to "juggle" with the received music and speech, and instruments are now on the market which allow of the best results being obtained for different classes of music. A gentleman listening to one such instrument not long ago passed the remark: "That is not So-and-so's orchestra, is it?" And, on being told that it was, went on further to say, "Well, wireless improves it a good deal." Always hear the instrument you are going to purchase, and if possible hear a number. Much beautiful cabinet work disguises instruments which reproduce music far worse than any gramophone. Whilst on this point it is interesting to note that the loud speaker is rarely at fault. Any good make of loud speaker is capable of reproducing really mellow and distortionless music if it is given the right supply from the instrument. Most of the tinniness and distortion so often put at the door of the poor loud speaker is due to faulty design of the set. This is not so noticeable on the headphones as the volume of sound is less.

The potential purchaser of a wireless set should not be too optimistic concerning the reception of distant stations. With a climate such as we are blessed with in this country, there is a fairly constant electrical disturbance in the atmosphere, and this is always causing unwanted sound in the receiving instrument.

THE LUSTRE OF CRYSTALS.

By J. F. CORRIGAN, M.Sc., A.I.C.

Some details about crystals that will prove of interest to amateurs who use that type of detector.

IN wireless circles one sometimes hears some specimens of crystals being referred to as possessing metallic lustres, whilst others may be said to have vitreous lustres, and so on according to the particular nature of the surface which the crystal possesses. The lustre of a crystal is a property which is entirely distinct from its colour. It is really a term used to denote the particular shine and appearance which is exhibited by the mineral or crystal.

We have already seen in this series of articles that the actual colour of a mineral is one of the characteristic properties of the material, and in a smaller way, the lustre which is possessed by a mineral is also characteristic of the substance. The difference between mineral colour and mineral lustre, however, lies in the fact that the latter characteristic is only a property which is possessed by the mineral when it exists in the mass or lump form, whereas its true colour still persists, no matter how finely it is powdered.

Reflection of Light.

The lustre of minerals is due to the peculiar nature of their surfaces, and it depends upon the way in which they absorb or reflect the light which falls upon them. If, for instance, a mineral reflects back most of the light which falls upon its surface, it is said to possess a high degree of lustre. If, however, most of the incident light is absorbed by the crystal or mineral, its lustre is referred to as being dull.

The lustre of minerals is usually divided into two classes, viz., metallic and non-metallic. Minerals which exhibit metallic lustres have, as the name implies, the peculiar shine which is so characteristic of all metals. Galena, which under the guise of some proprietary "ite" or other glistens in the crystal cups of countless amateur crystal receiving sets, possess a metallic lustre to a high degree.

Non-metallic lustres of minerals are more complex to classify, and they can be divided up into several different kinds. A diamond possesses an *adamantine* lustre because it has such a very high power of scattering the rays of light which fall on its surface. Many of the heavier minerals also possess this property to some extent, and thus we find that the lustre of the rectifying mineral, zincite, is described as being of a *sub-adamantine* nature.

Types of Lustre.

Vitreous lustre—i.e. the lustre of glass, need not be described at any length. Some of the common varieties of minerals exhibit this type of lustre, quartz and calcite being specially good examples of the type.

Other sub-divisions of the non-metallic lustre of minerals and crystals are *resinous*,

greasy, *pearly*, *silky*, etc. These terms are, however, self-explanatory, and therefore need not be further discussed. The peculiar silky appearance of some mineral substances is the result of their fibrous structure, and many kinds of asbestos exhibit this type of lustre.

Distinguishing "Faked" Crystals.

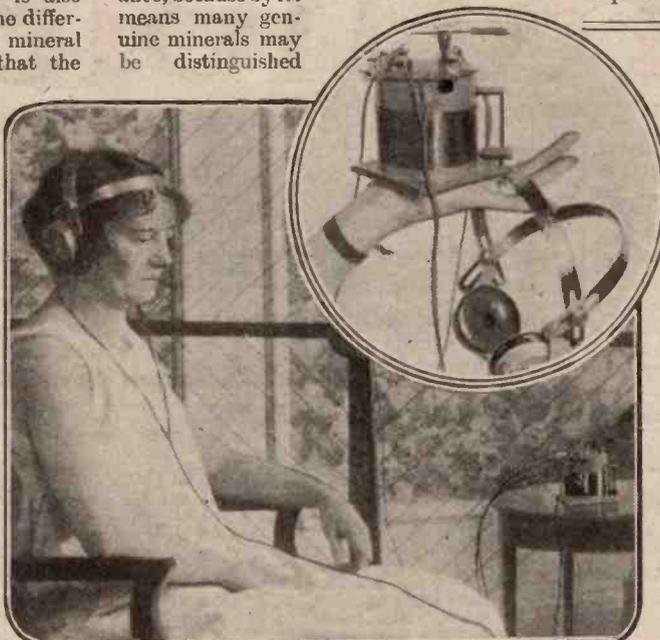
The lustre of most of the different varieties of minerals which are used for radio reception is usually of a metallic nature. Some of them, however, exhibit other lustres which will be seen from a glance at the accompanying table. The study of mineral lustre is of some importance, because by its means many genuine minerals may be distinguished

from faked compositions without the necessity of having recourse to chemical analysis. It is often very easy to imitate the colours of minerals, but to artificially impart the peculiar lustre which characterises the true mineral is very difficult.

The accompanying table, showing the lustre of various rectifying minerals used in

MINERAL.	LUSTRE.
Bornite	Sub-metallic
Carborundum ..	Adamantine
Copper Pyrites ..	Sub-metallic
Corundum	Vitreous
Galena	Metallic
Graphite	Dull-metallic
Iron Pyrites ..	Sub-metallic
Malachite	Vitreous-adamantine
Molybdenite ..	Sub-metallic
Silicon	Metallic
Tellurium	Metallic
Zincite	Adamantine

wireless, may be useful to the amateur who wishes to make sure of the kind of crystal he possesses.



Listening-in at Bournemouth on the apparatus described below. Inset, the small set employed.

PORTABLE RECEIVERS.

The frame aerial possesses many advantages, not the least of which is its portability.

THE aerial in the illustration is made of a light wooden framework resembling a Maltese cross about 4 ft. square, the arms having small ebonite insulators fixed on to them at 2½ in. apart. There are 10 insulators on each arm, and upwards of 80 ft. of wire altogether, which is wound round the insulators so that the whole has the appearance of a spider's web. The wire is single flex of the kind used for electric lighting, although ordinary bell wire is cheaper and answers splendidly. I had in mind the fact that the aerial might conveniently be collapsible for ease in carrying it about, and after some calculation as to the amount of wire required, and

the spacing between the wires which would give a value approximate to that of a full length house aerial, the whole took the form of the one in the illustration. The ends of the wire are taken to terminals on the frame, from either or both of which connecting leads are taken to the receiver.

Frame Aerial Useful.

This type of aerial possesses certain advantages, since it can obviously be moved from one room of the house to another; while in the case of an outdoor aerial the receiving set is confined to the room where the leading-in wire comes. Why, then, have an outside aerial at all? Because any type of aerial may be regarded as a feeler arm supplying to the receiver energy it picks up, and therefore the larger the aerial and the higher it is the more energy it receives. So an outside aerial becomes a sort of overhead carpet, having more power than an inside one.

When using any type of portable aerial, a somewhat more powerful receiver is required to produce the same volume of sound over a given distance as could be obtained with the large overhead type. Nevertheless, portable wireless has charms unknown to the home user. The up-to-date "portable" man does, so to speak, carry a broadcasting studio in his pocket—indoors or outdoors, he listens-in.

Compact Receiver.

Within a few miles range of a broadcasting station the type of aerial described will work admirably with even a small crystal set, having no upkeep cost. For longer distance work the more sensitive thermionic valve must be added.

Using the simple set shown in the illustration, in which case the whole outfit weighed only 2 lb., I heard concerts recently in all parts of the Royal Bath Hotel, Bournemouth, from the lounge to my bedroom, and even when in bed!



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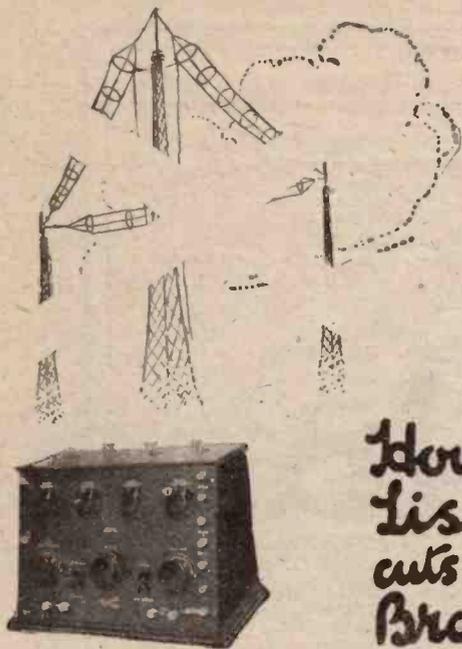
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—M.B.

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MUSIC FOR ALL.

By PERCY A. SCHOLLES (Music Critic of the B.B.C.).

With the advent of broadcasting the biggest problem in the history of music has presented itself. Catering for all tastes is no easy matter, and Mr. Scholes discusses the various musical problems and their solutions in the following article.

THE most fascinating problem in the history of music is the one of which a solution is now being sought.

Consider the history of music in a nutshell. Music began as a very simple art, which all could enjoy. For centuries it consisted of nothing more than a single line of notes—a mere melody or "tune."

Then, about the seventh or eighth century of our era, it began to develop in a new way. It was realised that several notes might be sounded together, making what we call "chords," or harmony, and several tunes woven together, making what we call counterpoint.

This went on until, in the sixteenth century, there was in existence the most wonderful choral art, that which expressed itself, for instance, through the Elizabethan madrigals.

The Growth of Music.

Then came a development of instrumental music, and gradually, during the next century or two, were developed the forms and styles of the fugue, the sonata, the symphony, and the string quartet.

But all these forms, the madrigal, the fugue, the symphony, and so forth, were, for some time, aristocratic forms of music. They were enjoyed in the houses of noble and rich, and were hopelessly beyond the reach of the great masses of the people, thousands of whom did not even know the meaning of such a word as "symphony."

And even to this day the country people, in remote parts of Europe, are still singing their old folksongs, which have merely one line of notes—i.e. are mere melody—though often very beautiful melody; or dancing to their own old folk-dance tunes (which, again, are mere melody—a single line of notes played upon such an instrument as the fiddle); and such people have, even now, never heard the word "symphony," or, if they have, do not know what it means.

Introduction of Opera.

But in towns the appreciation of the more developed music has widened. The first public concerts in England began near Fleet Street, in 1672. Public opera performances began in London during the latter part of the Commonwealth. Gradually then, music—i.e., developed music as opposed to primitive music—was put at the service of those who wanted it, provided they could pay for it—and a new epoch began.

But note that even amongst those who could pay for music, thousands remained still very simple in their tastes. the fact

being that to enjoy symphonies you must have plenty of symphonies, and unless something has made you very keen about music you are likely to overlook your opportunities of hearing them.

Most Important Event.

Then came the pianola and the gramophone, and in a few years the taste for symphonies, sonatas, string quartets, and the like was enormously widened, so that, whereas at first people only bought gramophone records of dance music and popular songs, nowadays, when a gramophone record of such works as Beethoven's famous "Fifth Symphony," or Vaughan Williams' "London Symphony," are issued, they sell at once—"like hot cakes."

But even the popular gramophone left thousands of people indifferent to good music of the more complex kind. Again a

one with another," people in every trade and profession, people of every grade of education, people of every temperament.

But unfortunately those people at present fall into two classes, musically speaking—those who have already learned to enjoy the more advanced and complex music, and those who have not yet learned to enjoy it.

Fully to satisfy those two classes at the one time is not merely difficult, it is impossible. I, as a musical man, would like symphonies and string quartets every night, with, perhaps, just a few minutes of Savoy band, for the sake of its rousing, rowdy, rhythms before I go to bed. And songs about "Roses," and "Gardens," and "You," I don't want at all, disliking both their words and their music. My neighbour, who has heard few symphonies, wants a whole evening of sentimental-song-cum-Savoy.

Programme Difficulties.

We cannot both have our demands met, and for the moment there is a clash of interests, which I personally think the B.B.C. is reducing so far as it can by a pretty fair division of programme time—with a shy, kindly leaning, as I think, to the side of my neighbour.

Tastes will always differ in music as in literature, pictures, food, games, and everything else. but the gap between my neighbour and myself will narrow even within the next twelve months, and I, on my part, must be patient with him, and he, on his, tolerant with me.

The future is rosy for both of us. In a year or two he will find his enjoyment of life widened by the appreciation of forms of music that are at present a dead letter so far as he is concerned. And as that comes about the programmes will, by his wish, gradually change in character, so increasing my pleasures.

Very Good Value.

Nothing has been taken from any of us by the advent of broadcasting; on the contrary, something has been added to our life and its music. We none of us get a whole week's programme of exactly the kind of music we most like, but even discarding all we dislike, we have all of us very good value for our fifteen shillings per annum!

If there is any determined "low-brow" reading me, one who swears that nothing will ever induce him to like anything beyond ragtime and sentimental songs, I invite him to cut this article out, keep it for one year, or for two years, and see whether my prophecies come true.



Alfredo Lever, the well-known Italian artist, frequently listens to a broadcast concert whilst at work.

little initiative was needed; not everybody thought of exploring catalogues and finding kinds of music that were new to them.

What the gramophone left undone wireless is going to do. All kinds of music are now being received in the people's homes—ragtime, sentimental songs, sonatas, and symphonies. They are now put at our disposal, and we can have them as effortlessly as we make use of the gas and water that enter our houses through pipes, or the electric current that enters them by wires.

This, I maintain—and I believe that few musicians yet realise it—is the most important event in the whole history of the art of music. None of us can yet see what will be its outcome, but it is certain that it will, in quite a few years' time, change the mind of the country, so far as the appreciation of music is concerned, thus probably greatly encouraging musical genius.

Every class is interested in broadcasting—"high and low, rich and poor,

A CHEAP BUT EFFICIENT CRYSTAL SET.

By F. W. PLEWS.

A neat portable receiver that is capable of efficient reception is always useful and amateurs will find that the set described in this article will provide very good service besides being extremely neat in appearance.

FIG. 3 is a plan of the lay-out. The heavy dotted lines indicate how the connections are made beneath the baseboard. Procure a piece of mahogany, walnut, or oak and, with the aid of the scale on Fig. 3, bore the holes the proper distance for the terminals, and also where the wire connections are brought through to the upper side and vice versa.

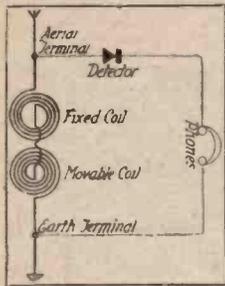


Fig. 1.

D, Fig. 3, is a small piece of wood $\frac{1}{2}$ in. square; this is to raise and also to fix on the hinged movable coil. The length of this piece of wood is $1\frac{1}{2}$ in. The underside of the base is also

raised by two similar sections of wood, placed from end to end on the longer sides; this prevents the terminals from coming into contact with the table when the set is in use.

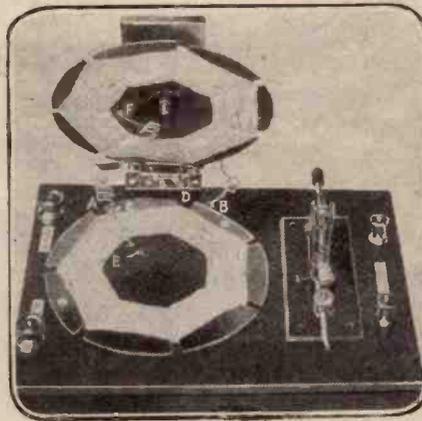
Winding the Coils.

The coils, two in number, are cut to the scale shown, using fibre or stout card-board. Mine were cut from the latter, and then varnished and dried three times. They are both wound with 24 S.W.G. D.C.C. The diameter of the inner portion of coil is 2 in., and the circumference, which measures about $4\frac{3}{8}$ in., is divided into seven equal parts, and spaces cut out as shown in sketch; these spaces are almost $\frac{1}{4}$ in. wide. Two holes are bored at

E, Fig. 3, and the wire threaded through, leaving about 6 in. projecting for joining up to the terminal on the outer side of the upper or movable coil.

Variometer Tuning.

Now proceed to wind the coil in a clockwise manner, first on the underside, then through the slit and across the upper surface of the coil, going round and round until the requisite number of turns is made. It will be advisable to put about 23 turns on either side; this will make 46 complete turns on coil No. 1. The movable coil is wound in the same way, but this will require 25 turns on each side—50 turns in all. The end of the wire in each case is brought through two holes on the outer edge of the coils at a position



The finished receiver.

extra precaution. The number of terminals required are five. The detector is a bought one on ebonite base; this cost 1s. 3d., completely assembled. A small hinge is required to fix the movable coil on the small block of wood D, Fig. 3; also see photo. If one can get a very stiff hinge, so much the better; if not, one must

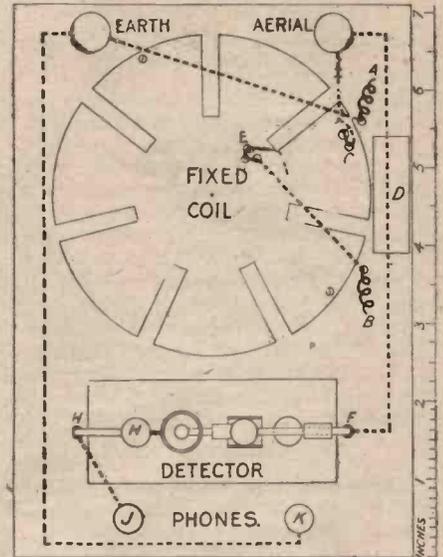


Fig. 3. The lay-out and wiring

provide means to hold the upper coil in position when tuning. In any case, a piece of thin wood will be required to fix the coil on to, as seen in photos. This measures $4\frac{3}{8}$ in. by $1\frac{1}{2}$ in. by $\frac{1}{4}$ in. thick. The coil is screwed on, and the hinge fixed on the base of this narrow support, and placed exactly over the fixed coil; the exact position to screw the lower portion of the hinge will then be seen.

The wiring can easily be seen from the photos and diagrams, while the wire used for wiring the underside connections is 20 S.W.G. rubber-covered copper. Tuning-in is done by raising or lowering the hinged coil.

corresponding to C, on Fig. 3; this will be sufficient to anchor the wiring firmly.

The finished coils will then appear like those seen in the above photo. For the Glasgow wave-length on a moderate-size aerial, I found 38 turns on the fixed coil sufficient, and 42 turns on the movable coil, and the front end of coil was about $2\frac{1}{4}$ in. from the lower coil when the set was working satisfactorily.

The fixed coil is screwed down in position on to the base, which should have been previously varnished twice. Fig. 3 shows the location of this coil. The inner end of wire is taken to the underside through one of the holes at E, Fig. 3; and E, Fig. 2, shows the same wire reappearing on the underside, and it is taken through the panel at B, Fig. 2, and on the upper surface it again appears at B, Fig. 3 and 4.

Fixing the Components.

The end of wire on same coil at C, Fig. 3, is taken to the aerial terminal also on the underside. The terminal holes in the baseboard were well varnished to prevent leakage of current, and ebonite washers were also placed on the underside as an



Fig. 2. The simplicity of the wiring is easily seen from this photo.

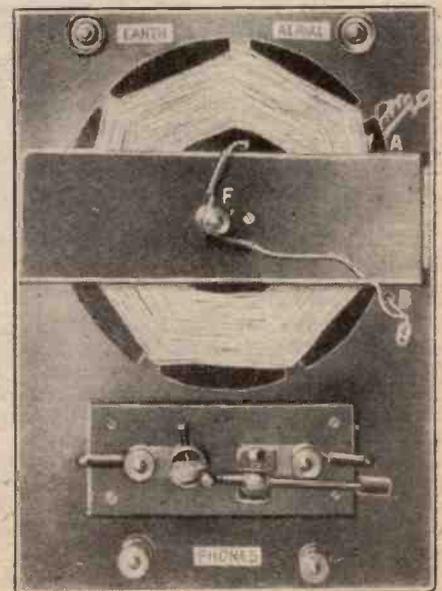


Fig. 4. A view of the top of the panel.

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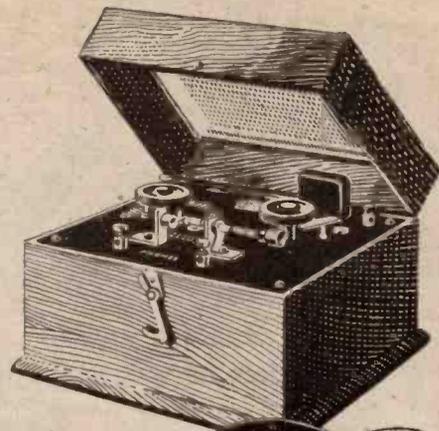
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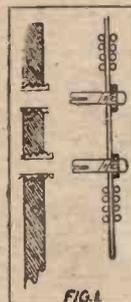
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LOW CAPACITY COMPONENTS.

By WARING S. SHOLL, A.M.I.E.E.

Capacity plays a very important part in wireless reception, and as long as it is controllable is extremely valuable; it is when unwanted and uncontrolled capacities are present in a set that the trouble arises. Especially is its presence felt where high-frequency circuits are concerned, and in such cases stray capacities should be eliminated as far as possible.

FOR the reception of very low wave-lengths, such as may be expected in many experimental or transatlantic transmissions the reduction of unwanted or "casual" capacity is of paramount importance. Quite recently the writer found a type of valve socket that he has been seeking for a long time.



The socket is essentially a screw, $\frac{1}{2}$ in. long under the head, screwed No. 1 B.A., and drilled throughout its length to admit the standard valve pin.

Nuts are also provided, but it is better to discard these when high-frequency work is under consideration.

Firstly, we find the sockets of considerable assistance in mounting spider web-coils on the system given by the writer in the "Wireless Review," No. 1, Vol. II., of December 1st, 1923.

In place of the ordinary valve sockets shown in that article, which are screwed 4 B.A., the newer type is to be used. The holes in the ebonite adaptor are drilled No. 17, tapping size for No. 1 B.A., and the sockets screwed home up to the head.

The top of the holes may with advantage be slightly countersunk and the sockets screwed up tight.

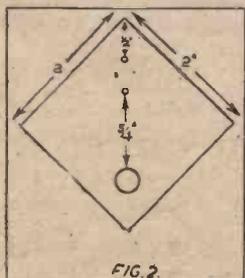
The valve pins are of the usual type and are fitted into fibre strips as previously shown, but in this case it is advisable to cut the pins down to the minimum. Fig. 1 shows the idea in section.

For Low Wave-lengths.

For a wave-length of 100 m. eight turns of No. 22, preferably D.S.C., on a 2-in. flat former with nine slots will be about right, but it will be advisable to make up several coils of from four to fifteen turns to cover as closely as possible the wave-lengths likely on this transmission.

The frequency is naturally very high on these short wave-lengths, and unless the capacity is kept down to a minimum, it will be impossible to tune down to very short wave-lengths, and, also, the circuit will become unstable and prone to oscillation.

For use with such a circuit a low-capacity valve-holder is necessary, and a very good one may be made, using the same type of socket.



For a valve-holder only, a piece of $\frac{1}{4}$ -in. ebonite should be squared up to measure $1\frac{1}{2}$ by $1\frac{1}{2}$ in., and having taken an impression of the pins of an actual valve on stout tinfoil, these dimensions should be transferred to the ebonite by means of a scribe.

If the worker is handy with a soldering iron, it is far better not to fit terminals, but to screw the valve-holder to the panel and solder the wires to the ends of the sockets direct.

Fig. 2 gives the necessary dimensions and a general idea of the holder.

Efficient Valve Socket.

Where terminals are unavoidable they should be of the smallest type, and the ebonite panel should be made larger, say 2 in. square.

The writer has actually made up a panel 2 in. square with filament resistance complete, a photograph of which is given in Fig. 4.

It is probably about the smallest and lowest capacity panel of its type yet produced.

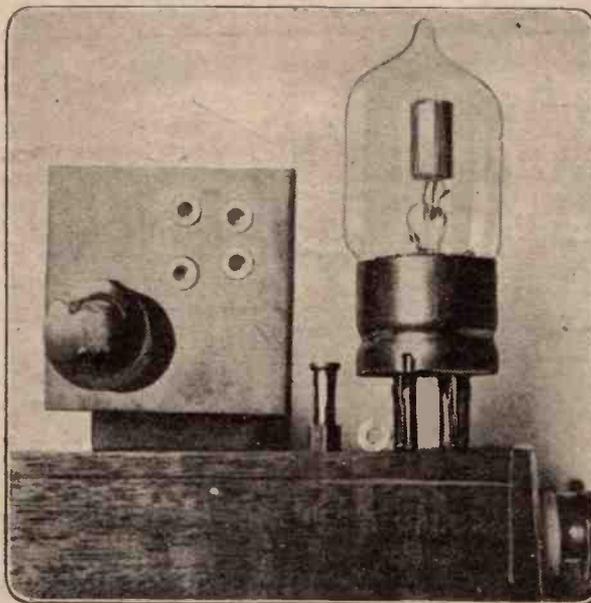


Fig. 4. The panel and resistance constructed by the author.

The type of holder using the ordinary valve socket is admittedly superior to the ebonite pattern, inasmuch as the air dielectric has only about one-third the capacity of ebonite, but the length of even these sockets makes the capacity sufficiently high to be capable of considerable reduction.

H.F. Amplification.

For this reason it will be seen that the nuts had better be discarded, as they will tend to restore a part of the capacity that we have been so far abolishing.

In some cases the connections may be soldered into the open ends of the sockets.

but before doing this it will be well to try a valve in the holder to ascertain if the clearance is sufficient.

In this case the ends should be tinned inside first, and any surplus solder cleaned off before screwing into the panel.

The greatest care must be taken to avoid over-heating the sockets, thus loosening their hold in the tapped holes.

Even the pins of the valves themselves may with advantage be cut down, but unless the worker is highly skilled the operation may prove disastrous to the valve.

This type of holder is strongly recommended for H.F. panels, as, unfortunately, two valve-holders per panel are introduced at a point just where they are desired least.

A Vernier Condenser.

Following up the idea of reducing irregular capacity, we come to the logical sequel of adding capacity where required in the small increments necessitated in H.F. work.

A very material factor in this connection appears in a mechanical vernier adjustment of the condenser.

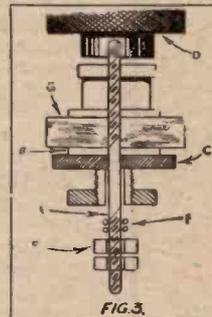
The writer has tried many ideas, but has finally settled down to the type about to be described.

Generally speaking, after a short trial, a good type of reducing-gear of this nature will be employed permanently, and therefore the writer distinctly prefers to make the whole gear permanent, and not trust to slack or spring-operated devices, which sometimes engage and sometimes do not.

Fig. 3 shows the essential parts of the device, consisting materially of the spindle, A, which should be plain where it enters the bush, C, and screwed 2 B.A. at either end.

At B, a 2 B.A. washer is soldered on dead square with the spindle and cleaned up perfectly smooth on the lower side where it engages with the surface of the bush, C, which must be of the type fitted with a back nut, and should have a head as thin

(Continued on page 888.)



A useful plug-in coil holder that has a minimum of capacity.

A HOME-MADE PLUG AND JACK.

This plug and jack was specially constructed for use in a "P.W." Combination Set owing to the difficulty experienced in obtaining suitable components. It has the advantage over bought plugs in that terminals are fitted for 'phones or loud speaker.

HAVING experienced a difficulty in obtaining jacks and plugs, it was decided to make them, with the following result. The drawings will convey to the craftsman sufficient information to enable him to do the same; however, a few hints may be acceptable to those not having much experience in the use of tools.

Material at hand was used in the construction, and the dimensions given need not be strictly followed, since, having plenty of room, I was somewhat generous in this respect, but with reasonable care the novice can be assured of success.

The principal points to be careful of are that the hole for the plug, which is made long to avoid play due to wear, is made a good fit, that the screws which hold the inner springs do not come into contact with the plug, and that the central wire connection of the plug is properly insulated.

To proceed, cut and square up the ebonite to the dimensions, mark centre line on face and edges, and start the long hole for the plug from both ends. (The smallest size Slocomb centring drill is very handy for starting a drill true.) Meet about the centre, and be sure this hole is not too large, or a loose fit is the result. If the size given is adhered to, and a No. 2 Morse drill is used, the tube for the plug will just enter and not go through.

Springs and Contacts.

Always test a drill for size on a piece of waste material, as both material and grinding, if done by hand, influence the size of the hole produced. To get your hole a good fit proceed thus: Cut off about 3 in. of the tube and file a flat at one end reaching $\frac{1}{4}$ in. up the tube slanting towards the end, where more than half the diameter is removed, leaving the burr produced by the file. Plug the other end so that it will not crush when held in hand vice, or similar tool. Turn this through the hole already drilled, and it will act as a broach and produce a hole an exact fit, providing too much material has not been left for it to remove.

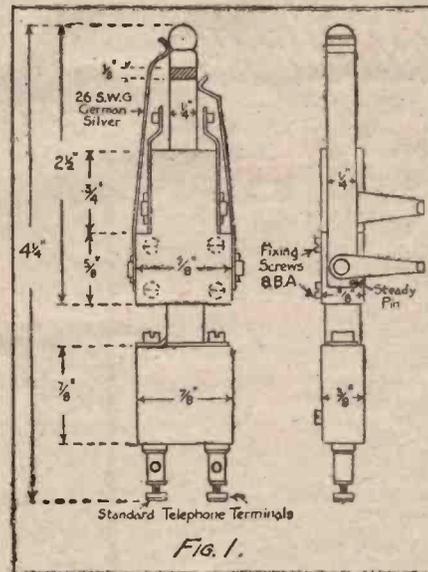
The springs or blades should be of hard rolled German silver or brass, and it is better to punch the holes in this thin stuff than to drill them. Procure or make a nail punch, see that the angle where face and sides meet is sharp, not turned in.

Make a lead dab by melting some lead and pouring it into any convenient shape $\frac{1}{2}$ in. thick. Place the spring on this, and a sharp blow on the punch will cut a clean hole.

The springs can then be held together by a screw and nut and all filed up to size at once.

The contacts as made are 22 ct. gold, but I believe they would answer quite well if the ends of the inner springs were filed to a blunt V-point, and turned outwards to meet the outer spring. They should be adjusted to give a little on making contact, and so keep bright.

The plug is made of $\frac{1}{4}$ -in. bare brass tube with an ebonite bush shouldered and driven in the end with a switch stud screwed into it



LOW-CAPACITY COMPONENTS.

(Continued from page 887.)

as possible. The position of the condenser dial should now be marked by scribing a line at its circumference—quite a small arc will do—and then marking the position of the bush, allowing about $\frac{1}{8}$ in. to overlap the dial.

A clearance hole should now be drilled at this point, and opened out to a slot running to and from the dial to provide for adjustment.

In assembling, the spindle has a rubber tap washer placed over it to form the friction wheel, G, next a washer and nut, and lastly the knob, D.

The bush is now inserted in the panel slot and screwed up finger tight only.

The spindle is put through the bush and secured with a spring washer, E, and two nuts, F, which must be locked up tight by holding the upper

and then filed or turned to shape, as shown in the diagrams. Before putting this in, file a flat $\frac{1}{4}$ in. long half-through the threaded part, and solder a length of copper connecting wire on.

Making the Adapter.

Slip on a length of insulating tube and bring it out of a hole drilled through the sleeve, which acts as a stop to the plug. This sleeve should be soldered on, and a wire turned round the tube and soldered. This should be taken round one of the screws in the adapter, the central wire going to the other.

The adapter is made by taking a piece of ebonite of dimensions given, drilling a central hole to fit the plug, and at each side of it a $\frac{1}{8}$ -in. hole. Drive a piece of brass tube in each of these and file off flush. A centre punch is lightly driven in tube to expand the ends, and thus are fixed the tubes firmly in the holes, which should have previously been chamfered out slightly.

A word as to hammering or riveting on ebonite. This must be carefully done or you will find a nearly finished piece of work coming unstuck if roughly used.

Finishing Off.

Soldering about ebonite should be quickly done, and for this cleanliness is essential if a neat job is to be made. After cleaning keep the hands off it—use pliers and Fluxite, and hold the bit so that the metal to be joined is brought to the same heat as the melted solder. A clean, sound joint will be the result.

The terminals should have the threads filed off the parts which go into the adapter, and then be split with a hacksaw, like a valve pin. If a nut or washer is put under the head of the screw of the terminal spade-shaped connections can also be affixed.

nut fast and screwing up the lower one, and then just a partial turn down to the upper nut, which will render all secure.

The whole assembly may now be adjusted to make firm engagement with the edge of the condenser dial, and the back nut of the bush tightened up permanently.

The photo., Fig. 4, shows the device in use, affording a reduction of about four to one.

In practice the fine adjustment will be found a great help in close tuning.

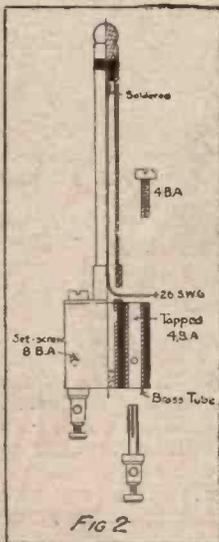


FIG 2

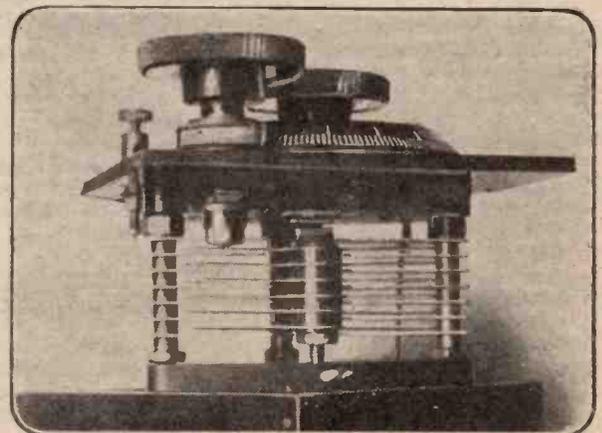


Fig. 6. The variable condenser with micrometer adjustment.

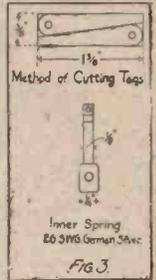
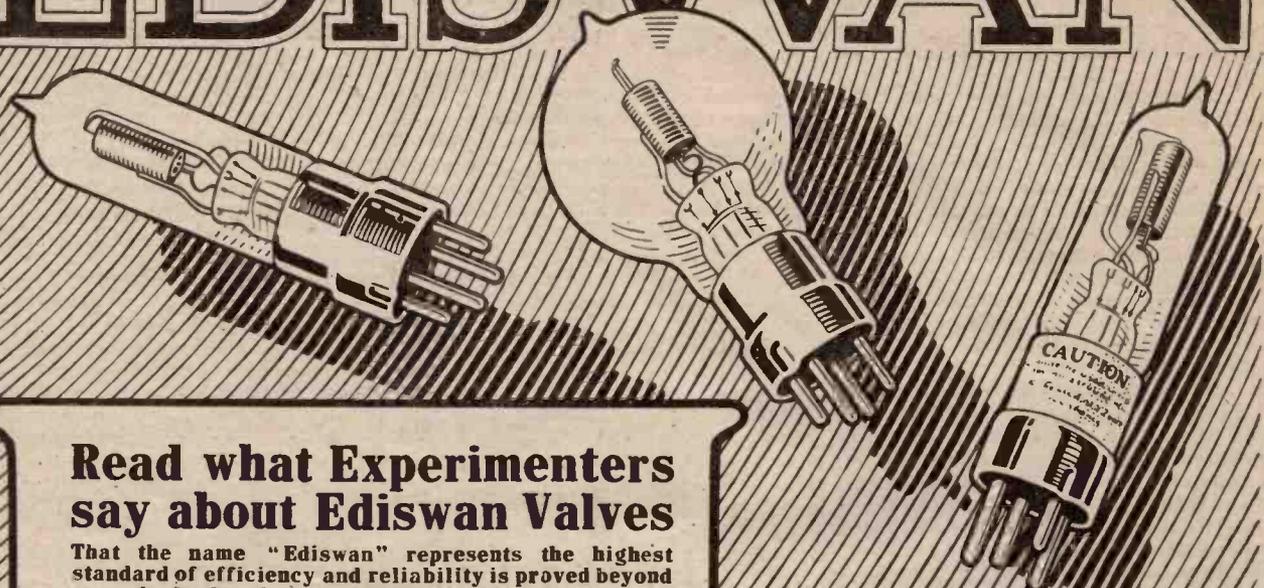


FIG 3

EDISWAN



Read what Experimenters say about Ediswan Valves

That the name "Ediswan" represents the highest standard of efficiency and reliability is proved beyond doubt by these records of actual results.

Darlington, 14th January, 1924.

Regarding my reception of Calgary, Canada, CFCN, with 3-valve Broadcast Receiver, using Ediswan A.R. Valves, I have also had the following stations:—

- PWX Cuban Telephone Co., Havana, Cuba.
- WMAL Trenton Hardware Co., Trenton, New Jersey.
- WGY General Electric Co., Schenectady, New York.
- WMAF
- IJW

In all 18 American transmissions, all taking place on an inside aerial, WMAL could be plainly heard 2ft. from the phones, the last being an amateur station calling ARRL.

As I do a lot of experimental work, especially long distance receiving, I have tried many makes of valves, and I have always had best results with your A.R. Type. The advantage I have found is that they are superior to the others that I have experimented with in the following ways: their action being very stable (a great advantage in long distance receiving), they are good H.F. and L.F. Amplifiers as well as good Detectors, and clear speech is a special feature.

I do not hesitate in saying that the A.R. valve is the best high temperature valve that I have had experience with, and I can recommend same for all types of receiving, either Broadcast or Experimental.—H.W.T.

Type A.R. 06 Near Cosham, Hants.

I recently had an opportunity of testing three of these, and I must say I was surprised at their amplifying power. Two of these valves gave much better L.F. amplification than three ordinary R valves. A.R. '06 valves I find are exceedingly good for telephony. They seem to give much clearer reproduction, and provided there is no vibration, they are wonderfully quiet.

J. H. C. H., A.M.I.R.E.

Type "A.R." and "R." 12/6

Type "A.R.D.E." 21/- (Dull-Emitter).

Type A.R. '06 30/- (The Latest Dull-Emitter).

This Valve can be run off dry cells, reducing upkeep costs to a minimum. The current consumption at a filament voltage of 2.5 volts is only '06 of an ampere.

Have you had your FREE copy of Illustrated Booklet "The Thermionic Valve"? If not, send a postcard to-day.

Your Dealer holds stocks to supply you. If not, write us direct, giving his name and address.

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Works:—Ponders End, Middlesex.

Contractors to H.M. Admiralty,
War Office,
Royal Air Force.

The safety Cap (Prov. Pat.) which is now fitted to all Ediswan Valves. The filament pins are shorter in length than the plate and grid pins, thus avoiding any chance of making surface contact with the wrong sockets.

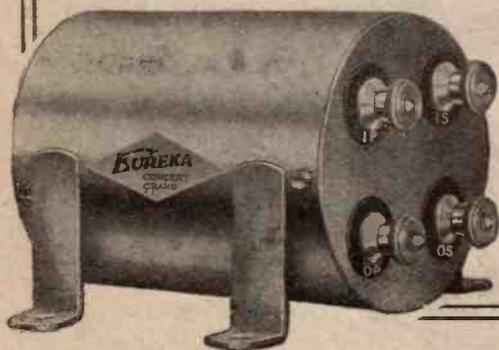
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The EUREKA

L.F. Transformer.

The New Eureka Concert Grand Transformer marks a new stage in Wireless development and constitutes probably the greatest advance yet made in low-frequency amplification. Its amplification is constant over the entire range of speech and music frequencies. Its windings are non-resonant to any speech or music frequency. It is absolutely guaranteed to give both a quality and volume of tone never before produced by any transformer at any price.



CONCERT GRAND TRANSFORMER

The most wonderful Interval-Valve Transformer in the world

Make this Test.

Try a Eureka against any Transformer you know. Note its wonderful amplification over the whole range of speech frequencies. Note the enormous improvement in tone quality and the complete absence of self-resonance at all audio-frequencies.

Two Models to Choose From.

The Eureka is made in two models: Concert Grand for first or single stage and No. 2 Model for second stage. Both are completely shielded in steel, with a copper deposit over all, and equipped for either base or panel mounting. No. 2 may be used as a single stage.

Concert Grand Model 30/- No. 2 Model 22/6.

TRADE NOTICE: Eureka advertisements will appear in the principal Wireless papers during February and the following months. Order your stocks to-day and be ready for the heavy demand.

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The "Gramaphix" Loud Speaker.



This is a most efficient device, to which the ordinary head-phones are clipped by a simple pressure on the spring clips. Mounted on the NEW IMPROVED RESONATOR, the voice is well and evenly distributed throughout the room, removing all necessity to "listen-in."

GRAMAPHIX, 10/6.

IMPROVED RESONATOR, 7/6.

Postage 9d. extra.

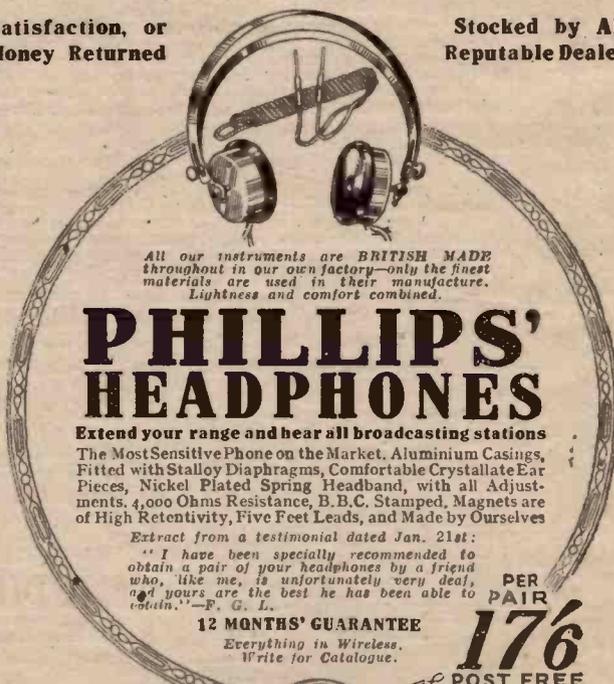
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Electrical Engineers and Wireless Experts,

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Satisfaction, or Money Returned

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Extend your range and hear all broadcasting stations

The Most Sensitive Phone on the Market. Aluminium Casings, Fitted with Stalloy Diaphragms, Comfortable Crystallate Ear Pieces, Nickel Plated Spring Headband, with all Adjustments, 4,000 Ohms Resistance, B.B.C. Stamped, Magnets are of High Retentivity, Five Feet Leads, and Made by Ourselves

Extract from a testimonial dated Jan. 21st:

"I have been specially recommended to obtain a pair of your headphones by a friend who, like me, is unfortunately very deaf, and yours are the best he has been able to obtain."—F. G. L.

12 MONTHS' GUARANTEE

Everything in Wireless. Write for Catalogue.

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OUR UNBEATABLE VALUE.

Latest 1924 Model de Luxe Set of Parts Complete in handsome polished Cabinet, assembled Ebonite Panel with latest improvements and simple instructions for wiring ready for use as illus. 100% RESULTS GUARANTEED.

A Purchaser writes.—"I tune into Newcastle quite well although the range is about 45 miles."

BEST RESULTS are obtained only by using "EXCELITE" the new SUPER Crystal. Every piece GUARANTEED. Obtainable only from us. Price per box

Sets of Parts from 7/6. LISTS FREE. Satisfaction Guaranteed or Money Refunded.

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W. DAVIS & SON,

THE SHEFFIELD RELAY STATION.

A considerable amount of discussion regarding the relay station's transmissions has been going on at Sheffield. Interference from land-line noises was experienced, and special tests had to be carried out by the B.B.C. before the trouble could be remedied.

SHEFFIELD, the first town in England to be linked to a broadcasting station by means of a land line, is the first one to complain. And, it is to be admitted, not without due reason.

The chief complaint was that the power which the station uses (100 watts) was not sufficient to allow users of crystal sets to receive the broadcasting with sufficient strength unless they lived within a few miles of the relay station. It is obvious that in such a large town as Sheffield there are many who live in the suburbs, where it is not possible to get good reception without a valve, who desire to hear the broadcasting without going to any further expense than a crystal set entails.

Re-transmission Tests.

As things stood, these people either had to content themselves with poor crystal reception, the expense of a good valve set, or nothing at all, while people similarly situated in our other large towns can get the best possible results on the cheapest of sets. Complaints had also been received stating that even when reception was loud enough, it was not clear or free from interruption.

Ever ready to do their best in cases, the B.B.C. did not turn a deaf ear to Sheffield's appeal, and Captain West came down to Sheffield to see what could be done about the matter.

When he came down Sheffield was linked to Manchester by means of a land line. There was only one possible alternative to this, and that was employing wireless reception. The idea was to pick up Manchester's signals in Sheffield by means of a wireless receiving set, then to re-transmit these signals, after they had been amplified, to the Sheffield ether. So Captain West carried out experiments to see if this latter idea was feasible, but it was found that, while the broadcasting came through fairly well, it was at times quite blotted out by jamming. So it was decided that this method could not be relied on completely.

Alternative Methods.

The land-line method also has its drawbacks, for not only is it expensive—the Post Office fees for this class of line being very high, although a special rate is allowed,—but the results so far obtained were not satisfactory. It was then suggested that if these two methods were combined the results would be more satisfactory. That is to say, use the land line until the least sign of interference takes place, then switch over immediately to the wireless receiving set. After numerous experiments had been conducted Captain West decided that the land-line method was by far the best,

but so that the service should be free from interruption, he decided that, instead of connecting Sheffield to Manchester it would be much more satisfactory if it was connected to Birmingham. The reason for this being that, of the country traversed by the two lines, that of Birmingham was the most suitable to ensure a continuous service.

Improved Results.

So Sheffield is now connected by land line to Birmingham, although the receiving station at Greenhill, which is just outside Sheffield, is still kept on, as experiments in this line will be carried out occasionally.

A marked improvement in the reception of the broadcasting proves that Captain West's deductions were correct.

The shortage of amateur transmitters in this district is very noticeable. Only two work regularly. These are 6 R O and 2 A S. The first is owned by Mr. A. Taylor, of 122, Wellington Street, Cardiff, while 2 A S is situated at Penarth, a few miles outside Cardiff, and is owned by Captain W. H. Moon.

2 I H is situated at the Technical College, but at present no telephony transmitter is in use, although one using a power of 10 watts is to be erected ultimately. A 1½-kilowatt spark transmitter is at present installed.

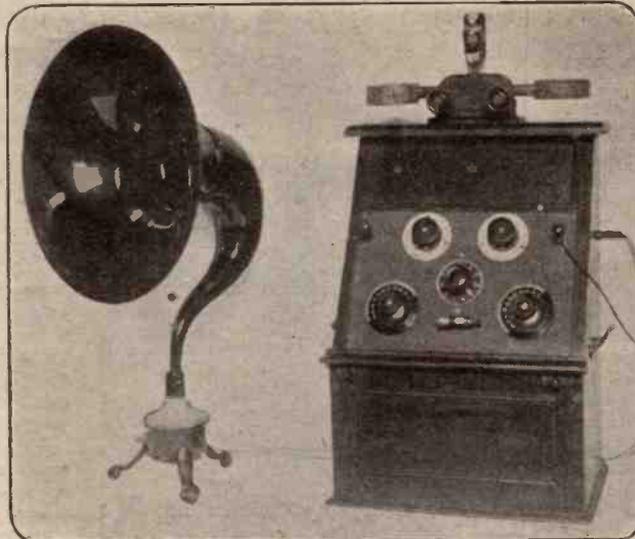
Another amateur, Mr. Sanderson, tells me that he hopes to get his station (call sign 2 U Q) in operation shortly, but is at present experiencing difficulty with his H.T. supply. The address of this station is 23, Palace Road, Llandaff.

Owing to the fact that their headquarters have recently been sold, the 14th Cardiff Lord Mayor's Own Troop of Boy Scouts recently found it necessary to dismantle their transmitting station just when it had reached completion, and it is doubtful whether 2 U N will be re-erected. This station was originally designed so that the Scoutmaster could keep in touch with his patrols when under canvas, and in this way put the parents in touch with their boys.

A Wireless Boom.

While wireless dealers in some parts of the country will tell you that trade is bad, I was informed by many dealers in Cardiff that they could not obtain supplies from the factories quick enough, so great was the demand for accessories in Cardiff and Wales generally.

Major A. Corbett-Smith, the popular director of 5 W A, is much more well known in literary circles than is generally supposed. In 1905 he was called to the Bar and served there with much success, and since this date among his writings are: "The Balance," "The Evolution of Modern China," "The Chinese Drama Yesterday and To-Day," "The Chinese and Their Music," "The Retreat from Mons," "Active Service Chats," The National Opera Handbooks, etc. He is also responsible for many musical works, perhaps that most generally known being "Elizabeth," an opera to his own libretto, which was produced in 1923. Wounded twice in the war, he did much work in entertaining the wounded and troops in action.



An efficient cabinet set constructed by Mr. R. Clarke, 134, War Lane, Harborne, Birmingham.

With regard to the power of the station, Captain West reminded the Sheffield listeners that the Sheffield relay station was licensed by the Postmaster-General for 100 watts only, so, much as the B.B.C. would like to, they are unable to increase the power of the station at present.

CARDIFF NOTES.

Some impressions gathered by "Ariel" during his recent visit to Wales.

BROADCASTING seems even more popular in Cardiff than in London, which certainly is a good testimonial to the excellency of the local transmissions. There seems to be more aerials to a given area in this city than in any other broadcasting centre I have visited.

Two Minutes Interval-Please!

By E. Blake A.M.I.E.E.

SOME men are dogged by ill-luck. Others are overtaken by it. Others are born with it clinging to them like eyebrows. In one of these categories must be the man whose sad tale was related to me recently.

Our story opens—as the film captions say—on the day when Sir Boyled Hoyle's closed, and he left his wordly goods to be shared between the collector of death duties and the orphanage patronised by the Postponed Irish Stew Syndicate, of which he had been a decayed director. As most of those goods lived in bins in his cellar they were not negotiable, and were, indeed, of little utility to orfings. So there was a great auction sale, during which a bottle of forty-year-old brandy was passed to a man called Bones in exchange for sixty shillings. He was not called Bones in exchange for sixty shillings. He paid that for the bottle of brandy.

Novel Idea.

Now, Bones raffled the brandy, and raked off eighty shillings, which he invested in all-wool undies, and hence, deservedly, passed from our ken. The ancient spirit was won by Graggs the unlucky. Unlucky, because, since the age of sixteen, he had flung approximately seventeen pounds into various raffles—and had received in return a German alarm clock, worth three shillings, and this bottle of medicine.

Christmas, 1923, drew near. He proposed to call unto him certain bosom cronies, all radio-mad like himself, and to broach with them that bottle on Christmas night. A glorious undertaking—for those who liked it. He felt warm at the prospect, benign, godlike. He drew the cork two days before December 25th, just to smell the medicine. The aroma made him feel like a king in Babylon. He thought Christmas Day should rightly be on December 23rd. Then he felt contrite at such unorthodoxy, had another sniff at that divine cork, and made a great resolve.

"Say it with music," was his thought. Let others share in your gladness if they cannot (and they cannot) share the brandy. (Oh! gross soul of man!) Accordingly, he resolved to carol around the neighbourhood before the—er—opening ceremony. His plan was to trundle a four-valve set with loud speaker round on a barrow, whilst the other glad partakers-to-be transmitted carols from his home by wireless. A novel treat for his neighbours and co-ratepayers!

Broadcast Carols.

Thus it fell out that on Christmas evening three prize stiffs, A, B, and C, were left in charge of his bull-pup, his gramophone, complete with 100 needles and eight double-sided records of carolian nature, and his transmitting set, whilst he, heavily clad and fortified with brandiferous emotions, set forth with the barrow, complete with dinky frame aerial.

The opening carol went with a biff—"The First Nowell." This performance,

rendered outside Colonel Bagsby's, clashed badly with a game of poker, and was received with the warmth of ten degrees absolute temperature. Graggs pushed on. At the doctor's, "Good King Wenceslas" floated out of the loud speaker at strength twelve squared, but was marred by interjections of speech—hoarse speech. Graggs reckoned they were having trouble with the new microphone. He had always distrusted that microphone. However!

Downfall of Graggs.

Outside Canon Koodle's he adjusted the receiver to an especial sweetness, and turned on "It came upon the midnight clear." Gosh! What splendid reproduction! What a Marconian transmitter!



Passing the dreary hours. A night watchman listening-in on a portable set.

Only a few more carols, and then, hey! for good company within doors. Who would be the policeman on Christmas night?

But what was that? There came upon the midnight (or thereabouts) clear, the spirit of melody metamorphosing itself. Graggs had an impression of the broadcast Lord Mayor's Banquet, a fleeting flash of jazz, a roar of laughter, a lot of clinking noises, half of "Ours is a nice house, ours is," and a miscellaneous assortment of conversations. A vision of the Canon standing upon the canonical steps

with a canonical look on his face finished Graggs, who switched off and sneaked off.

Yes! In searching for another accumulator A had spotted the bottle, and shown it to C, who had asked B what they had better do about it. B gave his verdict, and the rest agreed without worrying about a quorum. A jorum was what they required.

The Canon still deplores, *vide* the Parish Magazine, the rowdiness of the neighbourhood and the prevalence of jazzmania, and cocks a severe eye at poor Graggs, who was in November well on the way to a churchwardenship.

How to Begin Wireless.

And now I must fulfil the promise I made last week, and let you into a few of the secrets of how to begin wireless. You begin it with a W.

No, no! I did not mean to waste that one on you this week.

Well, first of all, you need an aerial (sometimes called a naerial or a haerial, according to where you learned engineering). And then you need an "earth," but this must not be the gas-or-water-pipes because—oh, well, I forget the theory—something to do with the white lead in the pipe-joints. Any expert will explain it to you. Try "Ariel." Between the aerial and earth you have to tie the "set"—between heaven and earth, as you might say.

The ways of acquiring a "set" are, as I have warned you, numerous. You can buy one. I recommend this method. It cheers up the advertisers. You can go to Trafalgar Square, and put down your hat and beg for one. This method is cheap but lengthy, and only to be recommended to persevering people. You can make one.

You have to be a cunning craftsman to make a set from first principles, so to speak—a hewer of wood and drawer of wire; one who scrubs ebonite and is acquainted with templates.

"Hook Ups."

I can never bring myself to regard the fellow who delights in hatching out sets from the raw as a pukkha wireless gink. More of a model maker, what? Does he worry about wireless after the last coat of varnish is dry? Just long enough to give him sufficient data to tell the Editor a few choice bangers about the reception of American stations, and then he has conceived another mighty work. This chap is more interested in saw cuts than in circuits.

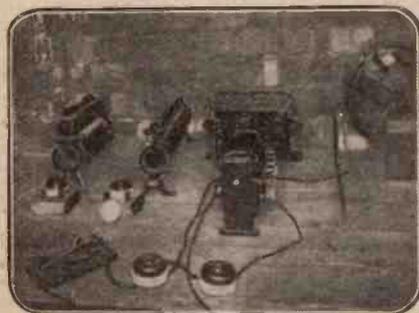
Personally, I warm more to the "hook-up" method, and there be many who will applaud me. In hook-up you just join up various gadgets with wire; there's nothing else in it. But by this method you can try six or a dozen circuits during one programme of the B.B.C., and in the doing thereof spoil no good ebonite or wood. Not a chip on the carpet, my dear lady! A hook-up hubby is a thing to strive for. All done on the kitchen table, and not even a screwdriver required. Next week, I shall tell you about hook-up. Watch this space! Order early!

HOW WE COMMUNICATED WITH AMERICA.

By 2 S Z (Mill Hill School).

During the recent amateur transatlantic tests a great deal of success was achieved by many of the stations, among which the well-known amateur 2 S Z played a conspicuous part. During the tests from that station the 100-metre wave was extensively used and proved once again to be ideal for long distance low power communication.

IT is not easy for a school to take part in transatlantic wireless, even on the receiving side. It is a deed of darkness which during term time is neither consistent with school regulations nor conducive to other work during the day; and in the holidays both masters and boys have a habit of going home, especially at Christmas-time. Nor is it really the work of a



The converter and transformers at 2 S Z.

wireless society, in its corporate capacity, for it is essentially a one-man job, and the last thing which the operator wants is company to help him either in sending or listening-in.

Initial Difficulties.

However, our chief operator, C. W. Goyder, undertook to try his hand in what promised to be the first successful amateur transatlantic test, which was being organised by the R.S.G.B. to take place between Dec. 22, 1923, and Jan. 10, 1924. The school station was entered for the test, and a 250-watt licence was obtained from the P.M.G., supplemented a few days later with permission to use the 100-metre wave-length on occasions.

The difficulties were great. The new science buildings, which afforded the only possible site for an aerial, were still in the hands of the builders, and our prospective wireless room was only approachable by a ladder, 'mid planks and scaffold poles, trays of mortar (useful as candlesticks), and other pitfalls. On some nights we could only get in by crawling underneath the trestles. The walls and ceiling were unplastered, the floor was unslaid, and the window-frames had to be stuffed with paper to keep out the draught. It was a dreadful place in which to spend even one winter night, and the test was to last for twenty.

Collecting the Apparatus.

A cable from the physical laboratory brought filament current, while power for transmission came from the sanctuary of the chapel itself. For the cable we used German flex of wartime manufacture, of magnalium wire and paper insulation,

purchased at Stevens' auction at 4/- a hundred yards. The voltage drop was considerable, but our transformers rose to, as they were borrowed for, the occasion.

A Crypto commutator rectifier, ordinarily used for accumulator charging at 30 volts, provided an admirable synchronous motor, and was fitted with a home-made commutator 8 inches in diameter with half-inch ebonite spacings between 2 brass segments, and, as the carbon brushes left a deposit on the ebonite which soon began to spark across, we copper-plated them.

But the plating soon wore through, and we had what can only be described as the impudence to solder copper strips on the plating on the brushes—and it rectified our 4,000-volt current throughout the twenty nights almost without a spark, and was running at its very best on the last night of the test.

Commencement of Tests.

Auto-transformers were requisitioned for chokes, glass condensers and an inductance on an 8-inch ebonite former were quickly made, and a flat 5-wire aerial, 55 feet long and 22 feet above the roof, with 10-foot spreaders, and a 45-foot cage lead-in, with rings of 3-ply wood, brought in through the roof, was erected by Goyder, and other members of the wireless society. For the counterpoise 8 wires were stretched between 2 cross wires below the aerial, which were themselves attached to the tiles by picture hooks. The counterpoise lead-in was also a cage.

A supplementary earth consisting of a copper earthing mat, belonging to the O.T.C., was buried under the window at a depth of 3 feet. A separate single-wire aerial, directional for America, proved very useful for receiving. A couple of O 250/C valves were generously and willingly loaned to us for the test by the Mullard Radio Valve Company. Rheostats, voltmeters, and ammeters from the physical laboratory completed the equipment of a station, which had thus been furnished almost entirely out of our existing resources. The Hartley circuit was used. On Dec. 18 the school broke up, and on the 21st Goyder went into "residence."

The following extracts from his diary should not be uninteresting. The interpolations in brackets are mine.

DEC. 21 (Night before beginning of test).—Received 1 C M P, loud, steady, good tone. 2 B G H, steady, faint strength. To 8 V F from 8 Z D. A C faint. Sent several times.

Radiation 3.6 amps, using 1 valve. W.L. 210 metres.

DEC. 22 (First night of official test).—Set working well until last moment before scheduled time to transmit, when radiation suddenly dropped 50%. Could not locate trouble, so worked schedule on half radiation, using 2 valves. Radiation 4 amps, W.L. 210 metres. Bad night, snow, then slush and mist. No Americans heard.

Peculiar Mishap.

DEC. 23.—Sent according to schedule. First transmission, radiation 4.5 amps., W.L. 212 metres. Later, radiation 4.2 amps., W.L. 202 metres. Cause of trouble not found.

DEC. 24.—Radiation still worse with coming of rain. Tested leakage between aerial and earth, and between counterpoise and earth, by putting full 4,000 volts direct on each. Discovered large leakage from counterpoise to roof due to an unobserved piece of wet string, and shown by large brush discharge. Set now working O.K. Radiation 5.5 amps. But more troubles to come. During first transmission, a red spark and smoke appeared behind one valve. Outer glass punctured by sparks jumping from grid leak through the glass with which it had been left in contact. Valve ruined. Valve taken back during day and new one obtained (the writer would express his appreciation of the kind and prompt way in which the



Mr. C. W. Goyder at work during one of the tests.

Mullard Company helped us out of this unexpected difficulty).

DEC. 25.—Set adjusted with new valve and valves increased to proper brightness, as it was discovered they had been under-loaded before. Radiation increased considerably, and after final adjustment unable to measure it for want of proper instrument. Plates just red hot after

(Continued on page 894.)

HOW WE COMMUNICATED WITH AMERICA.

(Continued from page 893.)

15 minutes' working. Set working excellently. W.L. 201 metres. Sent according to schedule.

DEC. 26.—Same adjustments as on 25th. Hot wire ammeter suspended as a shunt from 3 inches of aerial lead-in read 1.2 amps., with plate current of 90 milliamps. Set working wonderfully well. Schedule sent, W.L. 201 metres.

Results Improved.

DEC. 27.—First test report received. 2 S Z, one of 16 stations (9 British, 5 French, 2 Dutch) heard to date with code words verified. Tried to get 100-metre wavelength with multiple-tuned aerial. Not much success. (This experiment was discouraged by the writer, who was sent on the roof in the early hours of the morning to stand between the counterpoise wires with one foot on the top of a chimney and the other on rung of a ladder, and to shout over the roof and through the closed window the readings on an ammeter attached to an inductance swinging in the gale between the far ends of the aerial and counterpoise.) Later got wave-length and radiation checked up by glow-lamp on receiving aerial. Got 112-metre wave well.

First schedule on 200 metres delayed owing to trouble with aerial ammeter (not much wonder after its adventures on the roof). Otherwise sent to schedule; results better than on 26th. W.L. 205 m.

DEC. 28.—Experimented with M.T.A. on 100 metres, and got 3 on shunted ammeter. Sent after 6 a.m. on 100 metres, but no evidence of success.

Schedule on 200 metres. Some trouble again. Found workmen had thrown a wire over counterpoise, causing leakage. Removed this. Trouble remedied.

DEC. 29.—Changed from M.T.A. for 100 metres to Hartley circuit with series condenser and got 1 ampere.

Sent on 200 metres to schedule, but trouble owing to insulation breaking down on commutating rectifier. Remedied it by filing down ebonite.

DEC. 30.—Schedule on 200 metres.

Called America on 100 metres, but no reply. Series condenser sparking. Heard many U.S. amateurs on 200 metres, and called them on that wave-length, but no reply.

First Two-way Communications.

DEC. 31.—Schedule on 200 metres.

Changed mica series condenser for glass and sparking ceased. No further intention of trying 100 metres to-night, but heard C Q from 2 A G B (Dodman, New Jersey), so called him on 100 metres and received reply at 5.45 a.m. Kept up two-way communication with him for some time, and took down three New Year messages for France. He reported, "You are the only European station heard here to-night." Arrangements made to carry on next morning if possible.

JAN. 1.—No work on 100 metres to-night. Schedule as usual on 200 metres. Worked with 8 A B (Nice) for some time, but regulations prevented sending messages

other than those relating to wireless experiments.

JAN. 2.—No short-wave work, but got radiation '9 with shunted ammeter. Heard 1 B D I (Handy, Ovono, Maine) call 2 S Z on 200 metres at 6.15, and replied on same, but no success. 200-metre schedule.

The Final Tests.

JAN. 3.—Worked with Canadian 1 D Q (Crowell, Nova Scotia) on 100 metres, but he complained of interference and could not receive us any more. 200-metre schedule as usual. Tried Colpitt circuit for 100 metres, and got some radiation.

JAN. 4.—Schedule as usual. Very bad night. No Americans heard.

JAN. 5.—200-metre schedule as usual. Got the set working better on 110 metres, using a variable series condenser made by increasing the spacing between the vanes of an ordinary variable air condenser by removing alternate ones, and immersing it in olive oil to restore capacity and decrease liability to spark. Exchanged signals with 1 X W (Schnell, Hartford, Connecticut), and also with Canadian

1 D Q after 6 a.m. By addition of R.F. chokes in filament leads and additional chokes in H.F. leads radiation was improved.

JAN. 6.—Failed to wake for last schedule test only. No other work done. Bad night for reception.

JAN. 7.—Schedule on 200 metres, and for a few minutes on 100 metres. Bad night. No Americans heard.

JAN. 8.—Schedule on 200 metres. Called Canadian 1 D Q at 6 a.m., and heard 1 X W reply. Worked with 1 X W for 2 hours, who was able to receive with aerial and earth disconnected (by removal of primary coil) without necessity of repeating any signals. Afterwards worked with 2 A G B, who received signals when 4 feet from 'phones. Carried on well into daylight.

JAN. 9.—200-metre schedule as usual. Listened for 1 B D I by arrangement at 6.15 a.m., but could not hear him. Not a good night, but worked with Canadian 1 B Q (Greig, Halifax, Nova Scotia) after 7 a.m. on 110 metres.

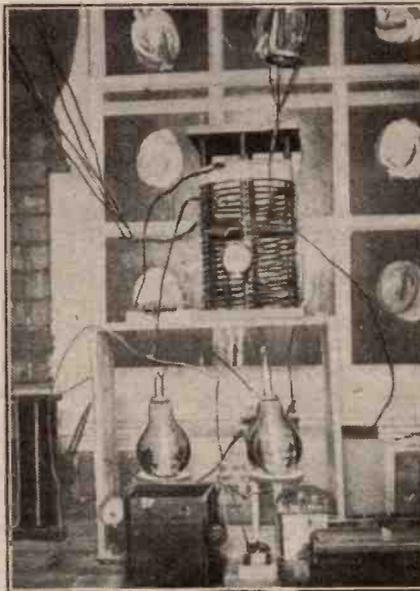
JAN. 10.—Worked with 2 A G B on 100 metres at midnight. Sent last 200-metre schedule, and listened and called on 200 metres till 8 a.m.

Reports of Success.

Thus ended the test. Within a day the room showed no sign of ever having contained a wireless instrument, and was again in possession of the plasterers. The weather was not kind—with a few exceptions the spell of weather chosen for the test was worse than could reasonably have been anticipated for wireless purposes at this time of year.

While waiting for the official report of the 200-metre test, cards are coming in daily from American stations, and we have received interesting reports of reception from Lisbon and from Oran, Algeria—the last station sending a list of our code words for 5 nights up to the date of writing.

The interesting feature of the test has been the successful two-way working with 4 American stations on 100 metres after 6 a.m., by the simple device of readjustment and insertion of the variable series condenser, from the same transmitter, which we were regularly and successfully using for the 200 metre official tests.



Part of the transmitting apparatus, showing the A.T.L. and two power valves.

RADIO IN LATIN-AMERICA.

THE Argentine Department of Agriculture has commenced the broadcasting of weather reports and market quotations by radio. Through the medium of the principal daily newspaper, published in Buenos Aires, a news bulletin (unfortunately exclusively "American" news) is sent out every night by means of the Service Radio Sud-America. It is not unnatural that this intelligence, bearing an unmistakable American impress, should prove unsatisfactory to the large number of other foreign residents in Argentina, who are therefore busily engaged in forming an association among themselves for the establishment of an independent service which will not be subject to United States influence.

A new radio station is in course of erection

for the Compañia Radiotelegrafica Brasileira, to be erected in Sepetiva. This will prove one of the most powerful radio-transmission stations in the world.

A new Chilean radio company has been formed in Santiago, capital of the State, the primary object of which is to establish plans for radio telephone and telegraph communication and to install one or more broadcasting stations.

British Apparatus Wanted.

At the same time the company will act as agent for manufacturers of radio apparatus, and any British firm anxious to extend their connections to the West Coast of South America will do well to place themselves in communication with the Director of the Chilean Radio Company, at Santiago. Communications in all cases should be in Spanish, and, where catalogues are forwarded, these should also be either in Spanish or French, English being little understood.

Send for full details of the Peto-Scott Unit System today and calculate how much you will save by building up your own Receiving Set.



Note the illustrated Instruction Folder supplied with the set of parts for the No. 4 Unit. Full details of the whole System are given in a 48-Page Catalogue (post free 3d.) or Peto-Scott's Wireless Book 1/3 (post free 1/5).

Technical knowledge unnecessary here

—yet these Units conform absolutely to P.M.G.'s requirements.

THE Peto-Scott standardised Unit System has been such an outstanding success for the last 2½ years because it appeals to the latent instincts of the man who wants to build his own Set.

Incidentally, of course, he saves a considerable amount of money, gets a good working knowledge of Radio, and obtains a more efficient Receiver than many of those put on the market specially for Broadcast reception.

Versatility and flexibility are the two outstanding features of this System. Versatility, because any combination of valves can be used at will on any wave-length range between 100-26,000 metres. Flexibility, because the enthusiast can commence with a simple Crystal circuit and can add Valves at any future time without discarding a single piece of apparatus previously purchased.

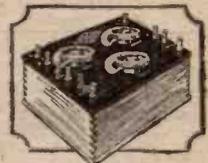
Certainly no other system in the world is so economical or adaptable.

Mail Orders: You will save three to four days' delay by sending mail orders direct to 64, High Holborn, London, as all mail orders are despatched from that address.

Prices of Units in sets of parts for home construction.

- 1. Tuner Unit 24/9
- 2. Condenser Unit 34/6
- 3. H.F. Unit 14/9
- 4. Detector Unit ... 19/-
- 5. L.F. Unit 34/6
- 6. Crystal Detector Unit 15/5
- 7. Reactode Unit ... 28/6

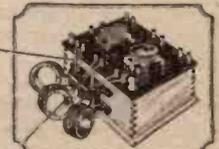
All Royalties paid, Engraving on Panels 2/- extra. Cabinets 3/6 extra, except No. 2 which is 4/6. Postage paid on orders of £2 and over. Full instructions with every box.



Condenser Unit No. 2



Detector Unit No. 4

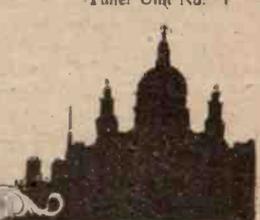


Tuner Unit No. 1

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Head Office: 64, High Holborn, W.C.1.

(Only address for Mail Orders)

Branches:
99, High Holborn, W.C.1.
Liverpool: 4, Manchester Street.
Cardiff: 94, Queen Street.



Peto Scott's Units

bridge the Atlantic

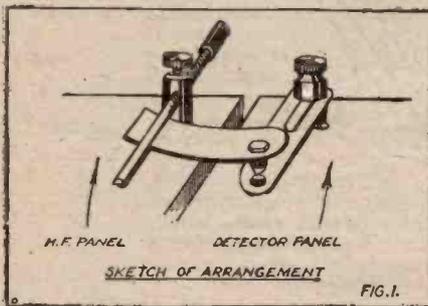
PRACTICAL IDEAS for the AMATEUR.



A CRYSTAL BRIDGE FOR INTERVALVE RECTIFICATION.

By S. V. HEAP.

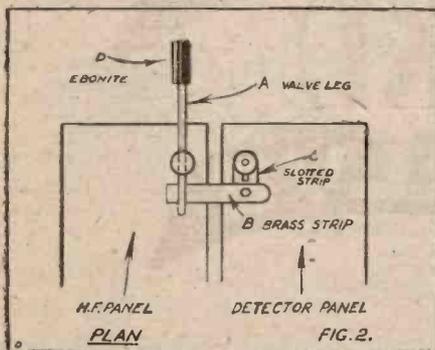
THE arrangement comprises a valve-leg held in the output terminal in the slit of which a springy strip of brass from a pocket flash-lamp battery is clipped. The upper crystal cup is supported on the end of this brass strip, making contact with the lower crystal carried on a shorter strip of



brass (a slotted keyhole plate) held in the input terminal of the next valve. This terminal is usually of the pillar type, and if not, a pillar type terminal can be readily substituted.

Useful Device.

A slight turn of the valve-leg holding the upper crystal suffices to vary the pressure of contact to the required extent, whilst the method of support enables the crystals to be moved about freely for adjustment,



and once set the combination needs no attention for weeks at a time.

The use of this device is almost equal to the addition of an extra valve to the set, as the detector valve now functions as an audio-frequency amplifier or note-magnifier,

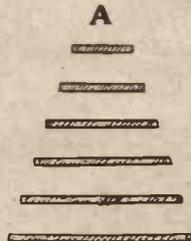
minus transformer. Should it at any time be desired to revert to valve-rectification, the crystal device can be removed in half a minute, and the usual connecting-strip or wire replaced.

The writer has found the most suitable combination of crystals for perikon stability to be zincite and bornite, but in place of the latter, chalcopyrites has also proved very reliable and efficient.

EXPERIMENTAL GRID LEAKS.

RECENT experiments have proved that an ordinary wooden match stick, well soaked in Indian ink, will function quite satisfactorily as a grid leak, and, as a suggestion, the writer presents the accompanying idea.

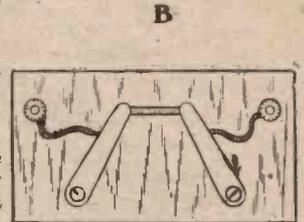
A number of match sticks of varying lengths are soaked in the ink and allowed to dry. These then represent so many grid leaks, as shown at A, the smallest, of course, having the least resistance. The length of each leak being different, it is necessary to provide a holder which will accommodate the largest as well as the smallest.



Such a device is shown in Diagram B. Two strips of spring brass are swivelled to a small matted ebonite base, each strip being connected to a terminal by means of

flexible leads, as shown. The outer ends of the arms are made to press against the ebonite, so

that a good contact is obtained when the leak is inserted beneath them. It will be seen that by opening out the arms, a larger size of leak may be inserted, and also that each leak may be made slightly variable by adjusting one or both of the arms.



SOME USEFUL HINTS.

IT is often necessary to bore holes in the edge of ebonite panels in order to mount or attach them to another panel. Even the experienced amateur often has great difficulty in doing this well, as the panel splits during the operation. The reason for this splitting is because the ebonite panel is built up of several sheets of vulcanised rubber which are pressed together in a press. If, however, the amateur will place the panel in a clamp at the point where the holes are to be drilled, he will find it just as easy to bore holes into the edge as into the face of the panel.

* * *

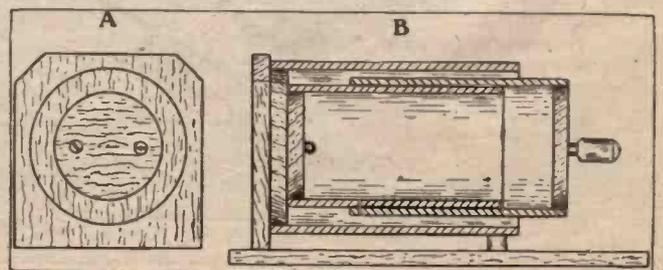
In laying out receiving or transmitting sets; do not place high-frequency apparatus in close proximity to low-frequency instruments. If you do, they will interfere with one another in operation.

A SIMPLIFIED LOOSE COUPLER.

THE sliding arrangement of the secondary coil of a loose-coupled inductance is simplified to a minimum by adopting the method to be described. The sliding support for this coil consists of an ordinary cardboard former, which is secured to a wooden disc, attached to a larger disc, which accommodates the outer or primary coil. Both discs are screwed to a wooden support in the manner indicated at A.

Diagram B represents a section side

view of the device. The secondary coil is made a fairly tight sliding fit over the supporting former, and if necessary a little grease may be applied. A third wooden disc is fitted to the outer end of this coil, this being provided with a small handle as shown. The instrument may be used either as a loose coupler, variometer, or anode coupling with reactance, according to the method of winding and the connections.



The Valve that made the Sensation!

Here is the **SECRET.**

Consumption 0.42 amps. average.

Filament Voltage 4.0 volts.

Anode Volts 50-100.

British Make Throughout.

Every Valve Stamped B.B.C.



THE THORPE K.I. VALVE is adaptable to every type of receiving circuit but more especially to those employing dual amplification and super-regeneration. The high efficiency of this Valve is due to the employment of a special anode which forms a perfect electron trap owing to the great surface area presented.

A new and original method of exhaustion has been adopted which guarantees a very accurate degree of vacuum.

The Valve has been subjected to exhaustive tests and has been received with remarkable approbation everywhere.

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EACH

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K.I.
VALVE

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BOWER ELECTRIC LTD.,
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BRAHAM RULES THE PRICE WAVE LENGTH

SPECIAL OFFER: Aerial Wire, 7/22 bare copper, 100 ft., 1/9.

BRUNET PHONES, 4,000 ohms. 13/9
 FRENCH THOMSON-HOUSTON PHONES 4,000 ohms, our price. 12/9
 N. & K. HEADPHONES, every pair stamped N. & K. 12/6
 ERICSSON E.V. TYPE SMALL EAR (Ebonite Continental). 13/9
 SIDE PHONES, 4,000 ohms. 10/9
 STERLING WESTERN ELECTRIC GECOPHONE, all 4,000 ohms, in stock (B.B.C. stamp) 6/11
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 GESSOR, MARCONI, MULLARD ORA VALVES in stock.
 CRYSTAL DETECTOR, glass covered. 1/6
 FLEX (TWIN), maroon colour. 1 1/4d.

ENAMELLED WIRE, all gauges in stock at lowest prices.
 RUBBER LEAD-IN WIRE, 3 mm. 1/4d.
 ALL D.C.C. WIRE, 1 lb. from 1/-.
 GECOSITE CRYSTALS, each 1/6
 TALITE (Genuine) each 6d., 9d., 1/-.
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 GENUINE MIDITE, The Super Crystal, in glass phial, each 1/-.
 SHAW'S GENUINE MOUNTED HERTZITE CRYSTAL. each 6d.

CRYSTAL DETECTORS each 1/-.
 CRYSTAL DETECTORS (enclosed in glass) 1/6
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 GOLD CAT'S WHISKERS each 2d.
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 FIXED CONDENSERS, all Capacities. 8d.

CONDENSER VANES, dozen 3d.
 L.F. TRANSFORMER, Ratio 5-1, best quality. each 9/6
 ADJUSTABLE CRYSTAL CUPS. each 2d.
 CONTACT STUDS, with nuts and washer. dozen 4d.
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 DETECTOR ARM and STANDARD. 8 1/2d.
 EBONITE KNOBS, 2 B.A., each 2d.
 VARIOMETERS 1/11 and 2/11 SET. 10d.
 MATCHBOX WIRELESS GALVANISED PULLEYS PACKET OF 4 ASSORTED CAT'S WHISKERS SWITCHES ON EBONITE, S.P.D.T. quality, the best. 1/3
 VALVE-HOLDERS, each. 8d.

Please send sufficient in stamps to cover postage.

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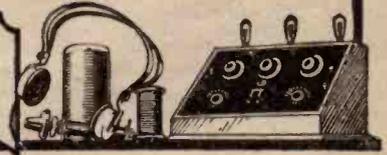
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USING THIS TUNER IN LONDON IN CONJUNCTION WITH A 2-VALVE SET, ALL B.B.C. STATIONS WERE PICKED UP WITHIN A FEW MINUTES USING NO AERIAL TUNING CONDENSER, THIS BEING QUITE UNNECESSARY WITH THIS TUNER.

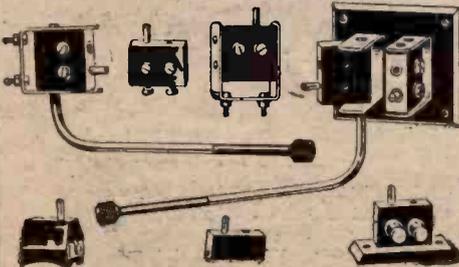
TUNING INDUCTANCE, 72 turns, 8 tappings of 8, and 8 tappings of 1	s. d.
EBONITE PANEL, 6 1/2" x 4" x 3/8", as illustrated, less detector	Price 1 9
CABINET, polished mahogany, 6 1/2" x 4" x 4"	Price 5 9
Dust-Proof DETECTOR. Unmounted 2/-; Mounted 3/-	Price 3 9
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Type	Description	Price each
1.	Fixed Holder for panel fitting	1/6
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Ready charged or uncharged—

2-volt	40	9/6
2-volt	60	12/-
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4-volt	40	16/6
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EVERYTHING ELSE FOR WIRELESS AND ELECTRICAL WORK.



A Section Devoted to the Interests of the Younger Constructor.

HOW TO MAKE A SINGLE VALVE SET.

MANY amateurs whose constructional efforts have been largely devoted to the building of crystal sets refrain from starting on valve receivers on account of the cost of the various components, but as a matter of fact, a very efficient single valve set can be built up at a very moderate cost.

The constructional features of the set described below involve no undue complications, being of such a nature that the novice can turn out an efficient instrument without the use of elaborate tool equipment. It is

Box	s. d.
Wiring and tabs	6 0
	1 0
Total cost	£1 7 0

The above-mentioned components can be purchased in the form of a constructor's set, as shown in Fig. 1, and Fig. 4 shows the complete set ready for use, from which it will be seen that the whole instrument is very compact and all the parts are well protected.

The Panel.

From the constructor's point of view, however, it is generally considered preferable to carry out the whole of the work in the home workshop, for which reason the whole of the operations involved will be described in detail, so

that the article shall include full working instructions which are easy to follow.

As will be seen from the drawing of the panel, shown as Fig. 3, a piece of ebonite measuring 10½ in. by 6½ in. is required, which may either be purchased cut to size or cut from a sheet. Even if the

greatest amount of care is taken in cutting out the panel there is always the risk of the saw running off the lines, a defect which has to be corrected by squaring up the panel by means of a square and file.

A good many amateurs are so eager to get their sets built that they are apt to neglect the proper amount of attention to the preliminary stages of the work, and, in consequence, the finished set suffers considerably as far as appearance is concerned. Nothing looks worse than an imperfectly squared panel fitted into a wooden case, whereas by taking pains in cutting out

the panel a very much improved job is obtained.

The next step in the operations is very important, as it consists of transferring the dimensions given in the sketch, Fig. 3, to the panel, which has

now been cut out and squared up. One of two methods can be adopted for this part of the work, the first being to draw out a template on a piece of paper, and the other to mark off the various positions direct on the panel. In the latter case, the centre line is marked from one end of the panel to



Fig. 2. The broadcast variometer.

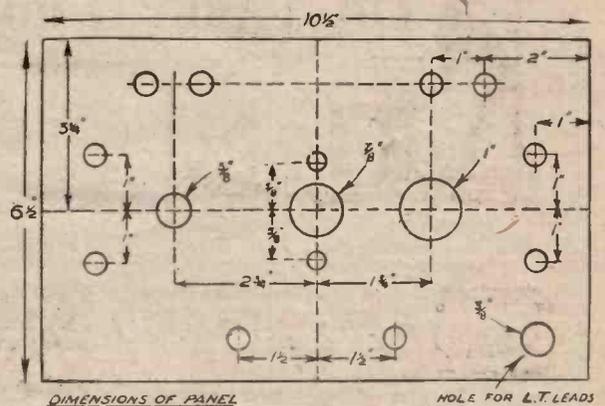


Fig. 3. Dimensions of the panel.

the other with the aid of a pair of odd-legs, care being taken to secure an even pressure of the leg against the side of the ebonite whilst the line is being scribed.

Fitting the Variometer.

A square and a scriber are used for marking off the centre line at right-angles to the first, and from these two lines all other

(Continued on page 900.)

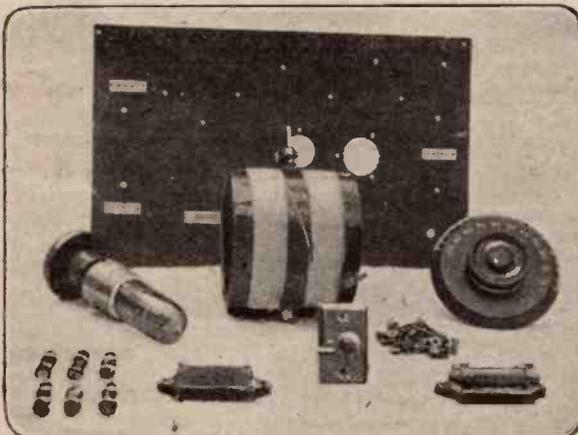


Fig. 1. Components ready for assembling.

contended by some that a single valve set does not offer any great advantages over a good crystal set, but apart from the steadiness of the signals received, greater volume of sound is obtainable, and at the same time the set provides a useful means of acquiring knowledge, which may be applied later in connection with the production of more elaborate instruments.

Necessary Components.

The component parts from which the set was built comprise the following articles:

Ebonite panel	s. d.
Variometer	3 0
Dial and knob	6 6
Valve Socket	1 0
Switch	1 0
Terminals	2 9
Condensers	9
Grid leak	3 0
	1 9

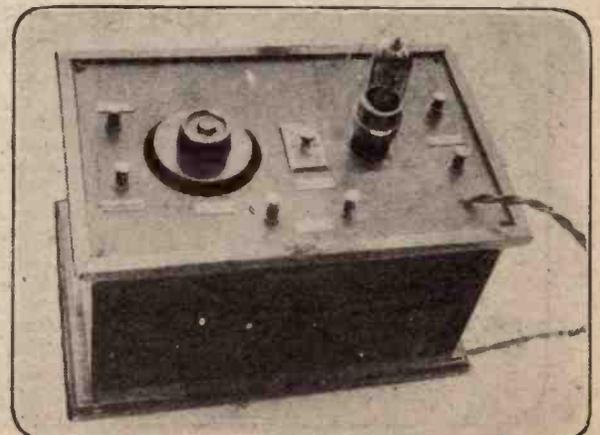


Fig. 4. A view of the complete receiver.

HOW TO MAKE A SINGLE VALVE SET.

(Continued from page 899.)

dimension lines are struck. A fine pointed centre-punch is required to mark the dimension points and dividers can be used to secure accurate spacing between the different points at which holes are to be drilled. In making the large hole to receive the valve socket, the circle may be cut out with a pad saw, started from a small hole on the circumference, or the centre can be removed by drilling a series of holes round the circumference and then cleaning the hole out by the aid of a small half-round file.

No difficulty will be experienced in drilling the other holes, but care is needed to ensure that the drill does not run, thus throwing the distances between the holes out of their proper positions.

For use with broadcasting wave-lengths the variometer shown in photographs will give an effective tuning range, and has the additional virtue of being easily mountable on the panel. The $\frac{3}{8}$ -in. hole drilled on the centre line of the panel at the left-hand side receives the threaded shank of the variometer spindle-bush, which is secured in position by a nut, clamping the component to the ebonite sheet, this, as shown in Fig. 6, being the first operation in assembling the set. It is important to see that the variometer is mounted so that the rotor has a free movement, after which the dial and knob can be fitted so as to provide a correct neutral position for the rotor and stator coils respectively.

Fitting the Valve Holder:

The valve-holder is fitted into the 1-in. hole

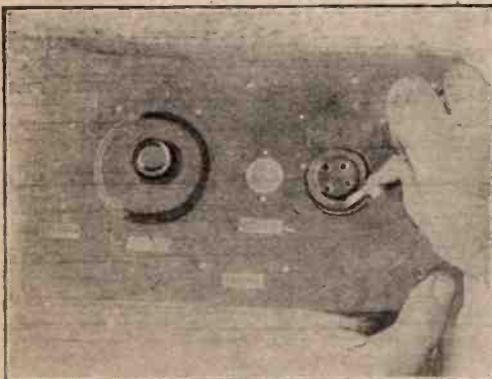


Fig. 5. Fixing the valve holder.

at the right-hand side of the centre line on the panel, which must be eased out to allow of this part being an easy fit, otherwise there is a risk of splitting the ebonite. As the holes for the screws are already drilled in the valve-holder, they will serve as a guide for the drill when the corresponding holes in the

panel are made, and, as indicated in Fig. 5, the valve-holder is held in position on the panel by means of three small set screws and nuts. No trouble will be experienced in fixing the two condensers, the position for the one with the grid leak being seen in Fig. 6, the position for the other condenser being shown in Fig. 9, which also illustrates the wiring arrangements.

Wiring Up.

The switch for the L.T. battery is of the plunger type, and is fixed to the panel by a neat rectangular plate held with four screws, a large hole being provided in the centre of the panel to receive the cylindrical portion containing the plunger contacts.

The diagram reproduced as Fig. 7 will be of assistance in completing the final connections of the set. From the aerial terminal a lead is taken to one side of the grid condenser, the other side of the condenser being connected with the grid leg of the valve-holder, which can be readily recog-

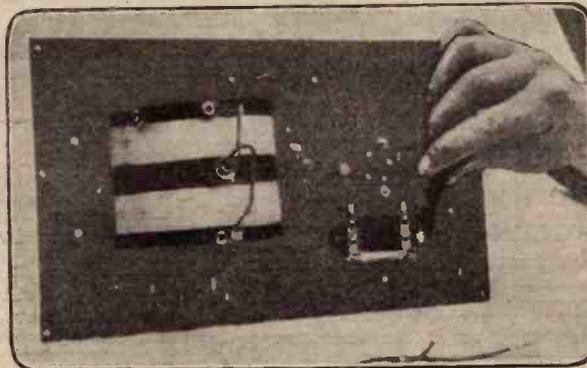


Fig. 6. The grid leak and condenser in position.

nised by the diagram shown as in Fig. 8. Another lead from the aerial terminal is coupled with the free end of the variometer rotor. The free end of the stator is connected to the earth terminal, which is also joined to the negative of the low-tension battery. The positive terminal of the low-tension battery joined to the negative of the high-tension battery, which is also connected to one pole of the switch.

A lead from the other pole of the switch goes to a filament valve leg, the other leg being connected to the negative of the low-tension battery. From the anode leg a wire is joined to a telephone terminal, the other side of which is connected with the positive of the high-tension battery, and the blocking condenser is shunted across the 'phone terminals in the usual way.

The set is one of the most simple forms that it is possible to construct, and can be recommended to the amateur in commencing construction of this class of apparatus.

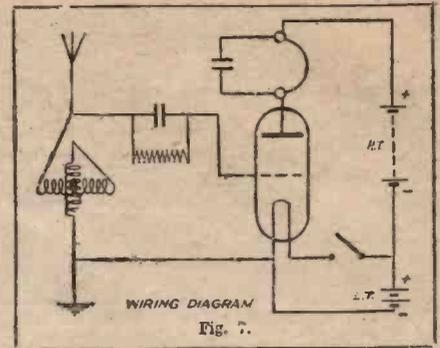


Fig. 7.

It is probable that some constructors will prefer to incorporate the usual variable filament resistance in this set, and, of course, this can easily be done if allowance is made at the commencement for this modification.

Filament Control.

Some experimenters vary their filament voltage as carefully as others manipulate the wander plug of the H.T., and are of the opinion that on any but strong signals a little "wangling" of the rheostat will make just that extra difference to results which is half the pleasure of wireless reception.

Such control of current is especially noticeable in reflex or multi-valve circuits, but even in a set of this description certain valves would be better for this additional control. Another point is that, whilst all the well-known valves are of such good quality that a sudden switching on and off will not be noticeably detrimental to them, there is no question but that a better arrangement is to bring the filament temperature up rather more slowly than a simple switch would allow.

The constructor can decide this question for himself, as in this instance it is never possible to cover every requirement with any particular lay-out or design.

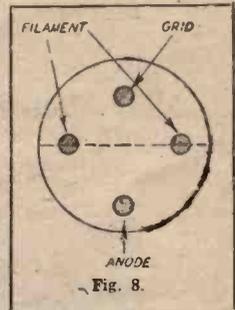


Fig. 8.

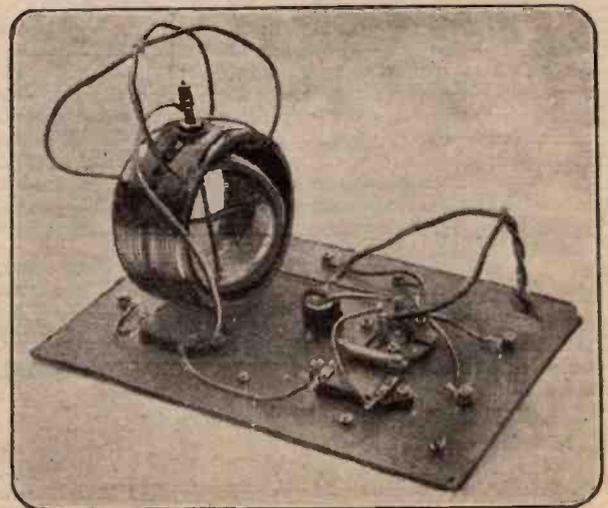


Fig. 9. Showing the wiring and the connection of the panel.

WIRELESS VALVES

An Announcement.



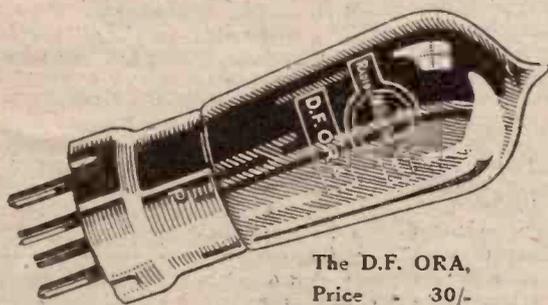
The D.F. ORA is a recent addition to the wide range of Mullard Valves.

It has all the characteristics of the celebrated general purpose ORA. It will Oscillate, Rectify and Amplify.

In addition the filament requires but .06 ampere, making the valve particularly suitable where extreme economy in filament batteries is desired.

FILAMENT VOLTS 2 to 3
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Artistes of the Aether

BY "ARIEL"

Some of the artistes who have given you pleasure while "listening-in"

THE first performance of his new opera at Covent Garden by the British National Opera Company, and its broadcasting, have brought the composer, Mr. Rutland Boughton, even more prominently before the public eye—or, rather, ear—following closely as it does on his



Mr. Rutland Boughton.

other music dramas, "The Immortal Hour" (which threatened to become another "Beggar's Opera") and "Bethlehem," the former still holding the Regent Theatre.

For "Alkestis" Boughton has sought the Greek drama of Euripides, and the story affords ample opportuni-

ties for his powers of choral and declamatory writing. Of Boughton, it was said by Sir Charles Stanford that, "whatever his faults, he knew how to make the right kind of noise." In his opera he again achieved this result, but judging it from a wireless standpoint alone, it proved disappointing, because in many places the heavy orchestration became overwhelming, and the need for more clarity of outline and declamation was very apparent.

Chamber Music.

The orchestra, too, though well conducted by the composer himself, was not conveniently placed in regard to the microphones, so that we got blurred intermission that detracted from the beauty of the score. The cast worked nobly, with Clara Serena, Frank Mullings, Walter Hyde, and Robert Parker in important rôles.

Chamber music is not a class that appeals to the widest section of the public, nor is the virginal music of the sixteenth and seventeenth centuries to be entirely commended for radio purposes, but as regards the playing of it recently, it was safe in the hands of that clever body of artistes, The Kinsey Quartet.



Mr. Herbert Kinsey.

It consists of well-known musicians, namely Mr. Herbert Kinsey himself, who formed the quartet, which has played at the classical concert halls since

1908, Mr. Patterson Parker, the 'cellist, who is also principal 'cellist of the London Symphony and Philharmonic orchestras, while equally well known is the viola player Mr. Ernest Tomlinson, and second violin Mr. Frank Howard. With them the old world music of William Byrd, Thomas Greaves, and many others of the sixteenth century, now long forgotten, was played with meticulous care and sympathy, but nowadays more robust works are necessary for the main bulk of their vast invisible audience. Songs of the same period, however, achieved more success, and were admirably sung by Mr. Philip Wilson.

A Famous Violinist.

As has been already amply proved, the solo instrument radios best, particularly the violoncello and violin. There is always cause for rejoicing when Miss Daisy Kennedy can be persuaded to broadcast, for there are few violinists whose tone and technique show to better advantage before the microphone. A recital was one of the "plums" of one of the recent programmes, and one afternoon, happening to come in at 2 L O during the Children's Hour, she was easily persuaded into giving the kiddies some solos to which they will be able to look back upon with pride, for Miss Kennedy's fame is world-wide.



Miss Daisy Kennedy.

as a tendency to hand this difficult item to a well-known concert party rather than to the individual as hitherto, and the scheme does not work out badly on the whole. The recent efforts of The London 8 Concert Party were a marked improvement on some of the earlier duologue artistes still imbued with the time-honoured red-nosed type of humour.

The Lighter Side.

This party numbers in its cast a capable trio in Miss Dorothy Alwynne (violin), Miss Joan Duff (piano), and Mr. Walter Nunn ('cello), and the other members, Messrs. Stanley Haysman, Tom Copeland, and Wilfred Virgo, with Mmes. Tarri and Colton did well with the material at their command. The Happy Family Party may also be included amongst the recent successes. We have had "The Greys," and "The Bristol Savages."

Where humour has been left to a single entertainer, one of the best is Mr. Foden Williams, who has been heard frequently at 2 L O and at Manchester. A known performer at Queen's Hall, as well as throughout the provinces, he brings to the microphone a host of capital songs and sketches written by himself and sung with a marked clarity of diction that, to misquote one of his own songs, makes him "get there every time." He has had many queer experiences, especially during the war. Having to appear one night in a Lancashire town, his "turn" came just as the Zepps were signalled at the coast. Out went the lights, and an anxious manager implored Mr. Williams to keep the audience from getting into a panic.



Mr. Foden Williams.

Mr. Williams made his entry practically in the dark, contriving to give the impression that this was a necessary factor to his "act," and so well did he hold the house that the show proceeded to the end without the audience realising the truth.

Symphony Concerts.

One cannot help wondering why the B.B.C. at 2 L O has gone back to its old form of Sunday programme. By substituting a church service relayed from any church at 6.30 p.m., as it did a short time ago, it had solved the vexed question of giving offence to the various other religious sects of London. The 6.30 p.m. service, a boon to many an invalid unable otherwise to attend, left the evening free to music lovers of all denominations.

Was it only accident, or an act of sheer wisdom on the part of that clever musical director, Mr. L. Stanton Jeffries, to make a recent Monday night his symphony programme? We suspect the latter, for Monday, being "change day" at the "pictures," we can see all lovers of jazz trotting off cheerfully to witness Mr. John Henry's "Perils of Claude Willy," while classical music lovers are left rejoicing with a programme that does credit to all concerned.

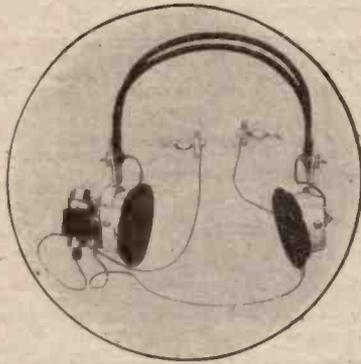


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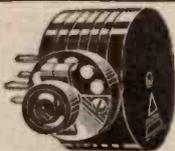
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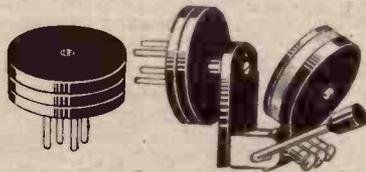
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Cat's Whiskers—Gold, 2d.; Silver, 1d.; Spearpoint, 1d. Set of 4, 6d.
Coils, Basket. Set of 6. 1/11 Wireless, duo-air spaced, remarkably efficient. 4 1/2-vt. Batteries (British), 5/- doz. Variable Grid-leaks, 1/11. "Bretwood" 3/-. "Radstock," Tapped Studs, 5/9
Coil Holders, solid ebonite, 2-way, 4/-; 3-way, 5/-; Sockets, 1d. each.
Condenser and Grid-leaks, 2/- Grid-leaks, all megs., 1/- and 1/9.
Condensers, Fixed—To .001, 9d.; To .005, 1/-; To .01, 2/3; To .1, 3/6.
Variable.—.001, 8/-; .0005, 6/-; .0003, 5/6; .0002, 4/6;
Vernier, 4/- With aluminum end plates. Knob and dial.
Condenser Dials, 0-150, 11d.; with knob, 1/4 and 1/9. Bushes—Top, 1d.; Bottom, 1d. All S. & D.C.C. wires stocked.
Condenser End Plates, drilled and tapped, 9d. each. Solid ebonite.
Contact Studs, 4d. doz. Stops, 2 a 1d. Connecting Wire, tinned copper, 3 yds. 2d. Jack Switches, 2-way, 5/6; 4-way, 7/6.
Crystals. Every make stocked. Zincite, 9d.; Bornite, 6d.; Talite, Hertzite, 9d.; Galena, Silicon, Carbonyl, 3d.; Copper Pyrites, 6d.; Marvellite, 1/3; Lapislite, 1/6; Mildite, 1/-.
Gold Seal Plastic Metal for fixing Crystals, 6d. box. Mellita, 1/-
Crystal Cups, 4-screw, 1 1/2. Detector Glasses, 3d. each. Buzzers, 2/6.
Crystal Detectors. Plain brass, 1/3; Nickel, 1/6; Dustproof, 1/6, 2/6; Plug-in Type, 3/6; Perikon, 2/3 and 2/9 (Zincite and Bornite).
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Transformers, H.F. Plug, 1, 150/450, 3/9; 2, 250/700, 4/-; 3, 450/1,200, 4/3; 4, 900/2,000, 4/6; 5, 1,800/3,200, 4/9; 6, 2,200/5,600, 5/-
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The Editor will be pleased to publish concise reports of meetings of Wireless clubs and associations, reserving the right to curtail the report if necessary. Hon. secretaries are reminded that reports should be sent in as soon after a meeting as possible. Reports sent in cannot appear in this paper in less than ten days after receipt of same. An asterisk denotes affiliation to the Radio Society of Great Britain.

The Leeds Radio Society.*

At the instructional meeting held on January 11th, Mr. W. G. Marshall lectured on "Resonance."

Hon. Sec., D. E. Pettigrew, 37, Mexborough Avenue, Leeds.

Wardsworth Wireless Society.

The above society held a very enjoyable social afternoon at the Pavilion, Lavender Hill, Battersea, on Sunday, January 13th, by kind permission of Capt. E. S. Davis.

Hon. sec., F. V. Copperheat, 222, Lavender Hill, S.W.11.

The Bangor and District Radio Society.

At a well-attended public meeting held recently at the Y.M.C.A., Mr. W. E. Williams, B.Sc., presiding, it was decided to form a society to be known as "The Bangor and District Radio Society," the membership fees being tentatively fixed at 10s. for adults, and 5s. for junior members. Meetings will be held at the Y.M.C.A. on Wednesdays in future, at 7.30 p.m., and intending members should send their names to the hon. sec. as soon as possible.

Hon. sec., J. C. Hughes-Roberts, 3, Snowdon Villas, Bangor.

Brockley and District Radio Association.

On January 18th, the annual general meeting of the above association took place at the headquarters, Gladstone Hall, New Cross Road, S.E. The following were elected for the year: Chairman, B. Hughes, Esq., M.I.B. (Lond.); vice-chairman, W. F. Emberley, Esq.; hon. sec., Harrie King; hon. assist. sec. and treasurer, R. W. Allwright. The old committee was elected "en bloc," with the addition of four new members.

Hon. sec., Harrie King, 2, Henslowe Road, East Dulwich, S.E. 22.

Darlington Rotary Club.

Lecturing before the above society on Friday last, Lord Gainford, the chairman of the British Broadcasting Co., gave an instructive address on broadcasting, touching upon the educational value of the science and its enhancement of friendliness between nations in the future.

Wimbledon Radio Society.*

Mr. J. A. Partridge, the first British amateur to establish two-way communication with an American amateur station, and a member of the Wimbledon Radio Society, will give a talk on "Working with America," at club headquarters, on Friday, February 8th, at 8 p.m.

Hon. sec. (pro. tem.), C. G. Stokes, 6, Worple Avenue, Wimbledon, S.W.19.

Coventry and District Co-operative Radio Society.

At a recent meeting an excellent lecture was delivered by Mr. C. Hopkins on "The POPULAR WIRELESS Reflex Circuit" before a large and interested audience.

Org. sec., I. Oscar, West Orchard, Coventry.

Dulwich and District Wireless and Experimental Association.

At the headquarters of the above association on January 7th, Mr. Harrie King delivered a

lecture and demonstration, entitled, "The Hinton Receiver," being ably assisted at the blackboard by Mr. J. Barrett.

Hon. Sec., Harrie King, 2, Henslowe Road, East Dulwich, S.E. 22.

Monday, February 11th.—Lecturer from the South London League of Radio Societies.

Monday, February 18th.—Demonstration, "A Transatlantic Receiver," by P. Falkner, Esq.

Monday, February 25th.—Lecture, "Telephony Transmission," by Geo. Sutton, Esq., A.M.I.E.E.

Monday, March 3rd.—Lecture and demonstration, "The Neutrodyne Circuit," by L. M. Skinner, Esq.



Two photographs of "P.W." Super Crystal Set constructed by Mr. J. Robey, 15, Grove Road, Brixton, S.W.9.

Monday, March 10th.—Lecture, "Construction of the Thermionic Valve."

Monday, March 17th.—Lecturer from the "South London League of Radio Societies."

Monday, March 24th.—"Special Experimental Exhibition."

Catalogues Book Reviews Etc.



Publication No. 363A from the Sterling Telephone and Electric Co., Ltd., is entitled "Gramophone Record and Voice-Amplifying Outfits." The circuit used in the

"Anodian" two-valve long-range receiver, described in leaflet No. 389, is identical to that employed in the "Sterling" vertical cabinet model, but has been produced to meet the demand for a less expensive instrument.

We understand that the "Sparta" loud speakers, manufactured by Fullers United Electric Works, Ltd., are being demonstrated at Selfridges, Harrods, Gamage's, and at their London depot, 58, High Street, W.C.2. A very efficient tone selector may also be tried at this latter address, but it should be noted that this "selector" is already incorporated in the type "B Sparta" loud speaker.

We learn that very good results are being obtained by users of the "D.W. 3" regenerative receiver. This and much other interesting apparatus is described in the January "Davenport" Wireless Bulletin, 3d., from 101, Clerkenwell Road, E.C.1.

For the "P.W." set, Wilkins & Wright, Ltd., Kenyon Street, Birmingham, will supply, at a very moderate cost, a very efficient lever switch combining two double-pole double-throw switches in one, both of which are controlled by the single lever. This switch will, of course, take the place of the two change-over switches in the "P.W." set, and, of course, is much more compact, and very efficient for H.P. work.

A perusal of Radio Stocks' latest price list will satisfy our readers that they can purchase quality goods with satisfaction and economy from this firm. Write to their head office, Radio House, Newman Street, W., for a catalogue, mentioning POPULAR WIRELESS.

Calipe, Dettmer, & Co., Ltd., inform us that although their temporary twelve-page catalogue contains a long list of wireless apparatus, component parts, and wireless tools, they are continually adding to their stock, and readers not seeing anything that they are in special need of should write, stating their requirements, to their London offices at 21 and 22, Poland Street, W.1.

Messrs. Power Wireless, of 53A, Ilford Hill, Essex, show some very good apparatus on a leaflet which has recently come to hand. We understand that Power's are not increasing their range of components, but rather keeping their present range up to the latest requirements.

For only 1s. 8d. the New London Electron Works, Ltd., will supply 100 ft. of heavily insulated wire which is ideal for wireless work, and all electrical work, in fact. Owing to its heavy insulation, it may be slung over a roof or tied roughly to a tree, and give good results as an aerial. There are a multitude of other applications too numerous to mention here, but some of which are described in a folder which we have received. As a drum containing one mile of this wire may be purchased for only 35s., it will readily be seen that it is extremely economical as well as efficient. Write, mentioning POPULAR WIRELESS, to The New London Electron Works, Ltd., Regent's Dock, London.

RADIOTORIAL.

All Editorial Communications to be addressed The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

There has been quite a storm in a teacup over the recent statements made by the B.B.C. concerning constructor's licences, and the daily Press has had a lot to say about the question of legitimate constructors of radio sets giving or selling their home-made apparatus to friends not holding a constructor's licence.

Naturally enough, it is not fair to the B.B.C. if a constructor sells his apparatus to the holder of a ten-shilling licence; but, providing the recipient of the set takes out a fifteen-shilling licence, I can see no reason why he should be termed a radio pirate because he accepts or purchases a home-made set.

However, the impression got about that the B.B.C. were against this, and that a constructor's licence only entitled the holder to make a set for his own use.

An official of the B.B.C. recently stated in an interview that the amateur constructor could rest assured that the B.B.C. has no intention of waging war against him, and he can carry on in peace.

It also seems clear that no action will be taken against the amateur constructor who sells or gives a set to a friend, providing that friend takes out a fifteen-shilling licence.

It would be as well, however, to have the licence question finally overhauled and satisfactorily settled. The new Postmaster-General is, I understand, to be approached on this matter.

THE EDITOR.

The Editor desires to direct the attention of his readers to the fact that, as much of the information given in the columns of this paper is of a technical nature and concerns the most recent developments in the Radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

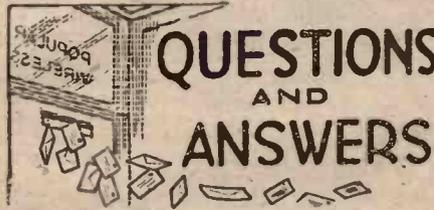
PATENT ADVICE FOR READERS.

The Editor will be very pleased to recommend readers of POPULAR WIRELESS who have any inventions to patent, or who desire advice on patent questions, to our patent agent. Letters dealing with patent questions, if sent to the Editor, will be forwarded to our own patent advisers, where every facility and help will be afforded to readers.

IMPORTANT NOTICE.

Readers are please requested to note that not more than three queries can be answered in one letter addressed to the Technical Queries Department. Owing to the extraordinarily heavy pressure on this department, readers are requested only to send in questions which they find they cannot possibly solve for themselves. On no account will more than three questions be answered in one letter, and telephone calls and personal calls at this office cannot be dealt with, owing to pressure of work on the technical staff.

A stamped and addressed envelope must accompany all queries. A copy of the questions asked should be kept by the sender, as it is not possible to reproduce the original query when replying. Number your queries 1, 2 and 3, and answers will be given to each item.



"Nontechnical" (Langport, Somerset).

Having had no wireless training I am very puzzled by the different diagrams used. Sometimes two or three quite different arrangements of the components are given, and in one of these diagrams a condenser may be shown as a box, whilst in others it is given as short parallel lines. Why are they drawn differently, and what is the purpose of several signs to mean the same component? When several arrangements for components are given, I suppose the wiring diagram is the one to follow?

There are three different forms of diagram in general use, called the "theoretical," "pictorial," and "wiring" diagram.

The theoretical diagram uses the symbols to indicate the different components. Its purpose is to show at a glance the path of the current, and

it is arranged without regard to practical lay-out and spacing, except that coils which are coupled are shown close together with an arrow through them to indicate the coupling. This class of diagram is read very easily with practice, and being clear, compact, and easily drawn is invaluable in the study of involved circuit connections.

The pictorial diagram is intended for the novice who is uncertain of the appearance of instruments or of their respective symbols. It is very useful for beginners, but is not so easy to follow as a theoretical diagram which, with practice, shows the path of the current at a glance.

The wiring diagram is simply a plan of the practical connections, showing how the components are arranged on the panel and the best method of taking the wires from point to point.

"LAW-ABIDING" (Lichfield, Staffs).—I have a "Home Constructor's" licence, and having made a very successful crystal set for myself I now wish to construct a similar one to give to a friend. I should buy all component parts and do all fixing up for him; but I understand that my friend would require to take out a licence. What kind of licence would he need, considering that he cannot actually "construct" any part of it himself?

As it stands, the position does not seem to have been allowed for by the existing rules governing licences. As the B.B.C.'s stamp does not appear upon home-made apparatus your friend is apparently restricted to either a "Home Constructor's" or to an "Experimental" licence.

The home-constructor's licence states that the owner must himself construct the receiving set, but in the case under consideration he will obtain the set ready-made from you, so apparently he is not covered by the home-constructor's licence.

This only leaves the experimental licence; but here again it is not a satisfactory solution to the case under consideration, because the experimental licence is only intended for an advanced amateur, whereas your friend is a novice. Anyone holding an experimental licence is assumed to be able to construct a crystal receiving set for himself, so that obviously this type of licence is not suitable for the purpose.

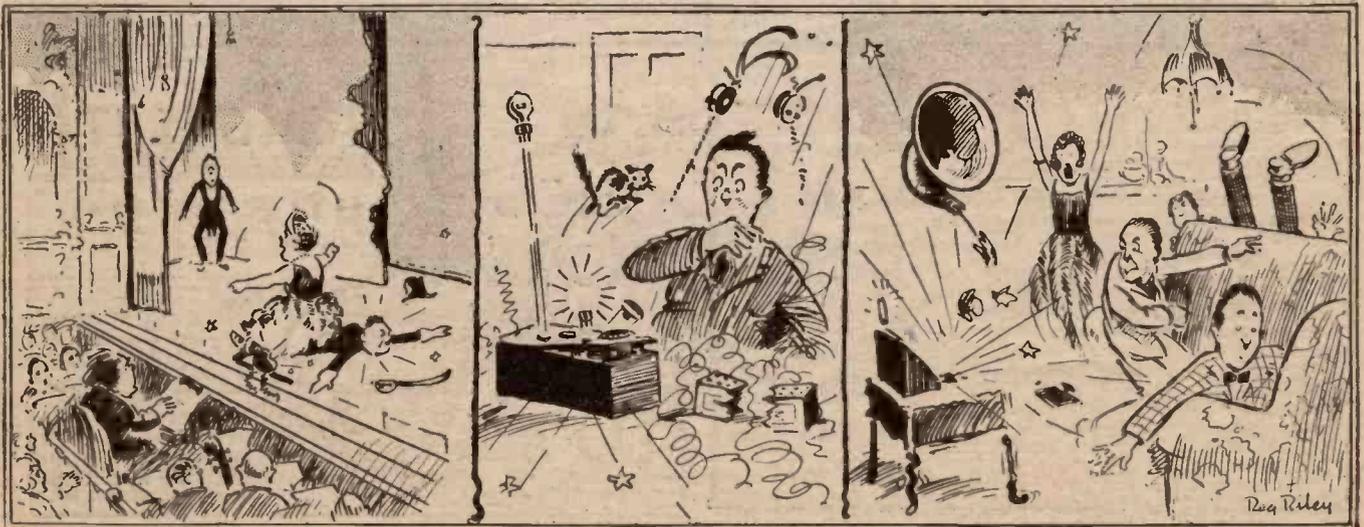
In the circumstances, we suggest that you, or he, should communicate with the Postmaster-General, giving full particulars and asking for a decision as to which type of licence should be purchased.

J. H. N. (Clifton, Bristol).—I have a single-valve and crystal circuit (dual) which gives fairly good results on stations of moderate distance, and loud signals from the Cardiff station, but does not seem to bring in any very long distance broadcasting stations. The aerial is a fairly good one, 40 ft. long and 30 ft. high, but the lead-in is rather long, being about 25 ft. from lead-in tube to set, and passing through two walls. How can the set be improved so that I can get long-distance broadcasting?

The long lead-in is probably the cause of your inability to get the distant stations, and if you can effect any improvement by keeping it further from

(Continued on page 908.)

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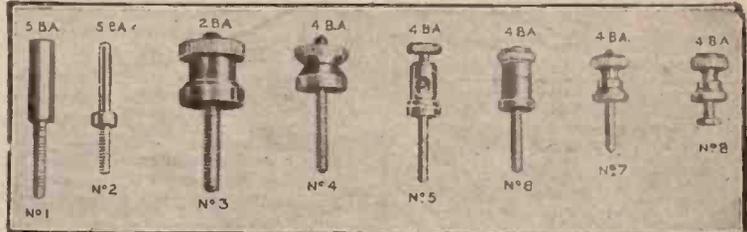
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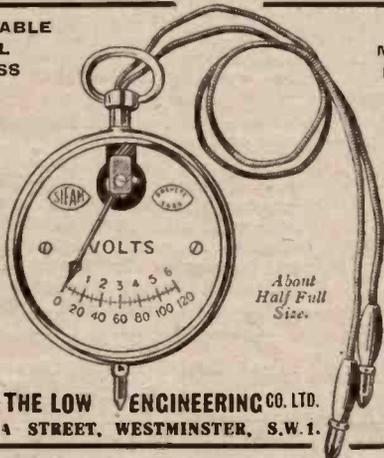


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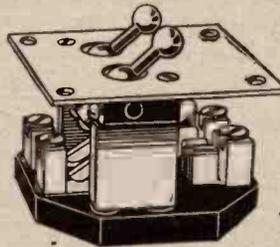
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RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 906.)

conducting surfaces or by decreasing its resistance to H.F. currents in any way you would get better results.

An alternative course is to have the set brought up to the point where the lead-in enters the house and to tune in there. For loud signals the 'phone leads could be extended to the point where the set is at present, and the effect of the long lead upon them would probably be less than upon the set as it is arranged at present. The long-distance signals would probably be weak in any case.

F. R. B. (Oswestry).—Can you explain the cause of a peculiar click that is occurring on my loud speaker? Soon after I have finished using it (say, three or four minutes) it gives a single loud click. At first I thought it was broken, but it seems to work exactly as before, except that it now invariably clicks in the way described after it has been used.

The click is caused by the diaphragm escaping from the pull of the permanent magnet and springing into its natural position. Normally, even when not in use, it is strained towards the permanent magnet, but apparently in your case the magnet is weakened, and after a time the natural spring of the diaphragm is able to overcome it.

This would cause a single loud click such as you describe, but you might not be able to detect any weakening of the magnet when the instrument was in use. Be careful not to connect it the wrong way round.

R. W. P. (Chelmsford).—I have just purchased a dull emitter and wish to insert some device which will prevent me accidentally burning out the valve by connecting the H.T. circuit across it. I believe a resistance is all that is necessary. How do I find out what value the resistance should be?

The resistance used should be a non-inductive one, and its value in order to protect the filament can be found from Ohm's Law: $\text{Current} = \frac{\text{Voltage}}{\text{Ohmage}}$

If the maximum current desired is .05 amps. and the H.T. voltage is 50, the total resistance of the circuit would need to be 1,000 ohms. There is only a small resistance in the battery itself, so it would be necessary to add the 1,000 ohms in series with it. Protection could alternatively be obtained from a fuse connected to the H.T. which is of such a value that a current in excess of the normal would cause the fuse to blow.

J. R. Y. (Yeovil, Somerset).—Does the term "stand-by" (as used so often in wireless work) mean "wait," and, if so, how does it apply to a "stand-by tune" switch? What is the purpose of the latter?

The term first became general in wireless when one station (for instance, a coast station) was controlling all wireless communication over a certain area, and a number of ship stations were waiting to transmit. Certain of the ships would be instructed to wait for a definite period, and others would be instructed to "stand by," either to receive messages that were then on hand for them, or because it was nearly their turn to transmit to the coast station.

The term came to be applied to the switch because a different adjustment for tuning was necessary in the different circumstances.

On the "tune" side a single desired station was kept tuned in, and the coupling was loosened so that all other signals were weakened as much as possible; in other words, the circuit was made as selective as circumstances permitted.

The "stand by" side was used when the receiving circuit was directly connected to the aerial, and all the stations in range were being listened to. In the expectation of a call or in order to seize the most favourable opportunity to transmit without undue interference with other stations.

"ANTENNA" (Golders Green).—I have often seen it stated that it is preferable to use an outdoor instead of a frame aerial. What is the efficiency of latter (approximately) as compared with the ordinary type of outdoor aerial?

The frame aerial will probably have only from 5 to 10 per cent. of the efficiency of the elevated outdoor type. Considerable amplification of the signal is required in order to make the results obtainable on a frame compare with those obtained in the ordinary way.

E. F. (Eltham).—Until lately I have been using a good make of small loud speaker with

a three-valve set, and get very loud signals from London. Wishing to fill a large room with music, I removed the set to this room and purchased a Magnavox loud speaker, but up to the present I have been disappointed with the volume of sound obtained. How can I improve this?

The Magnavox has been designed to deliver a large volume of sound without distortion, such as is apparent with cheaper loud speakers, and thus is ideal for large rooms and dance halls, etc., when a smaller loud speaker would not be so efficient. To obtain this extra volume, however, a somewhat large input is required—more than is required for an ordinary room. This extra volume should be obtained by the use of power amplification. A good article on the subject appeared in "P.W." No. 48.

T. M. I. (Barnstable).—How many turns to the inch are there of the following wires: Enamelled insulation—38, 44, 46, 48 S.W.G.?

There are 166 turns of 38 enamelled to the inch, 333 of 44, 400 of 46, 600 of 48 approx.

J. L. (Bristol).—When listening in on broadcasting wave-lengths I have often heard the carrier wave of a station, or of different stations, but so far I have not been successful in hearing their speech. What is the reason for this?

It is possible that you are too far away from the sending station to hear the speech, even although the carrier wave is distinct. You may, however, be unsuccessful on account of your set not having a very well-defined oscillation point. The effect of this would be that in the case of weak signals as soon as you commenced to loosen the reaction coupling, you lost the carrier wave. In order to hear very weak telephony it is necessary that the valves should be just off the oscillation point.

If the reaction is arranged so that the slightest movement passes the set into full oscillation you will be unable to make the necessary fine adjustment.

"DENSER" (Southampton Row, London).—What is a by-pass condenser, and how does it differ from a "blocking condenser"?

"By-pass" and "block" condensers are small fixed condensers which are inserted into a circuit where direct and high-frequency current is flowing. They are called "by-pass" when they are inserted across a resistance so that they afford an alternative and easier path for H.F. impulses which are flowing in that circuit. Where they are inserted in order to prevent direct current from passing a certain point they will allow H.F. current to pass, but they "block" the direct current.

A. J. F. (Fareham, Hants).—When loading coils are added in both circuits to increase the wave-length, should coils of similar size be placed in both circuits, or should the secondary circuit have larger coils than the aerial circuit? I notice that instructions for making secondary coils generally give them as being much larger than the coil on the primary of the same set.

The coils should be loaded at the same rate, and if the inductance of one circuit is increased by a No. 50 coil, the other circuit will need a similar coil to bring it into tune.

The reason that the original primary and secondary coils are of different dimensions should be apparent if it is remembered that the aerial itself is connected to the aerial coil, and therefore a smaller coil in the aerial circuit will be required in order to give the same wave-length as the secondary circuit, which has no aerial.

Once the circuits have been brought into tune in this way they will need equal loading in order to remain in tune with each other.

H. C. (Shepperton-on-Thames).—I have a crystal set consisting of a broadcast variometer, 'phones, with small condenser, and crystal detector, and with a 25-ft.-high aerial I get very good signals. I am told that a variable condenser would still further improve results and give better tuning. Is this so, and how should it be connected?

You would not improve results by adding a tuning condenser, as this is only useful for tuning a fixed coil or for "loading" a variometer.

The latter by itself is capable of very fine tuning, and the addition of a capacity across it would be detrimental, unless it is necessary to increase the tuning range of the instrument.

This tuning range is merely the band of wave-lengths which the instrument will cover, and has nothing to do with the range of reception, which is what you wish to increase.

HULLO, EVERYBODY!!

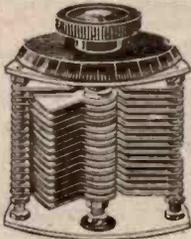
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Amplion Junior Loud-speaker.....	55/-
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THE B.B.C. PROGRAMMES.

The Editor, POPULAR WIRELESS.

Dear Sir.—While applauding your fairness in giving publicity to both points of view in the broadcasting controversy, I must protest strongly against the opinion expressed by your "anti" correspondent recently.

First let me say that I do not regard the Director of Programmes as a paragon (he would not thank me for an empty compliment), but I do believe he is doing his utmost to please the majority. Incidentally, if your correspondent thinks the noisy minority are ruling the roost, will he say why the majority remain silent. And, if they are silent, how does he know they are a majority?

Many aeriels are coming down. Everyone knows that. Most "pirates" became virtuous citizens again when given a fair opportunity, but there are the inevitable "scroungers" whose amusement became unnecessary when no longer free. And if questioned on the disappearance of the aerial, it is far easier to loftily blame the fare provided than to admit a disinclination to pay for it.

Every one of my friends is heartily pleased with the broadcasting as far as it goes. I can only speak for my own acquaintances, not being fortunate enough to be the confidant of the "silent majority" of listeners. Of light music we get enough—Savoy bands, 2 LO dance band, entertainers, light pieces in the regular orchestral concerts. It should not be forgotten that the B.B.C. is still labouring under the copy-right difficulty. As for tuneful ballads, I wonder if your correspondent heard "The Bells of St. Mary's" the other night, not to mention "Who is Sylvia?" and the host of other delightful songs broadcast regularly.

Talks, I admit, are boring if out of the listener's line. Well, what about utilising the ten minutes for trial of some new hook-up, the fire may need making up, the wife might enjoy a few words of encouragement to comfort her through the next hour of enforced silence. Let us be thankful we can hang up the 'phones at will, whereas at a concert or theatre we must stick in our seat, no matter what agony we suffer, unless we prefer to agonise our neighbours by walking out on their feet.

Finally, I had my 15s. worth on election night alone. I am enjoying what I get, Mr. Burrows, and I hope that won't stop you trying to give still better.

Yours faithfully,
G. H. STEARN.

44, Geneva Road,
London, S.W.9.

AMERICA ON "P.W." SET.

The Editor, POPULAR WIRELESS.

Dear Sir,—I am writing to add yet another compliment to the famous "P.W." set.

On a recent Sunday morning I heard broadcasting at 4.8 a.m. on about

(Continued on page 911.)

YEARS OF AMUSEMENT FOR 10/6. THE ESCO "BIG FOUR" B.B.C.



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No. 4. Each set stamped B.B.C. full guarantee.
We hold large stocks of component parts.
No. 1 Square Type 10/6 | No. 2 Oblong Type 11/6 | No. 3 Slope Top 13/6 | No. 4 Lid Top 15/6
Agents Wanted Everywhere. Liberal Trade Terms.
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"AERIAL CRADLE" P.P. 19,302
Fit this to your aerial and get 50 per cent better signals. Full instructions given. Price 1/6, (postage 2d.).
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Or to London Branch, 19, Archer St. Works, Piccadilly, W.1.

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4v. 40a....17/- | 6v. 40a....25/-
4v. 60a....21/9 | 6v. 60a....32/6
4v. 80a....27/6 | 6v. 80a....40/-
4v. 100a....32/6 | 6v. 100a....46/-
Polished teak cases for 6/60 and 4/100 only, fitted with fuses and switch, 6/6 each.

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CORRESPONDENCE.

(Continued from page 910.)

380 metres. The signals being fairly good, I resolved to try again.

Later I was able to pick up this station again, and enjoyed an hour's dance music. Ship "jamming" prevented me from hearing the speech properly, but I heard the announcer say "W G Y" (which I believe is the New York station).

The music was very clear, and was so strong at times that I was able to get back into bed, and lie there with the 'phones on. Other stations were received, but were very faint.

The above were received on "unit 1," aerial 60 ft. twin, 28 ft. high. I think these are excellent results for one valve, and they speak well for the "P.W." set.

Wishing you and the paper every success in the coming year,

I am,

Yours faithfully,

F. J. TAYLOR.

27, Florence Road,
Acocks Green, Birmingham.

THE WEEK'S BROADCASTING PROGRAMMES.

FORTHCOMING SIMULTANEOUS EVENTS.

- Sunday, February 10th.—Vladimoff's Balalaika Orchestra, 3 p.m.
- Monday, February 11th.—B.B.C. Literary Critic and popular concert. S.B. all stations ex. Cardiff. Dr. Saleeby. "Tristan and Isolde," Act 3.
- Tuesday, February 12th.—French talk.
- Wednesday, February 13th.—B.B.C. Dramatic Critic.
- Thursday, February 14th.—B.B.C. Musical Critic. Radio Society Talk. The Georgians Concert Party. Savoy Bands.
- Friday, February 15th.—B.B.C. Film Critic. "Parsifal," Act 3.
- Saturday, February 16th.—"Cavalleria Rusticana," "Pagliacci," Acts 1 and 2.

LONDON (2 L O).

- Sunday, February 10th.—The Rev. Henry Edwards, Vicar Designate of Watford. Mayfair Singers.
- Monday, February 11th.—Popular Concert by the Wireless Orchestra. "Tristan and Isolde," Act 3.
- Tuesday, February 12th.—French Programme, by the Band of H.M. Grenadier Guards.
- Wednesday, February 13th.—Popular Orchestral Programme.
- Thursday, February 14th.—The Georgians Concert Party. Rachmaninoff Items. Lecture Recital on Modern Russian Music.
- Friday, February 15th.—"Hamlet," produced by Sydney Russell. "Parsifal," Act 3.
- Saturday, February 16th.—See Simultaneous Events.

BIRMINGHAM (5 I T).

- Sunday, February 10th.—The Rev. W. Grome Merrifles' address. The station Repertory Choir.
- Monday, February 11th.—Programme mainly from London.
- Tuesday, February 12th.—The Pack of Cards Concert Party.
- Wednesday, February 13th.—The Band of the Royal Corps of Signals.
- Thursday, February 14th.—Popular Orchestral Night.
- Friday, February 15th.—Vocal and Orchestral Night.
- Saturday, February 16th.—Request Programme, and See Simultaneous.

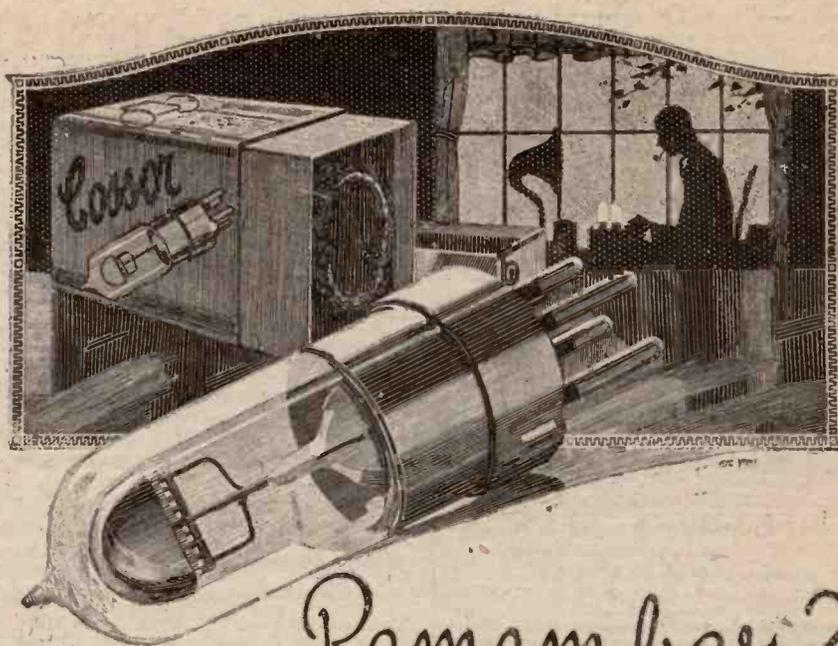
CARDIFF (5 W A).

- Sunday, February 10th.—Rev. Walter E. Rees. Modern Russian Night.
- Monday, February 11th.—Band of the 12th Royal Lancers.
- Tuesday, February 12th.—Entire Programme from London.
- Wednesday, February 13th.—Station Birthday Anniversary. Special Items by the Director and Staff. Short Address by Mr. J. C. W. Reith, Man. Dir. of the B.B.C.
- Thursday, February 14th.—Programme from London.
- Friday, February 15th.—Newport Glee Singers.
- Saturday, February 16th.—Programme from London.

MANCHESTER (2 Z Y).

- Sunday, February 10th.—The Rev. Canon R. Lavers Kemp. The Albert Hall Choir.

(Continued on page 912.)



Remember?

Do you remember when, months and months ago, you first heard of the **Cossor Valve**?

Do you remember how sceptical you were and merely passed it by as being just another Valve?

Do you remember how, in spite of yourself, the advertisements intrigued your interest, and you read about its curved filament and hood-shaped Grid and Anode? And later on, when your existing Valve departed this life, you decided to give "one of these **Cossor Valves**" a trial?

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P.1 For Detector and Low-Frequency amplification	12/6
P.2 (With red top) For High-Frequency amplification	
Wuncell P.3 (With green top) corresponds in characteristics to P.1	30/-
Wuncell P.4 (With blue top) for High-frequency use	

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Advertisement of A. C. Cossor Ltd.,
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When you have realised that your poor tuning is due to that inefficient slider and plunger, ask for the **G-W. SLIDER** which makes a broad contact along ONE WIRE and rolls smoothly over them without scraping or wearing them. The "G-W." slider will not clog up or short circuit your inductance. Ask your dealer for the **LAKEE "G-W." SLIDER**. 100 per cent efficient. Price 1/-, or post free 1/3 from **J. & J. LAKEE CO.**, 467, Romford Road, London, E.7. Some ENGLISH and Continental territories available.



BEGINNERS' GUIDE TO WIRELESS—BEST BOOK OBTAINABLE.
If you wish to make your own receiver, or to improve the set you already have, you cannot do better than obtain this book. **HOW TO ERECT, CONNECT, AND MAKE Aerials, Complete Crystal and Valve Receivers, Coils, Tuners, etc.;** also the latest two and three valve tuned Anode Receivers and one and two valve Amplifiers. 144 pages (including 28 diagrams), 1/3 post free—**SAXON RADIO CO. (DEPT. 14), SOUTH SHORE, BLACKPOOL.**

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CRYSTAL SETS - 7½d. per set.
VALVE SETS - 1/6 "
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We are the sole designers and proprietors of this tab.
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TELEPHONES REWOUND
to 4,000 ohms. Guaranteed. All makes 5/-, except BROWN "A" 6/-, and SULLIVAN, wax-filled, 7/- per pair. Ex-Army converted to high resistance 2/6 each earpiece. Postage, all makes, 6d. pair.
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TELEPHONE: 10806 CENTRAL.

PROGRAMMES.

(Continued from page 911.)

Monday, February 11th.—Programme mainly from London.
Tuesday, February 12th.—2 Z Y Orchestra.
Wednesday, February 13th.—Mr. Robert Parker of the B.N.O.C. and Orchestra.
Thursday, February 14th.—Programme mainly from London, with Lavilette, in extracts from Charles Dickens.
Friday, February 15th.—Special Concert Night, given in the Free Trade Hall, 2 Z Y Orchestra accompanying. Beecham Operatic Chorus.
Saturday, February 16th.—See London Programme.

NEWCASTLE (5 N O).

Sunday, February 10th.—Rev. G. C. Goodlet. Herman MacCloud's Quintette.
Monday, February 11th.—Programme from London.
Tuesday, February 12th.—Popular Orchestral Night.
Wednesday, February 13th.—Popular Orchestral and Vocal Night.
Thursday, February 14th.—Programme from London.
Friday, February 15th.—Popular Night.
Saturday, February 16th.—Programme mainly from London.

BOURNEMOUTH (6 B M).

Sunday, February 10th.—Rev. H. T. Maddford. Eastcliffe Congregational Choir.
Monday, February 11th.—Programme mainly from London.
Tuesday, February 12th.—Night of Memories. Songs with Orchestral Accompaniment.
Wednesday, February 13th.—Comic Opera Night.
Thursday, February 14th.—Programme mainly from London.
Friday, February 15th.—Musical Comedy Night.
Saturday, February 16th.—Programme mainly from London.

GLASGOW (5 S C).

Sunday, February 10th.—Rev. Lyle Rodger. The Fellows String Quartette.
Monday, February 11th.—Programme mainly from London.
Tuesday, February 12th.—Popular Night.
Wednesday, February 13th.—Light English Night.
Thursday, February 14th.—Instrumental and Vocal Concert.
Friday, February 15th.—Story Recital Night, by Percival Steeds.
Saturday, February 16th.—Welsh Programme; also See Simultaneous.

ABERDEEN (2 B D).

Sunday, February 10th.—The Rev. George Walker, D.D. Address. Beech Grove Church Choir.
Monday, February 11th.—Programme Mainly from London.
Tuesday, February 12th.—Modern French Composers Night.
Wednesday, February 13th.—Dance Night.
Thursday, February 14th.—Comic Opera, "The Grand Duchess of Gerolstein."
Friday, February 15th.—Scenes and Characters from Dickens.
Saturday, February 16th.—Programme mainly from London.



Adding an H.F. Amplifier.

The adding of an H.F. amplifier to a crystal receiver is a much simpler matter than many amateurs realise. It is not necessary to make any great alterations in the crystal set for the purpose. The H.F. amplifier unit has first to be made up, or procured, and after that it is only necessary to connect the output terminals of the amplifier unit (that is, the plate and plus H.T.) to the aerial and earth terminals of the crystal set. The crystal tuner acts as a tuned anode coupling, another tuner being required for the H.F. unit. Owing to the series capacity of the valve, it is desirable to connect a condenser of small capacity (0.0001) across the aerial and earth terminals of the crystal set.

Improved Loud-Speaker Horn.

There must be innumerable shapes and designs for the trumpets of loud speakers, each claimed to have some special acoustical advantages. I saw, recently, however, one which struck me as being a distinct change from the usual design. It consisted of two horns, one inside the other, the edge of the inner horn being turned well over the edge of the outer one. The sound waves proceed up the space between the two horns, and are reflected from the overturned edge of the inner one. It is claimed that this type of dual trumpet is not only theoretically advantageous, but that it gives greatly improved quality of reproduction.

Watch-Spring Condenser.

I saw recently the patent specification of a variable condenser working on the principle of a watch-spring. The two "plates" consist of lengths of metal strip (they may be actual watch-springs), and have one end attached to a fixed point, whilst the other end is attached to a central spindle. They are then interleaved with one another, and with the necessary strips of insulating paper. As the control handle is turned, the springs are "wound up," and the convolutions come tighter together and so increase the capacity. It struck me, however, that although the idea is ingenious, the condenser would have certain disadvantages, one of which would be the fact that the same setting of the control handle would almost certainly not give the same capacity every time. However, I have not tried it, nor even seen the actual instrument (the patent is of American origin), but perhaps some of my readers will come across it, and let me know how it works.

Conical Loud-Speaker Diaphragm.

Another interesting device is that of Ferrand and Davis (U.S.A.), which includes a conical diaphragm, about 15 inches in diameter, suitably mounted and connected by its centre to an armature which is actuated by the magnets of the reproducer, the connection between armature and diaphragm being a stiff metal rod. The diaphragm is made of stout vellum or other similar material. Owing to the large size of the diaphragm, no trumpet is necessary. This principle seems to be in use in certain French loud speakers, and has also been applied some years ago to a gramophone reproducer. The reproducer, instead of being at a little distance from the diaphragm (a few inches), and connected by a rod, may actually be located within the hollow of the diaphragm and connected directly.

Bell-Wire Aerial.

The days when an elaborate aerial was considered necessary for wireless reception seem to be passing rapidly. What with umbrella frames, bedsteads, and gas-cookers as aerials, it would seem that almost anything in the metal line would serve. Naturally these are very inefficient, but an aerial which is quite efficient, though still somewhat in the "improvised" category, may be made out of the wiring of the front-door bell. Either side of the line may be used, and if the connection is made through a condenser, there is no interference with the ordinary use of the bell circuit.

Fading.

Fading has been responsible for a good deal of trouble with broadcast transmissions, and in spite of all the investigations which have been made to ascertain its cause, or causes, no completely satisfactory theory has yet been put forward to account for it. There seems to be no doubt that it is due not to any one cause, but to a variety of causes which operate to different degrees at different times. A new and ingenious theory, which has much to support it, is that a certain amount of fading may be caused, in a city like London, by the presence in the atmosphere of smoke particles. It will be noted that these are frequently charged with electricity, and may have a similar effect to that due to charged thunder-clouds, and to ionised regions generally, which are admitted to be amongst the serious causes of fading.

New Application of Wireless.

An ingenious application of wireless apparatus has been made by a British mechanical engineer. It is well known that trouble in various kinds of machinery, due to over-heated or faulty bearings, etc., can often be detected by an experienced mechanic by placing the ear against the machine, and noting any peculiarity in the hum or characteristic sounds of the machine. It is now proposed to place microphones in certain positions on the machine, and to connect the same to amplifiers and loud speaker, the latter located in the chief engineer's office. The "chief" will then periodically plug-in the various microphones, and will be able to tell instantly whether everything is running smoothly, or, if there is trouble, where it is located.

"COUNTRIES OF THE WORLD," shortly to appear in fortnightly parts, is a magnificent new art publication which will describe the Continents, Countries, and Chief Cities of the Globe. It will be illustrated by nearly 5,000 photographs (the majority specially taken for it), including over 350 coloured plates. Famous authors and travellers contribute the fascinating and instructive articles. Such names as Joseph Conrad, Stephen Graham, Sir Philip Gibbs, Rosita Forbes, Dean Inge, etc., to mention but a few, are in themselves a guarantee of the authority and CHARM of this new work. It is hoped to complete "COUNTRIES OF THE WORLD" in about 40 fortnightly parts. Part 1 will be on sale February 12th, price 1 3.

DUBILIER

Grid Leaks



Constructional Chats

By PHILLIP R. COURSEY, B.Sc.

No. 5.

On the use of Grid Leaks.

Grid Leak resistances form an essential part of many radio receiving circuits using thermionic valves. In particular a grid leak is very commonly employed when the valve is used as detector, the leak resistance being connected either across the condenser which is inserted in the wire connecting to the grid of the valve, or connected directly between the grid and the filament of the valve.

The function of this grid leak resistance is to provide a path through which the electrons which collect upon the grid of the valve can leak away back again to the filament. Hence it follows that the value of this leak resistance is not particularly important within comparatively wide limits. If the leak has too low a resistance it will impair the proper functioning of the valve, while if it is too high the use of reaction becomes difficult. In many receivers the use of resistances of higher value than the conventional 2 megohms often leads to slightly improved results, and leaks of 3 or 4 megohms resistance may be tried with advantage.

The experimenter using very short wavelengths is also specially recommended to try values other than the normal one, in particular in these cases a lower resistance value (of about 1 megohm or slightly less) often leads to improved results and easier control of the receiver.

THE DUBILIER CONDENSER CO. (1921), Ltd.,

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IF WIRELESS WAS WIRELESS—



Wireless is "wire-less" so far, but wire is bound to play a part somewhere in the installation. Some amateurs consider the receptive qualities before the appearance of their sets, but even reception is apt to be marred by a hopeless conglomeration of wires and frayed insulation.

Set aside an evening of over-hauling—make careful adjustments—take each end of wire in turn, and with solder and a touch of FLUXITE join them neatly into place. You are bound to be satisfied with

the result of the few hours spent and the receptive qualities will attain higher sensitiveness in consequence. Soldering is so simple when you use a touch of FLUXITE—just the smallest touch does it.

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Things you should know about Filament Control—

FINE CONTROL. ASK HOW MANY TURNS the knob will make from the point where the filament begins to glow until the position of minimum resistance of the rheostat is reached. Oftentimes, with a cheap rheostat, the whole range of resistance variation is accomplished with HALF A TURN OF THE KNOB. This means that a shade of a turn represents many ohms variation. A little turn too much, and the result is a burnt-out valve. Every time this sort of control is moved your expensive dull emitter valve is in danger.

HOW DIFFERENT IS LISSENSTAT CONTROL—every part of a turn represents a fractional change of resistance. Several turns are necessary to vary the resistance over the whole of its range. Positive variation throughout.

If you buy dull emitter valves, it is worth while using LISSENSTAT control. AND LISSENSTAT CONTROL A LONG TIME HENCE WILL BE THE SAME FINE PERFECT CONTROL IT EVER WAS. Is it worth your while risking a substitute when you can now get your choice of three types of LISSENSTAT CONTROL?

The LISSENSTAT (prov. pat.) There is a perfectly free movement of the whole resistor column—fine variation of resistance because of the elastically deformable spring discs which form part of its unique construction—it is an ideal control for dull emitter valves. All those who desire exact control of critical electronic emission should use the LISSENSTAT. It adds range to a receiver in a way you never thought filament control could. Brings detection to the finest point **7/6**



Use a separate LISSENSTAT for each H.F. and the Detector valve.

DIFFERENCE. After you have tried all the other controls on your receiver of the LISSENSTAT knob will bring it in clearly and through a dead background of silence.

Maximum Transfer of Energy with LISSENAGON COILS—

It is the function of your aerial to pick up energy—it is the function of your inductance to build up the voltage which will operate the grid of the first valve. Do the coils you use make a maximum transfer of this energy or is there any minute loss which weakens the strength of your detection? The magnetic linkage between LISSENAGON coils is such that a transfer of energy will be effected even though the coils are comparatively a great distance apart. The farther apart coils can be kept the sharper and more selective tuning becomes. IT IS PARTLY DUE TO THE STRONG MAGNETIC FIELD BETWEEN LISSENAGON COILS, and PARTLY DUE TO THE NEGLIGIBLE LOSSES IN THE COILS THEMSELVES that LISSENAGON coils will oscillate easily even though at a considerable distance apart, as there are practically no damping losses to be overcome, even on the extreme low wave-lengths.



LISSENAGON COILS TUNE SHARPLY AND STRONGLY BECAUSE THEY TUNE WITHOUT ENERGY LOSS.

LISSENAGON TUNING CHART. Note the New Coils: 30, 40 and 60.

TABLE 1. Wavelength range when used as Primary Coils with Standard P.M.G. Aerial and 001 mid. condenser in parallel.			TABLE 2. Wavelength range when used as Secondary Coils with 001 mid. condenser in parallel.		
No. of Coil.	Minimum Wavelength	Maximum Wavelength	Minimum Wavelength	Maximum Wavelength	PRICE.
25	135	350	100	325	4/10
30	235	440	130	425	4/10
35	285	530	160	490	4/10
40	360	675	200	635	4/10
50	450	850	250	800	5/-
60	500	950	295	900	5/4
75	600	1,300	360	1,100	5/4
100	820	1,700	500	1,650	6/0
150	1,065	2,300	700	2,150	7/7
200	1,385	3,200	925	3,000	8/5
250	2,300	3,800	1,100	3,600	8/9
300	2,500	4,600	1,400	4,300	9/2

Audio Frequency in Reflex Circuits—It has been found that the LISSEN T2 transformer is an ideal transformer in these circuits, where it yields very powerful amplification with great purity of tone. **25/-** An Excellent Light Transformer—one of the best light transformers made is the LISSEN T3. **16/6**

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BUILD—WITH THE RIGHT PARTS.

Your dull emitter valves must have fine control—and this fine control must LAST. When you buy your rheostat, do not merely ask whether it gives fine control, do not rely upon the evidence of initial demonstration, but ASK HOW LONG THE FINE CONTROL WILL LAST FOR.

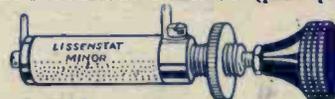
If you are offered a powder rheostat—ASK, WILL THE POWDER "PACK" together in use? ASK WHETHER ANY POWDER RHEOSTAT YET MADE HAS EVER FAILED TO "PACK" AFTER USE.

"PACKING" means the tendency to close together which is an inherent trouble in all powder rheostats which rely upon compression to bring about the variation of resistance.

"PACKING" is the great trouble of a powder rheostat.

With a cheap rheostat your dull emitter valves are always in danger. You can get the valve to glow, BUT THIS IN ITSELF IS NO TEST OF

The latest type of Lissenstat Control—the LISSENSTAT MINOR (prov. pat.)



This is intended to provide something of the beautiful LISSENSTAT control at a popular price. Infinitely superior to wire or powder rheostats. Well made throughout. Indestructible. The LISSENSTAT MINOR is the next best thing to LISSENSTAT control itself. It **3/6** is a perfect little device. For efficiency, use a Lissenstat Minor for each valve.

The Protection of the LISSENSTAT UNIVERSAL—

This is specially designed to provide a safeguard against burning out expensive dull emitter valves. A minimum resistance can be left in circuit to protect the valve, and yet the resistance can be reduced to zero when full battery pressure is needed. It gives all the beautiful LISSENSTAT control with the additional protection named. Full resistance is 50 ohms. Use one for each H.F. and Detector for efficiency **10/6**



To those who make the mistake of thinking that LISSENSTAT (prov. pat.) control is the same thing as an ordinary rheostat—LET THEM TRY THE control in vain to bring in a distant station you know is there, just a tiny turn of the knob.

Sensitivity aided by the LISSEN VARIABLE GRID LEAK

This is a unique resistant element used in the LISSEN Variable Grid Leak which cannot be duplicated because it is covered by definite patent claims. Valves vary in characteristics, and it is an excellent thing to be able to alter the leak resistance to make full use of the critical features of the valve. With the LISSEN Variable Grid Leak the exact value of leak resistance can be selected to suit every working phase of the valve and circuit, thereby obtaining correct grid potential. UNDER ALL CONDITIONS. LISSEN ONE-HOLE FIXING, OF COURSE—POSITIVE **2/6** STOPS BOTH WAYS



Regeneration is No Alternative to Radio Frequency Amplification—

It is a mistake to assume that because aerial reaction is used there is no need for radio frequency amplification in the same receiver. One stage of LISSEN REACTANCE (prov. pat.) should be used in every receiver. It makes reproduction purer, brings in distant stations with far greater ease and certainty, and makes a receiver far more sensitive. LISSEN REACTANCE makes rapid tuning possible and H.F. amplification exceedingly efficient and easy. It is simple to connect—see blue print with each. It has a switch already mounted and complete. No complications. **19/6** 150 to 10,000 metres **17/6** 150 to 600 metres

Radio Frequency Plus

Regeneration—That is why LISSEN REGENERATIVE-REACTANCE (prov. pat.) has been so successfully used in the reception of American telephony. It replaces aerial reaction and makes a receiver exceptionally sensitive. It is NON-RADIATING, replaces plug-in coils, is lower in cost than a set of coils to cover the same wide range—it is easier to handle, one knob controls tuning and reaction. Introduced into the anode circuit it forms an unequalled first stage of radio frequency. Reception is often possible with both aerial and earth connections dispensed with. Blue print with each shows the easy connections. Unbroken regeneration possible over the whole range, complete with internally connected switch. No soldering. LISSEN ONE-HOLE FIXING, OF COURSE. **£2 12s. 6d.** 150 to 4,000 metres



Tune always with a vernier (preferably use the LISSEN Vernier, specially designed for fine tuning in H.F. circuits, price **12/6**.) Build up Beautiful Tone Quality—for immediately after the detector valve—a wonderful power amplifier, too—this incomparable transformer can also be used throughout. IT HAS A COIL WHICH WOULD AMPLIFY BY ITSELF WITHOUT ANY IRON CORE AT ALL. **30/-**

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