

HOW WE RELAYED U.S. BROADCASTING (By Capt. A. G. D. WEST)

Popular Wireless

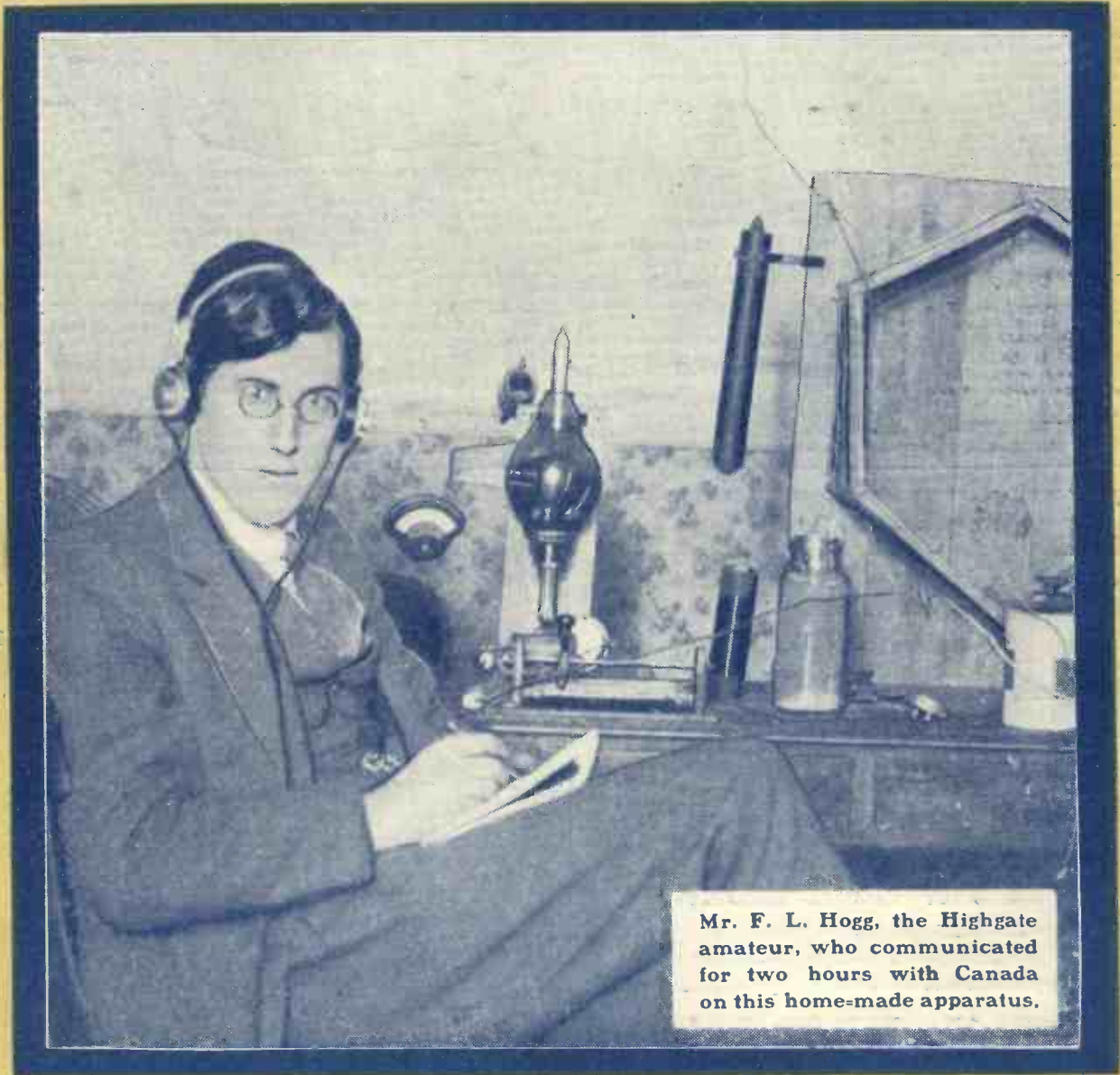
PRICE 3d.

EVERY FRIDAY.

No. 85. Vol. IV.

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

January 12th, 1924.



Mr. F. L. Hogg, the Highgate amateur, who communicated for two hours with Canada on this home-made apparatus.

FEATURES IN THIS ISSUE.

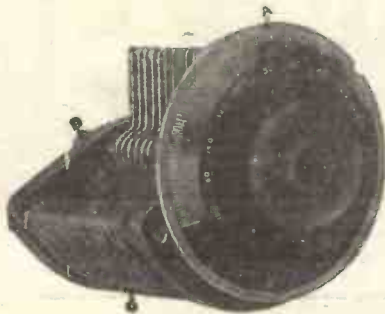
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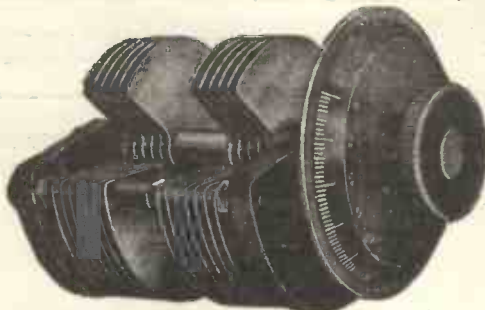
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POPULAR WIRELESS

THE WIRELESS WEEKLY WITH THE LARGEST CIRCULATION.

January 12th, 1924.]

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

[Every Friday.

TOPICAL NOTES AND NEWS.

German Broadcasting.

THE German Chancellor, Dr. Marx, broadcast a seasonable message to the German nation, in the presence of members of the Reichstag and others, on New Year's Day.

Wireless Effects Orchestra.

OWING to the dancing craze and to wireless, the Bournemouth Municipal Orchestra, conducted by Sir Dan Godfrey, is being neglected. It was stated that the receipts have dropped in the last three months by about £1,700.

2 L O's New Studio.

THE other night Captain Frost allowed me to look at the new studio—a very fine palatial room. The workmen are at the moment fitting artificial windows, so that when the studio is finished it will resemble a very artistic drawing-room.

Wireless in the Vatican.

IT is interesting to note that Cardinal Gasparri has asked the Italian Secretary of State for permission to erect a powerful wireless station in the Vatican Gardens for the Pope. The application is to have the careful consideration of the Cabinet.

Our Cartoons.

A LETTER from a member of the American Relay League, a society which has done so much for the benefit of wireless, said that "P.W." is quite popular in U.S., and the cartoon which we give every week is considered the best that any wireless paper produces.

2 Z Y on Fire.

TWO microphones worth £100 each were destroyed, with other wireless equipment to the value of another £100, by a big fire which mysteriously broke out in 2 Z Y's studio. After the fire was extinguished a land line was run to a neighbouring picture-house, and from this the artistes carried out the usual programme.

Interference at Bournemouth.

SEVERAL complaints have come to hand in respect of "humming" from 6 B M. Mr. H. Bishop, an assistant chief engineer of the B.B.C., is trying to locate the cause. He told me that nearly all the stations had their own peculiar hum, and one by one they had been able to effect a cure. The cause of the trouble of one station does not necessarily apply to the others.

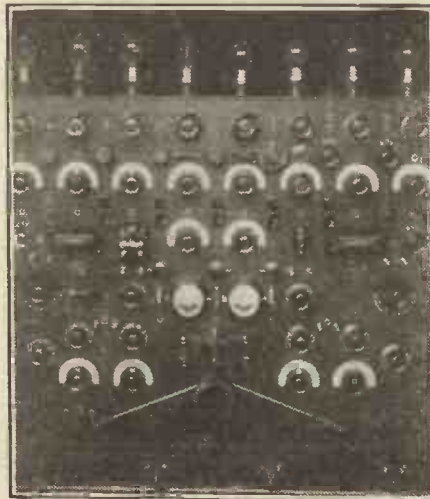
In South Africa.

THE American programme broadcast in England was heard by listeners in Cape Province, 6,000 miles from

London. The next day Camp Bay, near Cape Town, reported picking up 2 L O dance music on a loud speaker with good volume—a most extraordinary instance of "freak" reception due to equally freakish atmospheric conditions.

Two Radio Romances.

THE first wireless "uncles" to marry since the inception of broadcasting in this country are: (1) Mr. H. Fellows has married Miss Ellen Milligan (Mr. Fellows is known to all kiddies as "Uncle John"); (2) Mr. K. A. Wright, late of 2 Z Y,



How would you like to tune in this receiver, constructed by Mr. H. Stumpson of 38, Balfour Road, Bromley, Kent

has married Miss Jessie M. Cormack, M.A., the pianist of the Manchester station. Good luck and long lives of happiness to both lucky "uncles" and their ladies!

Too Much.

I WAS demonstrating some time ago, and reception was being continually spoilt by somebody who would keep oscillating. My assistant was so annoyed that he used the reaction on the set and transmitted, by means of these oscillations, a few kind remarks on the subject in Morse. I feel convinced that my assistant must have said something terrible, as the oscillator did not annoy us again.

Another Advancement.

PROBABLY the greatest advancement made in broadcasting was the relaying of K D K A, the Westinghouse station at Pittsburg. Captain A. D. G. West, who was in charge of "operations," deserves the congratulations of all wireless enthusiasts, and even those who are not interested in wireless, for the assistant chief engineer of the

B.B.C. has made another stride in this modern age of science. An article by Captain West appears on page 727.

The Greatest Living Wireless Pioneer.

IN an article which appeared recently in "The Daily News," the Editor of POPULAR WIRELESS suggested that the Order of Merit should be conferred on our greatest living wireless pioneer—Sir Oliver Lodge. Only one scientist holds that honour to-day—Sir J. J. Thomson, the Master of Trinity, who discovered the electron.

The Vacant O.M.

THE Editor of "The Daily News" endorses the suggestion in a leading article, in which he says: "Wireless is no more the invention of one man than the modern linotype machine or the fountain pen, and the tribute which Mr. Norman Edwards pays to Sir Oliver Lodge is certainly deserved. It is only one of the titles to distinction of a veteran, who is admittedly the most famous British scientist of the day. Mr. Edward's suggestion that his work in this respect alone justifies his inclusion in the Order of Merit would certainly be endorsed enthusiastically by popular opinion."

And I feel sure that readers of "P.W." will agree with the above remarks, and sincerely hope that our famous scientific adviser may be the recipient of the distinguished Order of Merit.

America and the "Old Vic."

I KNOW of several wireless experts who expressed the opinion that relaying an American programme from America was an impossibility and quite impracticable. The "Silent Staff of the B.B.C." dismissed such pessimism and the opinions of such experts from their minds when any efforts are being made for the benefit of this great science. I remember when Captain West told me that he was going to build a small wireless transmitter and broadcast a programme from the "Old Vic." to 2 L O for them to re-broadcast, a great friend of mine, who is well-known in wireless circles, laughed at the idea. As we all know, Captain West accomplished the feat and with great success.

Californian Broadcasting.

ONE of our readers has just received an inquiry in Esperanto from Oakland, California, asking whether the radio concerts broadcast from the "Tribune Tower" station, lately erected, have been heard in this country. Their

(Continued on page 722.)

NOTES AND NEWS.

(Continued from page 721.)

concerts have already been heard in Alaska, some 4,000 miles away. The call sign of this station is "K L X."

Any of our readers who have heard these transmissions, are requested to communicate with Mr. H. A. Epton, chairman of the Hackney and District Radio Society, 17, Chatsworth Road, London, E. 5. Mr. Epton has arranged to send any reports received to the proper authorities in Oakland, California.

Glasgow Heard 4,780 Miles.

THE Glasgow station was recently heard at Flandreau, South Dakota, U.S.A., and by four receiving stations in Minneapolis. The distance from Glasgow to Flandreau is about 4,780 miles.

Relaying Brussels.

IT is to be hoped that within a month the B.B.C. will give an international evening, with music from such places as Paris, Brussels, and an American station—"X's" permitting.

A Well-Known Centenarian.

THE mother of Lord Haldane was one of the listeners to the New Year's programme. She has a set in her home in Perthshire, and was particularly interested in her old friend, the Rev. Archibald Fleming, who was broadcasting from 2 L O. She is in her hundredth year.

The B.B.C.'s Promise.

THE B.B.C. has now 3,000 artistes at its call, a considerable number of whom are under contract. "Every effort will be made to provide increasingly better fare during the coming year," is the B.B.C.'s promise for 1924.

A Novel Aerial.

GOING home late one night, I noticed a night watchman with clay pipe and coke fire wearing telephones on his ears. On closer inspection I found that he was listening in on a crystal set, using a short aerial running along the ropes enclosing the "road-up" space.

Plymouth Station at Last.

THE B.B.C. has received a permit from the Postmaster-General for the erection of a wireless relay station at Plymouth, which it is hoped to have working in three months' time. This should do a great deal to supply the wireless needs of the West Country.

6 B M Causing Trouble.

BOURNEMOUTH is up in arms against wireless. The Town Council have decided that aeriels are spoiling the appearance of their beautiful town. The Libraries' Committee reports a falling off in the number of books issued, and the town clerk has received sealed orders to look into the matter.

Pros and Cons.

ONE man who does not view wireless with alarm is Alderman Cartwright, the Mayor, who opened 6 B M's station, and gave me a splendid welcome

when I visited that town. He is of the opinion that wireless will be an advantage to local trade and dwellers; but, as he told me, "Let the novelty wear off."

Radiola's 15 kw.

ARRANGEMENTS have been made between CKAC of Montreal and the Radiola station of Paris for the latter station to broadcast every Sunday from 8 to 10 p.m. a special concert, which will be re-radiated by the American station. The power to be used by the French station is reported to be 15 kw., and the wavelength, 1780 metres.

Future Developments.

DURING the past week nearly every daily and weekly paper has devoted columns to the question of the re-transmission of American broadcasting, and to what they think about the work accomplished on the North Downs. They were all unanimous in acclaiming the results obtained to be indications of a far wider and more useful application of wireless telephony in the near future.

Truly, the successes achieved open up



The two units of the "P.W." Combination Set, built into one case by W. Johnson, of 42, Warwick Road, Stratford, E.15.

endless possibilities, and this year will undoubtedly see tremendous developments in all branches of wireless science.

British Enterprise.

THE British have done more for radio science than any other nation in the world. We have beaten "all comers" in the Transatlantic tests, "S. B." and many other branches of radio which are not known to the general public, but which add to the efficiency of broadcasting. It is a recognised fact that the transmissions of the British stations are the finest in the world.

Amateurs' Experiments.

SOME remarkable series of experiments have been conducted by American and English enthusiasts. One great experiment is the attempt at communication with the ice-bound "Bowdoin." American amateurs have actually received accounts of the progress of the explorers, and in turn the amateurs have transmitted the latest news.

Valves Cheaper.

NOW that there is a decided decrease in the price of valves many crystal users are adopting valve sets, although the largest percentage of listeners are

crystal users and probably always will be. But undoubtedly valves will increase in popularity before the end of the season.

Chaperons in Demand.

IT was most unfortunate that when Mr. A. R. Burrows, Director of Programmes, was about to deliver a lecture on Educational Wireless at the University College, London, that the receiving set should develop fault.

Instead of receiving a lecture on "St. Paul's Cathedral" a chat on "Chaperons and their Disappearance since the War" was given. The audience decided to hear the lecture on chaperons and to make another attempt to hear the St. Paul's lecture another time.

Phase That Will Pass.

THERE is still quite a considerable amount of uneasiness among managers of concert halls and conductors of orchestras, regarding wireless. Bournemouth is going through similar troubled waters to those experienced by 2 L O a year ago. Complaints are being made about poor attendances at concert halls, theatres, etc., owing to wireless, as recorded in another paragraph on this page. This is bound to happen for a time, but as soon as the novelty of listening wears off, theatres will obtain better attendances.

No Detrimental Effect.

I REMEMBER about six months ago—the difficulties the B.B.C. had to overcome in persuading halls and theatres to have their productions broadcast. Now the position might change; those that refused in the early days are only too ready to have their productions broadcast.

I was talking to an official at the Savoy Hotel and I asked him whether the broadcasting of its Dance Band had detrimental effects. "None whatever," he replied. "It may be argued, of course, that when first-class dance bands can play into your own house many people with loud speakers will dance at home instead of going to the hotel for that purpose, but in actual practice there is no detrimental effect."

A New Microphone.

A NEW microphone at 2 L O has given readers cause to inquire what it really is. Capt. H. J. Round is the designer, and from many experiments he has now produced a microphone which is the most sensitive sound apparatus in existence. It really should be called a magnetophone, as it is on the magnet system—that is, a central iron core with a surrounding iron cylinder. Round the central core is a magnetising coil taking about 4 amps. at 8 volts. In front of the magnetic system is a very wide air gap, and in the gap is a very fine aluminium wire pancake coil. This coil acts as the diaphragm.

A Mystery.

THERE is considerable mystery attached to the refusal of M. Poincaré to broadcast a New Year's message to listeners. There were no technical difficulties whatever in the way; for, as a substitute, a Paris programme was transmitted with very good results. The two Governments unhesitatingly placed the telephone systems at the disposal of the B.B.C. for the purpose, but for some unknown reason M. Poincaré did not speak.

ARIEL.

A COMPLETE LOUD-SPEAKER RECEIVER.

By H. J. RODGMAN.

During the long winter evenings amateurs naturally turn to wireless matters with which to occupy their time. Listening-in by oneself is often a boring and monotonous proceeding, and the best way to thoroughly enjoy the broadcast programmes is by means of a loud speaker and a set that will give loud speaker signals without distortion. The set described below will fulfil these requirements.

THE chief requirements that this receiver was designed to meet were, firstly, a reliable means of obtaining the local



Fig. 1. A view of the front of the receiver.

station on a loud speaker, using a minimum number of controls, so that any member of the household who is unacquainted with the mysteries of wireless could readily operate with success, after receiving a few simple instructions. And, secondly it must be of pleasing appearance and finish so that it could very well be installed in and harmonise with the surroundings of a drawing-room.

The receiver is shown in the accompanying photographs from which an idea of the construction can be obtained. It will be seen that the valves and H.T. battery are enclosed in the receiver, and that the various terminals are fitted to the sides of the box, enabling the doors to be locked without disconnecting any wires.

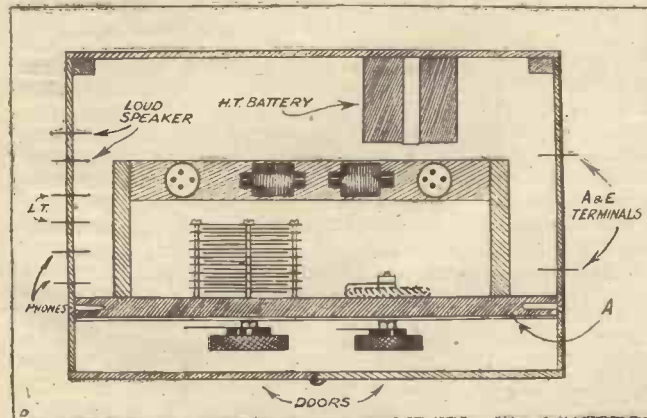


Fig. 2. Showing the lay-out of the components.

Obviously the first step in construction is the making of the box, and this will not be so difficult if the instructions are followed. The kind of wood used is, of course, a matter of choice, but mahogany is preferable because this wood does not want staining, and gives a good finish when it has been plainly varnished. It should be fretwork wood of $\frac{1}{4}$ in. thickness, as this wood is already planed to the correct thickness, and this is a great saving to one who is not an expert carpenter. Also it minimises the number of tools required for making the box.

The Cabinet Work.

The base and cover measures 15 in. by 9 $\frac{1}{2}$ in., allowing an overlap of $\frac{1}{4}$ in. all round, which is rounded with a small plane having a fine cut, and afterwards sand-papered. The two sides, each measuring 8 $\frac{1}{2}$ in. by 10 in., and the back measuring 14 $\frac{1}{2}$ in. by 10 in., are cut and the ends chiselled square. They are then carefully

by $\frac{1}{4}$ in. by $\frac{1}{2}$ in. One is screwed to the base, and the other to the sides, in the positions shown in the sketches. To these strips the panel is screwed. The cover, which is, of course, removable,

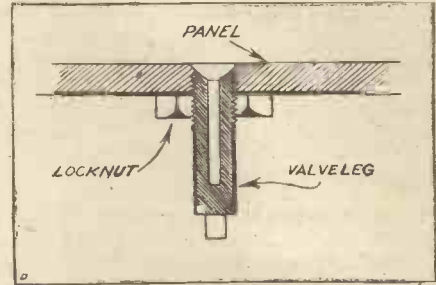


Fig. 4. Method of fixing the valve legs.

is secured to the box by five screws, three of which are screwed to the top strip and the others to the corner blocks.

The complete box is well sand-papered and dusted, and then given a coat of shellac varnish. It will probably be necessary to give it four coats before a pleasing gloss is obtained. Between each coat the box should be rubbed with very fine paper to remove any roughness.

When the box has been varnished, the terminals can be fitted, fixing the A and E terminals to the right-hand side, and the L.T., the 'phones, and the loud-speaker terminals to the left-hand side, in the positions judged from photos, Figs. 1 and 7. In Fig. 1

the lower pair are the L.T. terminals, and the other pairs, the 'phones and loud-speaker terminals respectively. The terminals may be labelled.

(Continued on page 724.)

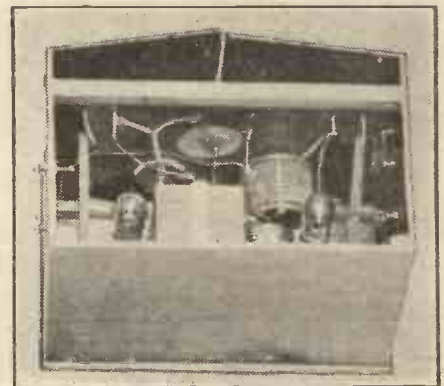


Fig. 5. Interior of the set.

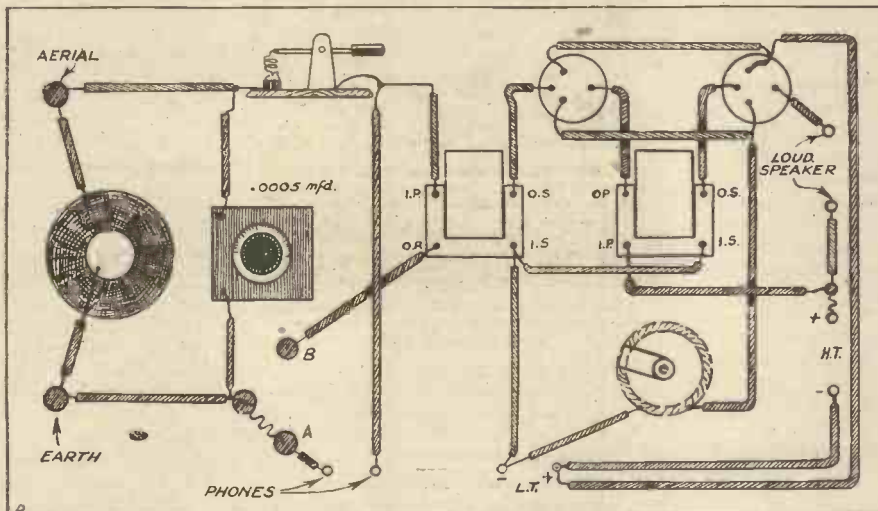


Fig. 3. Full wiring diagram of the set.

nailed together, and the whole nailed to the base, using fine $\frac{1}{4}$ in. nails, and taking care to have $\frac{1}{4}$ in. overlap at the back and sides, and $\frac{1}{2}$ in. at the front, because the doors have yet to be fixed. The box can be strengthened by gluing pieces of wood at the corners. The doors measure 7 $\frac{1}{2}$ in. wide by a bare 10 in. high, so as to avoid any rubbing against the base or cover. To the left-hand door a piece of half-round beading and a lock are fitted.

The strips of wood shown AA in Figs. 6 and 2, and of which one is seen in photo, Fig. 5, measure 14 in.

A COMPLETE LOUD-SPEAKER RECEIVER.

(Continued from page 723.)

The dimensions of the panel are 14 in. by 10 in., and this is squared up to make a good fit into the box. All the necessary holes, including the two for viewing the valves, are drilled in the positions given in Fig. 8. A .0005 mfd. variable condenser, a filament resistance, a crystal detector, and two sets of plugs are fitted to the panel. The plugs are employed in place of switches, the left one for disconnecting the H.T. when the receiver is not in use, and the right one for changing from the ear-phones, when using crystal only, to the loud speaker, when using valves and crystal. The valve legs, which form the plugs, can be fitted in the ordinary way or as shown in Fig. 4, which is certainly the better way. In the latter case, about $\frac{1}{2}$ in. of the legs will have to be screwed, but this will not be difficult as they are usually made of soft brass. The legs will take a $\frac{1}{4}$ in die comfortably, and, of course, the panel will have to be suitably tapped. The valve legs are screwed into the panel and are locked by nuts. The front is then countersunk, as seen in Fig. 4.

An outline of the inside of the instrument can be seen in Figs. 6 and 2, Fig. 6 showing the side view and Fig. 2 the plan. The transformers and valve holders are fitted to a platform secured to the panel by two supports AA. This is clearly seen in Figs. 6 and 2. The supports are cut from $\frac{1}{4}$ in. wood to the shape shown in Fig. 6, and the platform cut from $\frac{3}{8}$ in. ebonite to the sizes 12 in. by $1\frac{1}{2}$ in. The parts are fitted and the whole secured to the panel.

Connecting Up.

The inductance, which is a basket coil, is fitted to a piece of ebonite secured to the panel by one of the detector screws. The coil is made up in the usual way, having 45 turns of No. 28 S.W.G., D.C.C. wire wound on a cardboard former of 3 in. outer diameter and $1\frac{1}{2}$ in. inner diameter, and with nine divisions.

The method of fixing the H.T. battery is seen in Figs. 6 and 2. The base of the battery is held by a piece of wood, and the top

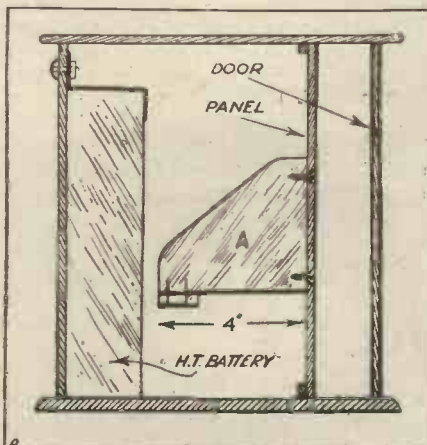


Fig. 6. A side view of the cabinet.

fastened by a brass clip bent into the shape of the battery and held by a small nut and bolt.

The next operation is that of connecting up. The connections are given in Fig. 3. Fairly thick wire, say No. 20 S.W.G., should be used for connections, and covered with systoflex, or any other protective covering. As the connections are numerous, which would make it difficult to trace a loose wire, and as any scraping sound caused by a loose wire would, in this case, be amplified considerably, all the connections should be soldered. There can then be no fear of trouble through loose wires.

To operate, obtain the station as loud as possible on the ear-phones, by varying the

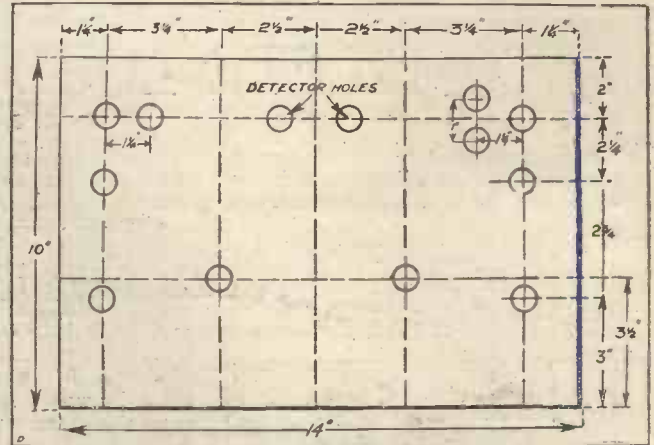


Fig. 8. Panel dimensions.

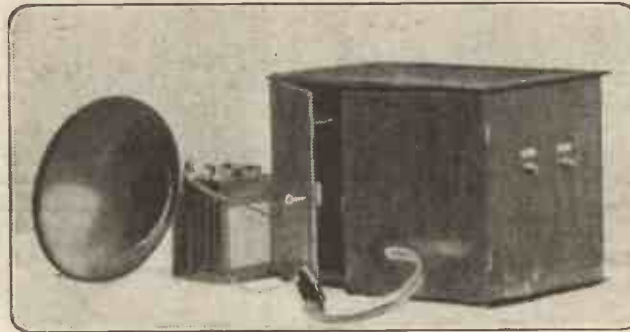


Fig. 7. The receiver in use with a loud speaker.

condenser and adjusting the crystal for maximum strength, and then switch over to the loud speaker by pulling the plug from socket A, in Fig. 3, and inserting it into the socket B.

If there is any tendency to oscillation, the iron cores of the transformers may be joined together and connected either to earth or to the positive of the H.T. battery. This receiver will, of course, bring in the local station on a loud speaker with ease, by one who is even inexperienced in manipulating wireless instruments.

It is not a long range receiver and no claims are made that it is capable of distant work even on 'phones.

CRYSTAL REVIVERS.

Some details about the various means of rejuvenating your crystals.

THE so-called "crystal reviver" is one of the very latest additions to the numerous host of wireless accessories which have been put on the market during the last few months. Without a doubt, its arrival is the outcome of the enormous popularity with which crystal receiving sets have been received by the general public, and, in many respects, the commercial production of the various brands of crystal revivers is symbolical of the transient sensitivity of many of the galena-"ites."

Undue Handling.

Of course, some types of crystallised galena often become insensitive through no intrinsic fault of their own. Careless handling of the crystal is a very common cause of unsatisfactory rectification with a good set. Every time a crystal is picked up with the fingers a minute deposit of the natural grease and oil of the hands is deposited until it attains sufficient proportions to offer a great deal of resistance to the current which passes through it, and consequently the signal strength which is produced by the set very much decreases.

Generally speaking, most of the crystal revivers which are at present on the market consist of certain organic solvents which dissolve away the accumulated grease from the crystal, and enable its originally

clean and fresh surface to be once more attained. Many solvents can be used for this purpose. Pure alcohol, rectified spirits, ether, acetone, benzene, and even high-grade petrol are all very suitable for the preparation of crystal revivers.

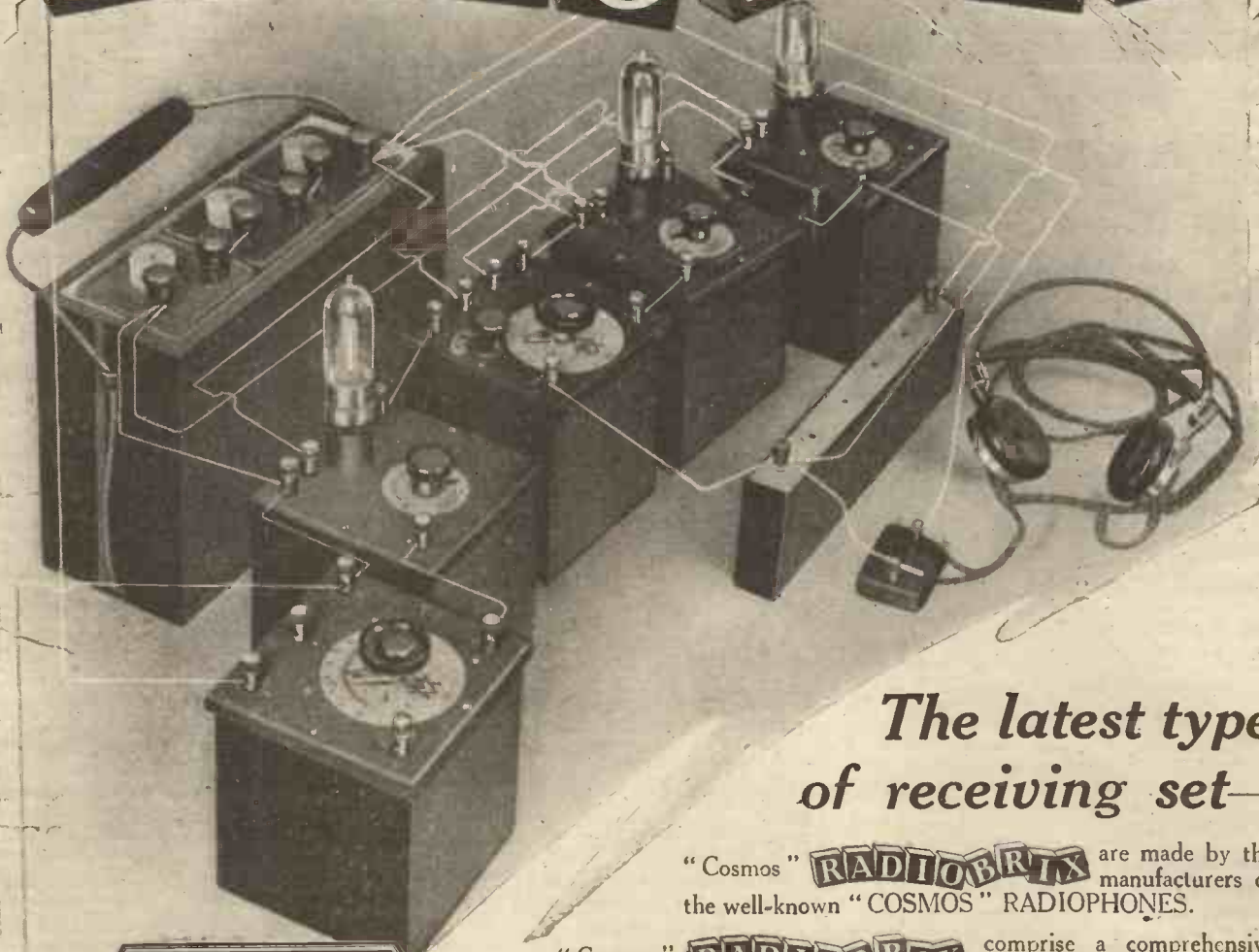
Can Be Dangerous.

A mixture of equal quantities of alcohol and ether, to which has been added one or two drops of strong ammonia, constitutes a good cleansing fluid for rectifying crystals, as also does a mixture of 2 parts of petrol and 1 of ether.

It is almost unnecessary to remark on the fact that all these solvents are very highly inflammable, and consequently that the operation of cleaning a crystal by rubbing it with a camel-hair brush which has been dipped into the solvent, ought to be performed at a respectable distance from a naked light or a fire.

Whether the grease removal action of the crystal revivers brings about any permanent return of the lost sensitivity of a crystal is a matter of opinion, and also for experience. Personally, the writer prefers the more prosaic method of chipping away the insensitive parts of his crystals when the rectification becomes unsatisfactory, but there is no doubt that if a crystal has been subjected to a good deal of handling, or if it has become covered with a layer of dust and grime, the cautious application of a little of a crystal reviving solution together with a subsequent careful chipping away of the insensitive portions of the crystal will do much to restore to it a good measure of its lost sensitivity.

RADIOBRIX



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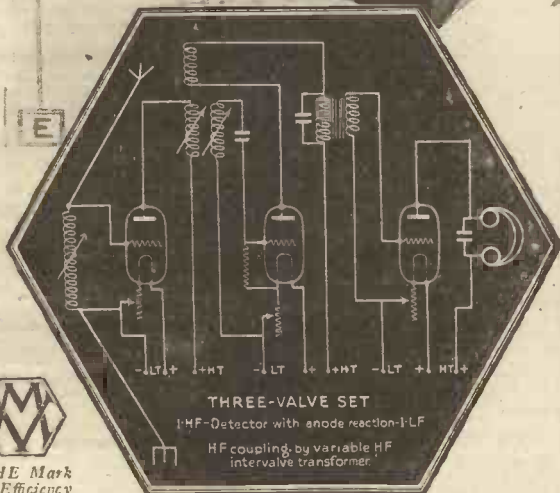
“Cosmos” **RADIOBRIX** are made by the manufacturers of the well-known “COSMOS” **RADIOPHONES**.

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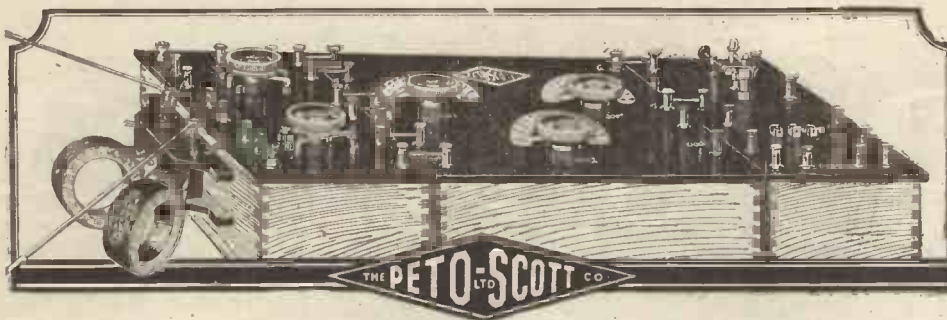
The above illustration and diagram shows a three-valve set made up with **RADIOBRIX**. Get a copy of the new book, “**BUILDING WITH RADIOBRIX**,” full of useful circuits, with theoretical and wiring diagrams. Obtainable everywhere, 1/- (or post free, 1/5)

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A super-efficient Tuner, with series-parallel and stand-by—tune control. Complete with three-coil holder, as shown. Full set of parts .. 24/6
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MANY thousands of amateurs have found that the most economical and sensible method of starting Wireless is to begin with the famous Peto-Scott Standardised Unit System. The reasons for its immense popularity are obvious.

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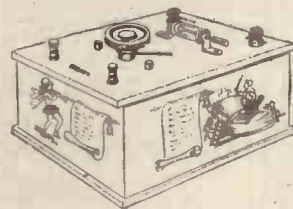
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Complete set of parts and full instructions. All machine work and polishing already completed .. 27/6

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For the first fifty orders received we will assemble the Frame aerial in our own workshops without extra charge. Send to-day.



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Well designed, solidly constructed and finished in a superior manner. Fitted with long handle. For panel mounting can be used in either vertical or horizontal position .. 7/6

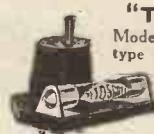
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Highly efficient Coils at a moderate price.

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No. 8 3,000-4,050 ..	7/-



HOW WE RELAYED U.S. BROADCASTING.

By Captain A. G. D. WEST, B.A., B.Sc.
(Assistant Chief Engineer of the B.B.C.)

In the following article, exclusively written for "Popular Wireless" by the Engineer of the British Broadcasting Co. in charge of the Relay Experiments, readers will find a deeply interesting account of how broadcasting from KDKA and other stations was received at the Biggin Hill listening post, and relayed by the B.B.C. stations to British listeners.—THE EDITOR.

THE recent tests of transmission between England and America, carried out by the British Broadcasting Co., and the chief broadcasting stations of America, show that it is possible for any set in the British Isles of three or more valves to pick up, under favourable conditions, transmission from the other side of the Atlantic. They necessitated, however, sitting up into the early hours of the morning, but patience in this matter was sure of its reward.

Originally the idea of the British Broadcasting Co. was to transmit some sort of programme from the American stations as soon as possible after these transatlantic tests, but we had to consider carefully what methods should be adopted to obtain suitable results.

Now there are two types of broadcasting being done in America. Firstly, that by the main stations, on wave-lengths between 300 and 500 metres—similar stations, in fact, to those in our own country. Secondly, there are a few stations operating on wave-lengths round about 100 metres, among which KDKA, East Pittsburg, Pennsylvania, is the most notable.

Low Wave-Length.

The Westinghouse Electric Co. of America started experiments on short-wave transmission in about June of last year, having found that for some reason, yet unexplained, these short wave-lengths carried farther than the longer waves between 300 and 500 metres. They found, for instance, that in Cleveland, Ohio, which was more or less a blind spot for the reception of the normal broadcast, fairly good results were obtained on the shorter wave-length. Cleveland is only 120 miles from Pittsburg, but this result seems to follow in the case of trans-oceanic transmission.

In experiments which I made in listening-in on various sets to transmissions from various stations in the United States and Canada, I was surprised to find that the shorter wave-length transmissions had very many distinct advantages over the longer wave-length transmissions, especially when considered from the point of view of relaying.

On the normal waves there is a considerable amount of jamming by badly tuned spark stations; fading of signals is very

apparent; atmospheric may be extremely violent, and, above all, there is continual mush from the harmonics of certain high-power continuous-wave stations in this country. Then, of course, all over the country others are trying to listen in to America, with the result that the ether is filled with a medley of howls and oscillations. It thus follows that in listening on the short wave-lengths, where there is practically no jamming, atmospheric are less, there is practically no mush, and, above all, local oscillators did not exist, better results will be obtained. I say *did* and not *do*, because this wave-length of 100 metres is no longer free from these oscillation troubles—in fact, on the second night of our recent tests, directly after we closed down, KDKA was swamped out by local howlers who had read in the papers of the wave-length on which we received that station. Another example of the fact that certain members of the "criminal profession" are not lacking in smartness.

Fading.

The oscillations set up by receiving sets on these short waves seem to travel over miles and miles. I thought I was at least six miles from the nearest aerial when I was out at Biggin Hill, and imagined that there I should be quite clear of such troubles, but it was not so.

I decided, therefore, to make the first relaying attempts on the short wave-length, and as transmission conditions were so variable—i.e. on one night very strong signals would be obtained and the following night practically no signals at all, it was necessary to listen in night after night until a suitable state of the atmosphere occurred and then to relay it without previous notice. This latter, of course, must be distinguished from periodic fading, which is experienced on the longer wave-lengths. It is merely a matter of atmospheric conditions. One night will be good throughout, another night will be bad; sometimes there will be a sudden change during the night.

The Pittsburg station, however, has been received pretty regularly without too much variation in strength from night to night, using, of course, suitable apparatus for the purpose. The only real disadvantage that appears on this short wave-length is that of night distortion of speech and music. It is the result of slight variations in the wave-length of the transmitter. For instance, in the case of speech, one moment it may be quite intelligible and the next moment quite unintelligible. Sometimes music, as it were, falls to pieces. You get just the same sort of effect as when you have a loose contact in the telephone leads. This defect in the transmission can be overcome by the use

of a master oscillator, which maintains absolutely constant the frequency of the oscillations generated in the transmitter.

I will now describe the conditions at the receiving end. The site at Biggin Hill was chosen because it appeared to be one of the loneliest spots near London, so as to be as clear as possible from the oscillations of receiving sets. Perhaps memories of War days might have been a further reason for returning to this haunt. We had, additionally, the further facilities of having direct overhead lines to London suitable for carrying music without distortion.

Details of Receiver.

I am very grateful to the authorities at the Air Ministry for giving me, at a moment's notice, every possible facility and accommodation for my apparatus, and for making suitable arrangements. They placed at my disposal an aerial specially designed for short wave-lengths, about 45 ft. high and 30 ft. long, being of the T cage type. I could use either a counterpoise or an earth connection. After making experiments with various types of circuits, including simple reaction circuits, super-heterodyne, and a high-frequency amplifier, I decided on the latter as being most suitable for our purpose.

The amplifier has six high-frequency valves and one detector valve. It is of the well-known transformer-coupled type, mounted in a tin box for screening purposes. There is a capacity reaction for bringing up strength, the set being perfectly stable. This amplifier was very loosely coupled to the aerial circuit, which was made aperiodic to avoid any possible changes of wave-length due to swaying of the aerial, and this was a very wise precaution, because up at Biggin Hill, which is the highest point in Kent, the wind does know how to blow when it feels inclined. This was brought emphatically to our notice one evening by the crashing of one of the aerial masts, but it did not take us long to re-erect it.

For low-frequency amplification I used a two-valve set, which gave sufficient strength of music and speech to transmit over the telephone lines to 2 L O. The set necessitated very careful tuning adjustments, so that long handles had to be fixed on the small capacity tuning condensers, and even when KDKA was picked up it was necessary to keep on adjusting all the time to keep in tune with the transmission.

The programmes had to be taken as they came, and it was fortunate that they proved to be suitable for relaying purposes. The American station did not increase its power at all for these tests, and it is very remarkable that this transmission was got over so well in view of the fact that the power used there is considerably less than that of any of the British stations.

The success of the experiment, however, was not merely due to that of picking up and relaying signals to 2 L O. It was made also more remarkable by our being able to make use of previous developments of the Broadcasting Co., notably the perfection of simultaneous broadcasting arrangements, so that the result of the experiments could be heard all over Great Britain.

In this way we are undoubtedly ahead of American broadcasting, which has so far not attempted or achieved any similar result—a fact of which we, as a nation, can be very proud.



Capt. A. G. D. West,
Assistant Chief Engineer
of the B.B.C.

ADVENTURES AT BIGGIN HILL.

By "ARIEL."

Throughout the tests at Biggin Hill, "Ariel" of "Popular Wireless" was assisting Captain West and Mr. Honri. "Ariel" was the only journalist permitted to be present, and the following breezy account of his adventures will make interesting reading.

LITTLE is known of the set and the work which made it possible for the B.B.C. to rebroadcast American programmes. I was one of the three who helped in these fascinating experiments, and invariably it was not until the early hours of the morning that I left the stone hut, on the bleak north downs at Biggin Hill. In fact, during the whole of the Christmas week I had only five hours' sleep, and Captain West had even less!

Captain A. D. G. West, the Assistant Chief Engineer of the B.B.C., who was in charge, and Mr. B. Honri, his assistant, who has had personal experience of American broadcasting (having worked in U.S.A. with some of the large stations there), were solely responsible for the receiving apparatus.

Every night we were driven to the old Army hut, a cold, miserable stone room of about 12 ft. by 33 ft., with nothing to warn us except a paraffin stove. It was here we carried out the experiments. It was necessary to keep the exact location of the place a secret for several reasons, and it was very fortunate that the Air Ministry were able to assist us in this respect by allowing us the use of the hut, which is equipped with a telephone.

On Monday evening we received K D K A with good volume, but atmospherics were louder than the music; but as a matter of interest it was broadcast to listeners. However, we did not lose heart, but carried on, and another attempt was made on Thursday. We entered the hut at about six o'clock, and the first thing Captain West did was to see if there were any atmospherics about. This he did by switching on the nine-valve receiver, which is the set we used to get America.

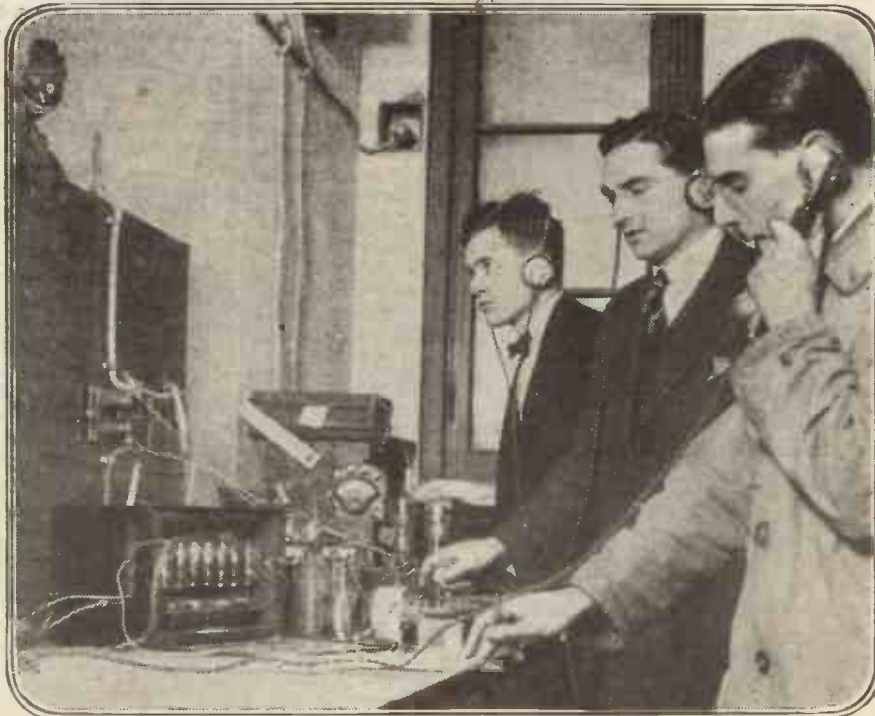
Bad Luck.

"Not an X!" he exclaimed. "Quick! Have a look at the aerial, 'Ariel' (!) You, Honri, run to the 'phone and connect up the land line!"

We both quickly obeyed him. I ran outside to see if the aerial was O.K.; it is a 60 ft. steel mast with an 80 ft. cage aerial, and counterpoise earth. I started to pull

up one of the slack guy ropes, and the peg pulled out, with the result that the 60 ft. pole wavered a little and fell. I rushed to try and save it from the glass window of our hut, which it luckily missed, and fell within two inches of my head, the nearest escape I have ever experienced.

The noise brought Captain West and Mr. Honri to my rescue, and with great difficulty the three of us re-erected the aerial;



Capt. West (centre) tunes in an American station, while "Ariel" (left of Capt. West) passes instructions to the "other end" by 'phone.

but how we did it in the dark is still a mystery to us.

At about 11.10 we heard K D K A very distinctly, and without any atmospherics or trouble. With feverish haste I rang up 2 I.O and told the engineers that we were going to relay K D K A through, and asked them to make an announcement. But, alas! before I had finished talking to the announcer K D K A, the Westinghouse station at East Pittsburgh, closed down, or in the American term, "Signed off." And it would be difficult to imagine our disappointment.

However, we decided to try again, and on Friday night we once more visited the cold hut, and connected the nine-valve set up, using six H.F. and two L.F. on a Marconi Type 55 B amplifier. At about 11.30 we got results, but the atmospherics were very bad, and Honri, who was inclined to be a little superstitious, advised us to close down, as Friday was an unlucky

day! But we cried him down and decided to try again.

We notified London, and the programme was sent over at a minute past twelve. The results were much better, as the atmospheric trouble had been reduced. It was necessary for Captain West to put his hand near the reaction to give more selective tuning. Honri again remarked that Friday was unlucky, but now that it was Saturday the results were better!

Success at Last.

The first item to come through was the "Song at Twilight," followed by an overture, "Oberon." Towards the end of K D K A's programme they made a long announcement which was clearly received. This surprised us, inasmuch as this was the first time American broadcasting had been successfully relayed, and they were not aware of our experimental work or what we were doing.

They signed off at one o'clock, after asking all listeners to write a report of their programme. We shook hands with one another, and in this hut Honri and myself gave Captain West three hearty cheers. Before he had time to reply, the 'phone bell rang, and Captain Ekersley, the Chief Engineer of the Company, gave us hearty congratulations.

At three o'clock in the morning three exhausted but happy men were seen walking across the downs to the roadway, where a car was waiting to take them to their homes, having accomplished what experts thought impossible—the reception of K D K A, one of the smallest power stations in America, transmitting on a 100 metre wave-length.

I heard later that on the first night of our attempts, Captain Ekersley was so annoyed that "X's" had beaten us that he smashed his loud speaker, threw the valves out of the window, and the set into his cellar. But when we *did* succeed, he spent the night listening on his neighbour's set.

A movement is now on foot to subscribe for a new crystal set for Captain P. P. (of the silent staff).

But the experiments made at Biggin Hill have taught us many valuable things about long-distance reception, and the tests will certainly be repeated, while, though atmospherics occasionally be troublesome, it is probable that the reception and retransmission of American broadcasting will become increasingly better and in the near future may form a recognised portion of some of the evening programmes.

The science of wireless is young yet, but this year will see great strides made in its progress.

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FOR BROADCASTING.

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GRAND OPERA on a Loud Speaker with **Incomparable Purity.**

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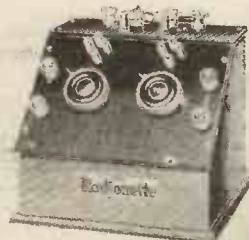
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It is as distinctive in appearance as it is exclusive in

operation. No terminals; enclosed valves. **Range.** All British Broadcasting Stations **Power.** Equal to a 4-valve Receiver, and will efficiently operate Loud Speaker at 40 miles, or with any indoor aerial at 20 miles from station

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The Radio-Structa Hook-up shown in mahogany tray with removable bottom to facilitate connections. May be wired to any circuit in a few minutes

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For 2 valves	-	£4 10 0
" 3 "	-	£6 10 0
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INSULATING SLEEVING.
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Valve Holders .. 1/- each
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Guaranteed wound with Eureka Wire 1/6 each on Ebonite Former. 5 ohms.

THE SIMPLEX RADIO CHART
reduces the wiring of the most complicated circuit to a mere mechanical operation. High frequency, tuned anode coupling with intervalve re-action for 2, 3 or 4 valves.
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CURTIS Intervalve Transformers
Maximum Power and **NO DISTORTION**
The only Transformers that work in pairs without howling.
15/- each.

WHAT IS ELECTRICITY?

By P. J. RISDON, F.R.S.A.

In this, the concluding portion of the article which appeared in "P.W." No. 82, Mr. Risdon explains how the emission and flow of free electrons in a metal conductor facilitate the flow of an electric current, and the theory underlying the rectification of oscillating currents by crystal detectors.

WE have now to consider a further phenomenon for which a full explanation has yet to be found. It is that in metals (which are electro-positive) there appear to be large numbers of electrons free to move about through and between the atoms of the metal. Under ordinary conditions of temperature, etc., probably comparatively few of these free electrons escape from the surface, but the slightest rise in temperature causes quite a serious disturbance amongst them.

If the temperature of, say, a copper wire be increased, molecular and electronic activity increases also until, at a sufficiently high temperature, perfect pandemonium reigns, the free electrons making their way to the surface and creating, as it were, a seething atmosphere of themselves around the metal. It is almost analogous to the case of water vapour in contact with the water from which it escapes, but with the difference that the electrons tend to return to the metal and to perform a wild up and down dance all round it.

If the wire be evenly heated throughout its length, there is no greater tendency for the electrons to move, as a whole, in one direction *along* it than another, consequently they do not give rise to an electric current.

Cause of an Electric Current.

If, however, the wire be only heated for a portion of its length, a rush of electrons takes place from the hot to the cold portion, until the temperature is equal throughout; this results in what we call conduction of heat by a metal.

It is common knowledge that when a current of electricity passes through a wire, no matter how small the current may be, the temperature of the wire rises—however small and inappreciable the rise may be. What happens is that when the electric field is applied—i.e. when the wire is subjected to a difference of potential by connecting the ends to a battery or other source of electric supply—the free electrons in and around the wire proceed in a stream in the opposite direction to that of the electric field, and thus function in the same manner as the gaseous ions described in the first part of this article.

The application of the electric field has much the same sort of effect upon the electrons as the dinner hour hooter has upon thousands of men in a big works—they all set off at high speed in the same direction.

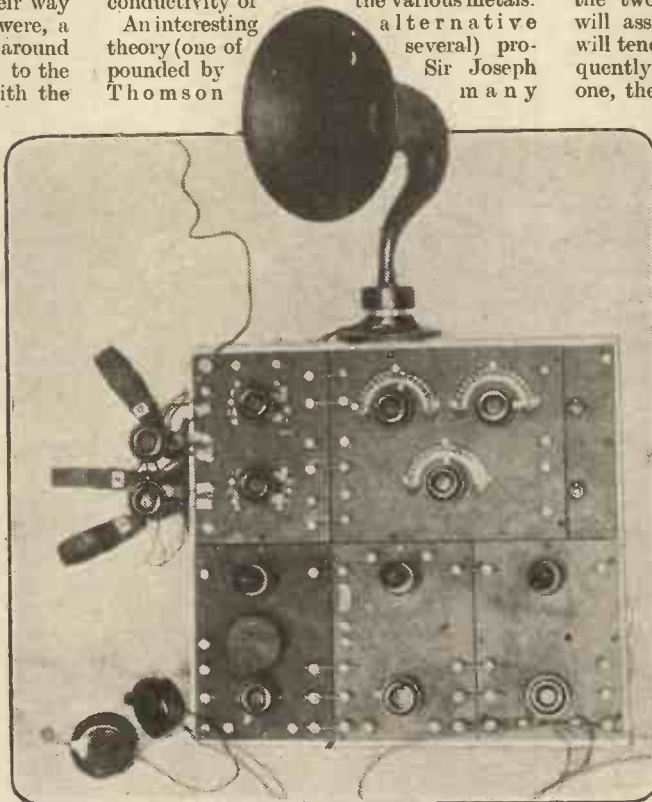
When we consider the velocity of electrons, and that they must sustain countless collisions in their passage, and then think of their changing direction hundreds of thou-

sands of times a second under the influence of an alternating current of high frequency, their trials and tribulations must be somewhat severe.

It must be remembered that this flow of electrons does not necessarily imply the movement of atoms which, for our purpose, may be regarded as fixed, or even the displacement of the electrons comprised in the atoms.

It should also be borne in mind that the correctness of this theory depends, not merely upon such definite data as electric conduction through gases, but upon the satisfactory manner in which its application bears out what is already known about the conductivity of the various metals.

An interesting alternative theory (one of several) propounded by Sir Joseph Thomson in a n y



The neat 3-valve unit set assembled by Mr. R. E. Inns, Treverlyn, Cambridge Road, Wanstead, E.11.

years ago, when the theory of atomic structure was in its infancy, was that the atoms become polarised under the electric field so that they arrange themselves with the positive electrons of one atom facing the negative electrons of the next, and so on, the idea being that the flow of electrons takes place by an interchange between the atoms. That is to say, that an electron leaves one atom and lodges in another from which another electron detaches itself and passes on to the next, and so on. This theory, however, is not in harmony with the more modern view of atomic structure. Nevertheless, it cannot be said definitely, as yet, to

what extent really free electrons in matter exist.

Readers who have carefully followed what has already been stated should have no difficulty in understanding the following theory as to how crystals, used in ordinary crystal receiving sets, rectify the incoming current from their aerials.

The number of electrons—say per cubic millimetre—varies with different metals. Consequently, if two dissimilar metals be brought into contact, there will be a flow of electrons from one to the other until a certain permanent potential difference is established between the two metals. If then an electric current be passed through the two metals, this potential difference will assist the flow in one direction, but will tend to retard it in another. Consequently, if the current be an alternating one, there will be a tendency to assist the impulses in one direction and to oppose those in the opposite direction.

Crystal Rectification.

The effect of such a junction of dissimilar metals somewhat resembles that of the thermionic valve in which an oscillating current can be retarded in one direction and assisted in the other. An important difference, however, is that, whereas in the thermionic valve we can apply any degree of retarding potential we please, in the case of a given crystal the retarding influence is a constant quantity.

In carborundum crystals for wireless receivers it is necessary to introduce a metal plate to provide a contact of dissimilar metals, but in the case of many crystals used in wireless receivers this is unnecessary because they are really alloys of different metals. The dissimilar metals, in cooling, crystallise and form microscopic points of contact, for it must be remembered that an alloy is a mechanical mixture—not a chemical combination.

It is unlikely that a complete stoppage of the impulses in one direction of the oscillating current is effected. The presumption is that those in one direction, being impeded, and those in the opposite direction assisted, there results what, for practical purposes, amounts to a direct current.

Should the cat's whisker happen to make contact at such a point that the current is not compelled to traverse a junction between different crystals but finds a path through crystals of the same kind in contact, no rectification occurs, and we then have to find what is commonly known as a more "sensitive" spot.

EFFICIENCY IN BROADCAST RECEPTION.

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

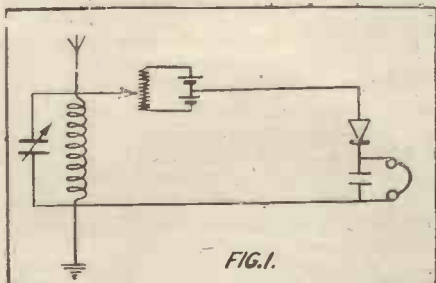
Some useful details concerning the various forms of detectors that are used in the modern wireless set.

THERE are three points to be considered in choosing a crystal rectifier—i.e. those crystals which excel in the virtues of reliability, sensitivity and simplicity. This latter point crops up because many of the best combinations are most effective when a small current is applied to them from an outside source, and it is a curious fact that reliability and sensitivity work better with the addition of this applied current. In most broadcasting receivers, apparently for the sake of cheapness and simplicity, no provision is made for this applied current, but if the reader knew of the results it is possible to obtain with its addition I am convinced that listeners who use crystal rectification would demand the addition of this small refinement.

A Well-Tried Detector.

Undoubtedly the most reliable crystal detector is provided by a piece of carborundum resting on a steel plate. Thousands of such rectifiers were in use during the war, but in the broadcasting receiver it is chiefly conspicuous by its absence owing to the necessity of an applied current. It would take a young elephant dancing in the room to throw this crystal out of adjustment, but sensitive pieces of carborundum are not easily obtained, and if the reader decides to try such a combination he should purchase from a firm who specialises in wireless crystals rather than one of those wonderful emporiums who stock everything wireless, from a cat's-whisker to an Umpty valve cabinet receiver at prices a little less than anyone else.

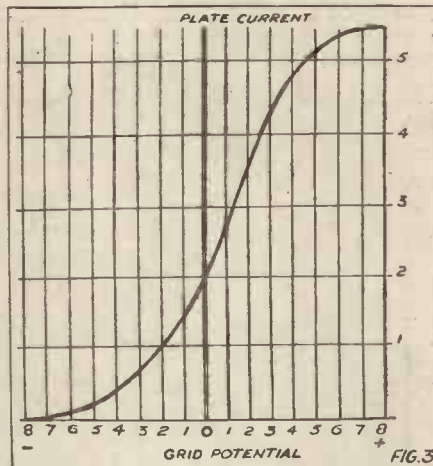
Another excellent combination, slightly more sensitive, but not quite so reliable, is that of a tellurium point pressing on a zincite crystal. Here again an applied current is distinctly of advantage, as it is also to another zincite crystal combination, namely zincite-bornite. In using either of these combinations, a two cup holder must be used, and for preference it should have a universal adjustment and a vernier adjustment for pressure.



Of those crystal rectifiers which do not require an applied current the writer is inclined to favour a gold cat's-whisker on a treated galena crystal. Treated galena is sold under various names, generally ending

with "ite," and each, judging by the advertisers' claims, surpassing each other in sensitivity. There is little to choose between them and practically all are produced by the same process. Another good "cat's-whisker" type of crystal is silicon, but few of the "cat's-whisker" combinations are really suitable for broadcast reception owing to the fact that the contact is light and small and they are very easily thrown out of adjustment.

With regard to the method of applying a steady current to the crystal detector, a suitable circuit is given in diagram 1. The source of the current in the case of carbor-



undum should be a three-volt dry battery, and it is necessary to arrange a switch for disconnecting this battery when the set is not in use, in order to prevent it from running down through constantly discharging itself through the potentiometer. In the case of a zincite-bornite or tellurium combination a one-volt dry cell will be sufficient.

The Thermionic Valve.

A simple potentiometer can be very simply made by the method shown in the sketch Fig. 2, which should be self-explanatory, a hard pencil being used.

When making a crystal set, the following precautions must be observed if success is to be obtained. The insulation must be high quality ebonite, with the exception of former, which may be made from waxed or shellacked strawboard. All sliding or other contacts must be spotlessly clean and bright and quite free from shellac. The crystals must not be handled more than is absolutely necessary, and if they are to be mounted in Wood's metal great care must be taken to avoid getting them too hot.

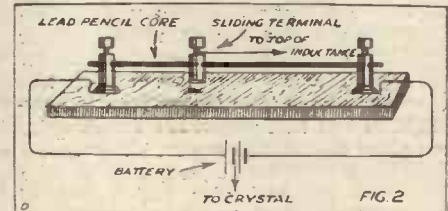
The other detector which is in use to-day is the valve detector, and nowadays it is

always the three-electrode valve that is used.

If we look at the curve in Fig. 3 we find that if we make the grid of the valve sufficiently negative, say, by putting a potential on it of three volts, then the grid is made, say, a further two volts negative by the incoming signal. The change in the plate circuit is negligible.

Valve Receivers.

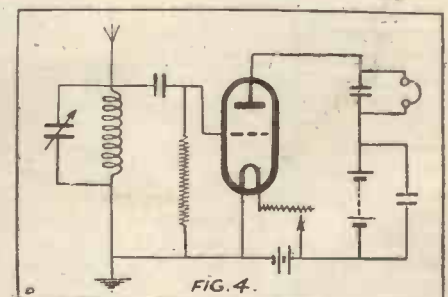
When, however, the incoming signal on the alternation makes the grid two volts positive, there is a very big change in the plate circuit, and in this way we make the valve act as a rectifier of the alternating

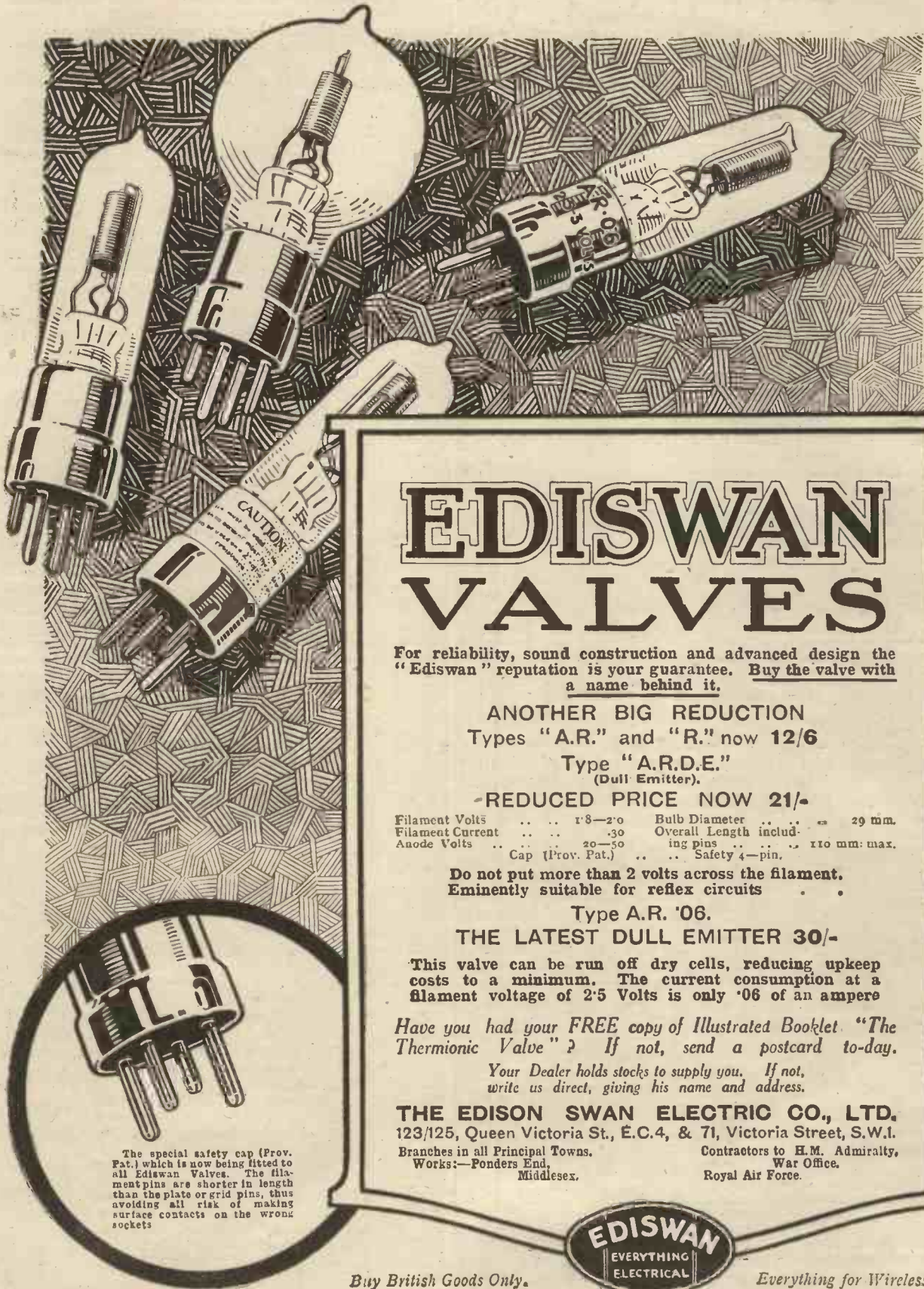


incoming current. With many types of valves, quite a little extra negative potential on the grid is sufficient to make it work on the right point of the curve, but in modern practice it is more usual to keep the grid negative by the use of a condenser in the grid circuit, and this condenser is short-circuited, as it were, by a very high-resistance grid leak. The capacity of the condenser can be anything between .00015 and .00035 mfd., but different valves work best with different values of resistances or grid leaks, as they are more commonly called. It is, therefore, quite a good plan to use a variable leak, but for the most ordinary purposes a leak of about 1½ meg. will be found suitable. Using a single valve detector for the reception of broadcasting, reaction should not be used, so that the circuit available becomes that shown in the accompanying diagram, Fig. 4. Without the use of reaction they give little better results than a crystal set, although they are certainly more reliable, but if valves are to be used in the set at all, it is much better to start straight away on a two-valve set in which reaction may be used, and the range will be more than ten times that of the single valve.

For use as a detector in a single-valve set, what is known as a soft valve should preferably be chosen. Special valves are made for this purpose by most of the leading makers.

Keeping in view economy as well as efficiency, perhaps a combination of both crystal and valve makes the most suitable form of set for the reception of broadcasting, very good results being obtained with the minimum of cost in upkeep.





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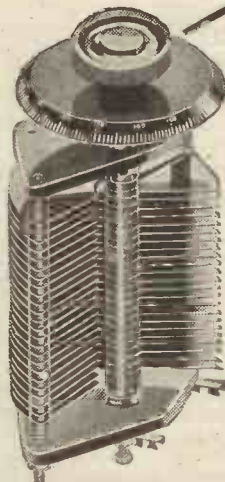
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THE CONSTRUCTION OF A HIGH-CLASS LOUD SPEAKER.

A loud speaker is always a useful adjunct to any valve set, more especially in view of the fact that low-frequency amplification has been so greatly improved that no distortion need exist if it is handled properly. The loud speaker described below will give very clear results with comparatively small strength of signals.

THERE are many amateurs who, although they have constructed their own receivers, have never completed their installations by the addition of a loud speaker. The many commercial instruments on the market, although giving excellent results, are rather expensive and generally require considerable power for satisfactory operation. The quality of reproduction obtained with a small horn attached to an ordinary telephone receiver usually leaves much to be desired, whilst the construction of a really satisfactory instrument seems at first sight to be rather beyond the powers of the average amateur.

Adapting the Ear-piece.

Below will be found a complete description of an efficient loud speaker: which can be easily and cheaply constructed at home, and which will give a very satisfactory tone of reproduction. It has the additional advantage that it will operate with considerably less than the current required by most commercial types, and it will, in fact, usually give quite good results with only a single stage of low-frequency amplification. This enables the cost of the amplifier to be reduced, whilst the less the number of stages in the low-frequency amplifier the better will be the quality of reproduction.

In this instrument the receiver is mounted at the focus of a non-metallic reflector which reflects the sound waves in a parallel direction, the principle being the same as that utilised to obtain the powerful beam of light from car head-lights.

Let us deal first of all with the receiver itself. It is desirable to use one in which the distance of the diaphragm from pole-faces of the magnet is adjustable, as the maximum volume of sound from a given current input is then obtainable. A standard Brown's telephone ear-piece is quite suitable, whilst very good results are obtained from an ordinary non-adjustable ear-piece which has been modified in the following manner. The ebonite cover of the ear-piece is unscrewed and the "Stalloy" diaphragm removed. A mica diaphragm of the same diameter is then cut from a sheet of mica about 0.015 in. thick (that used for the

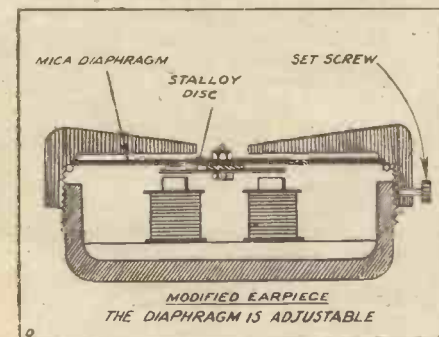


Fig. 1.

windows of anthracite stoves being quite suitable), and a small hole is drilled in the centre, care being taken to avoid splitting the mica.

From the old "Stalloy" diaphragm we next cut a small disc just large enough to cover the two pole-pieces of the magnet, a small hole being drilled in the centre. Two thin brass washers about 1/2 in. in diameter and a very small nut and bolt complete our requirements, the latter being most easily obtained from a watchmaker. The new diaphragm is assembled in the following way. The small Stalloy disc is threaded on the bolt, followed by one of the brass washers,

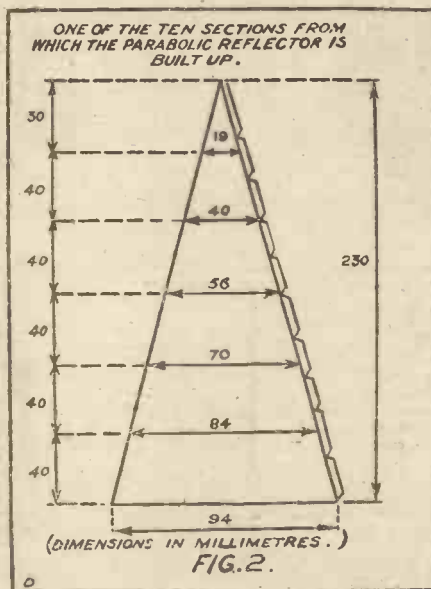
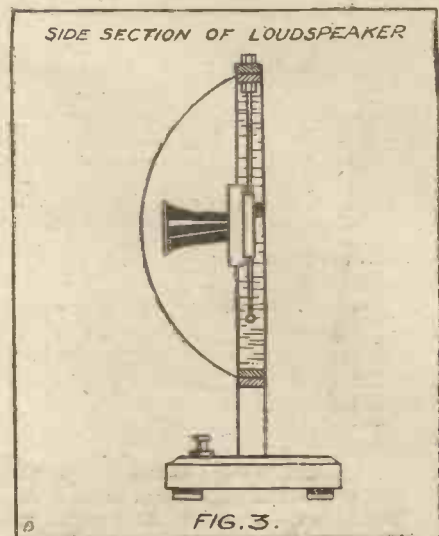


FIG. 2.

the mica diaphragm and the other washers are then threaded on and the nut is screwed on and tightened up. (See Fig. 1.)

Fixing the Diaphragm.

The projecting end of the bolt should then be filed off flat with the face of the nut and a small spot of solder may be applied to prevent the nut from working loose. We have thus a diaphragm of which only a small part is of metal and a very good tone will be obtained, free from the unpleasant effect which is sometimes experienced with small metal diaphragms. As the mica diaphragm is much less stiff than the metal one, it will require a smaller force to produce a given deflection, so that the receiver will operate with a smaller input current. We now proceed to mount the diaphragm in such a manner that the distance from the pole-faces may be adjusted. A thin paper ring is placed in the ebonite cover of the receiver and the mica diaphragm is placed on it with the small metal disc uppermost. Another

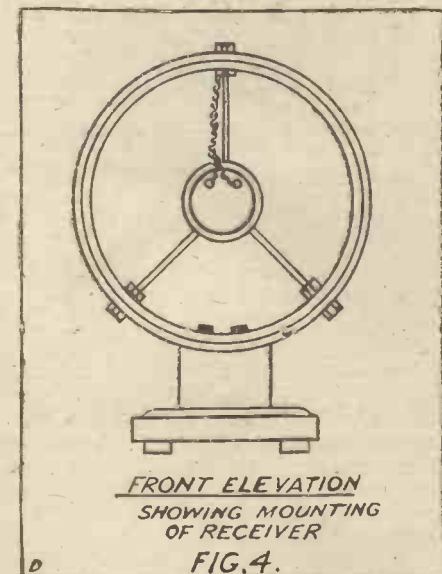


paper ring is placed on the diaphragm and the latter is then fixed tightly in the cover by means of a piece of stiff iron wire bent into a ring. This wire should be about 1/8 in. in diameter, and should be sufficiently stiff to press tightly against the side of the cover so that the diaphragm is rigidly gripped between the ring and the shoulder of the cover.

Parabolic Reflector.

This condition is most important, as it is essential that the diaphragm be tightly fixed all round the edge. The cover is then screwed back on the ear-piece, the distance of the diaphragm from the pole-faces being now adjustable by screwing the cover further on the ear-piece. The best results are obtained when the diaphragm is as close as possible to the pole-faces of the magnet without being so close that it strikes the latter as it vibrates. The adjustment is made in practice by screwing the cover on until the diaphragm drops on to the magnet with a sharp click. The cover is then screwed slowly back until the diaphragm falls away from the magnet with a muffled sound. The cover may be fixed in this position by a small set screw if desired. (See Fig. 1.)

(Continued on page 736.)



FRONT ELEVATION SHOWING MOUNTING OF RECEIVER FIG. 4.

LISTENING-IN WITH THE TEETH.

An interesting description of a new invention for assisting persons with imperfect hearing.

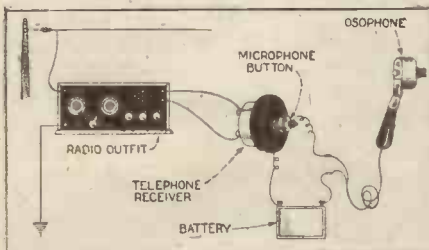
SOUND waves have long been known to be transmitted through the bones of the skull to the auditory nerve and thus to be readily perceived. An ingenious use of this phenomenon has now been made by an American physicist, Mr. H. Gernsback, of New York, in designing an apparatus by means of which those hard of hearing not only can carry on a conversation, but enjoy the benefits of wireless communication.

This apparatus, or Osophone as it is called, comprises two electro-magnets carried by flexible soft iron laminations and inserted into the circuit of a 6-volt battery and a microphone transmitter. Two hard rubber bit pieces mounted on the (soft iron) pole tips are taken between the teeth and serve to transmit the oscillations of the pole tips (moving to and fro as the Osophone is in operation) to the skull and thence to the auditory nerve. If the latter functions at all, though the diaphragm be partly or entirely destroyed, the Osophone will render hearing possible.

Application to Wireless.

The Osophone may as well be connected up to a phonograph, a telephone or a wireless receiver. In the latter case, an ordinary 1000-ohm telephone receiver has mounted in the centre of its diaphragm an ordinary microphone button. The resistance of the Osophone is only about $5\frac{1}{2}$ ohms and, accordingly, allows powerful currents to pass. Any sound coming through the telephone receiver will operate the microphone, which in turn acts upon the Osophone.

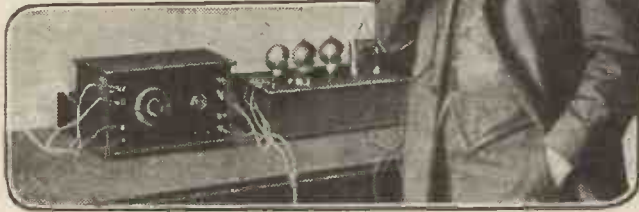
Recent tests at the New York Institute for the Deaf have shown the apparatus to work very well for those hard of hearing while in case of absolute deafness no



auditive perception can, of course, be expected. Still, even in this case, the apparatus will translate the vibrations imparted to the teeth into some sort of sensation, and after some weeks' practice, the deaf person will be able to perceive the meaning and rhythm of vibrations. In

fact, some deaf people have been known to actually translate vibrations into a sensation equivalent to sound, and the possibility of thus conducting a conversation is by no means excluded.

Mr. Gernsback is one of the pioneers of wireless in the United States, and his in-



Mr. H. Gernsback, of New York, using an Osophone.

terest accordingly centres round the possible application of the Osophone for wireless communication

THE CONSTRUCTION OF A HIGH-CLASS LOUD SPEAKER.

(Continued from page 735.)

Let us now turn our attention to the parabolic reflector. This is constructed of thick, stiff paper and is built up from ten sections, which are each cut to the shape shown in Fig. 2. The flaps of each section are carefully gummed to the back of the next section, and in this way a paraboloid is built up of the shape shown in Fig. 3. A small paper disk about $\frac{3}{4}$ in. in diameter may be gummed over the centre point if necessary. The reflector should be given a light coat of shellac varnish, and is then ready for mounting. For this purpose we require two concentric wooden hoops, one being a loose fit inside the other. This entails a visit to an art needlework shop, as the hoops which are used as a frame for embroidery are eminently suitable and can be bought quite cheaply. A diameter of about one foot to eighteen inches should be chosen, the higher figure being the better. The reflector is now mounted so that the edge of the paraboloid is gripped all round between the two hoops, three or four small nuts and bolts being used to make the assembly permanent. Care should be taken that the reflector is mounted centrally on the hoops.

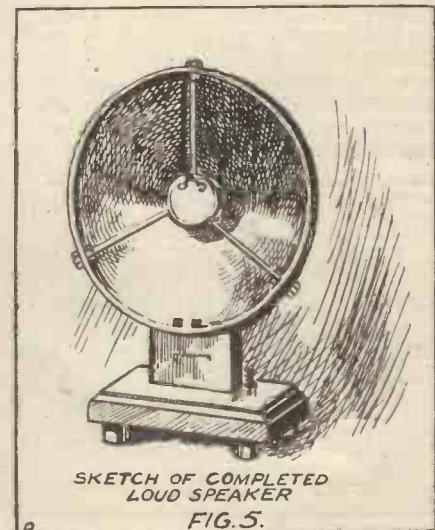
The next problem is to mount the telephone receiver in a suitable position in front of the reflector. This is effected by carefully drilling and tapping three concentric holes in the case of the receiver and drilling three corresponding holes in the hoop frame of the reflector. Three rods of suitable length are then obtained and a screw thread cut for a short distance at each end. One end of each rod is screwed into the case of the receiver, and the other end is fixed to the frame by means of two nuts, one on each side of the hoop. The receiver is thus mounted centrally, facing the reflector. The appearance of the instrument may be improved by threading lacquered brass sleeves over the rods before they are fixed in position. A short horn with a small taper is now mounted on the receiver, the length being such that the mouth of the horn is at a distance of exactly $3\frac{1}{2}$ cm. from the centre of the reflector. This ensures that the sound waves emerging from the horn are reflected in a parallel direction.

The Complete Loud Speaker.

The assembly is now mounted on a stand, as shown in Figs. 3 and 4. This may be very simply made from two pieces of wood $\frac{3}{4}$ in. or $\frac{7}{8}$ in. in thickness. One piece is used as a base and the other is screwed to it in a vertical position. The upper side of the vertical piece is made concave so that the frame will fit into it. The reflector is fixed by means of a couple of screws which pass through the frame into the stand. A finished appearance is given by connecting the receiver to two terminals mounted on a small piece of ebonite screwed to the base, and a coat of varnish completes the instrument. The sketch in Fig. 5 gives an impression of the appearance of the completed loud speaker.

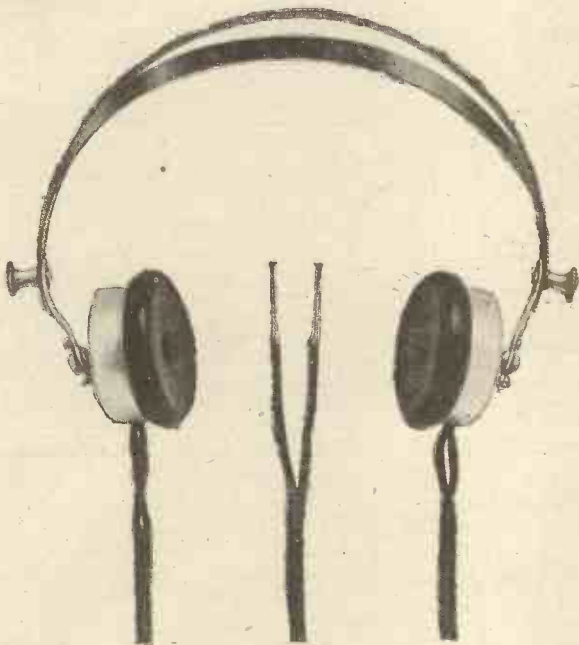
The cost of the whole instrument need not exceed 10s., and the sensitivity is such that it has been operated successfully with high-frequency amplification alone, resulting in a unique perfection of quality.

It is hoped that this short description will enable many amateurs, who have hitherto been deterred by high cost or difficulties, to construct at a very small cost a loud speaker which, although not intended for use in large halls, will give a quality of reproduction in an ordinary size room which is superior to that of many commercial types.



SKETCH OF COMPLETED LOUD SPEAKER
FIG. 5.

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READ WHAT

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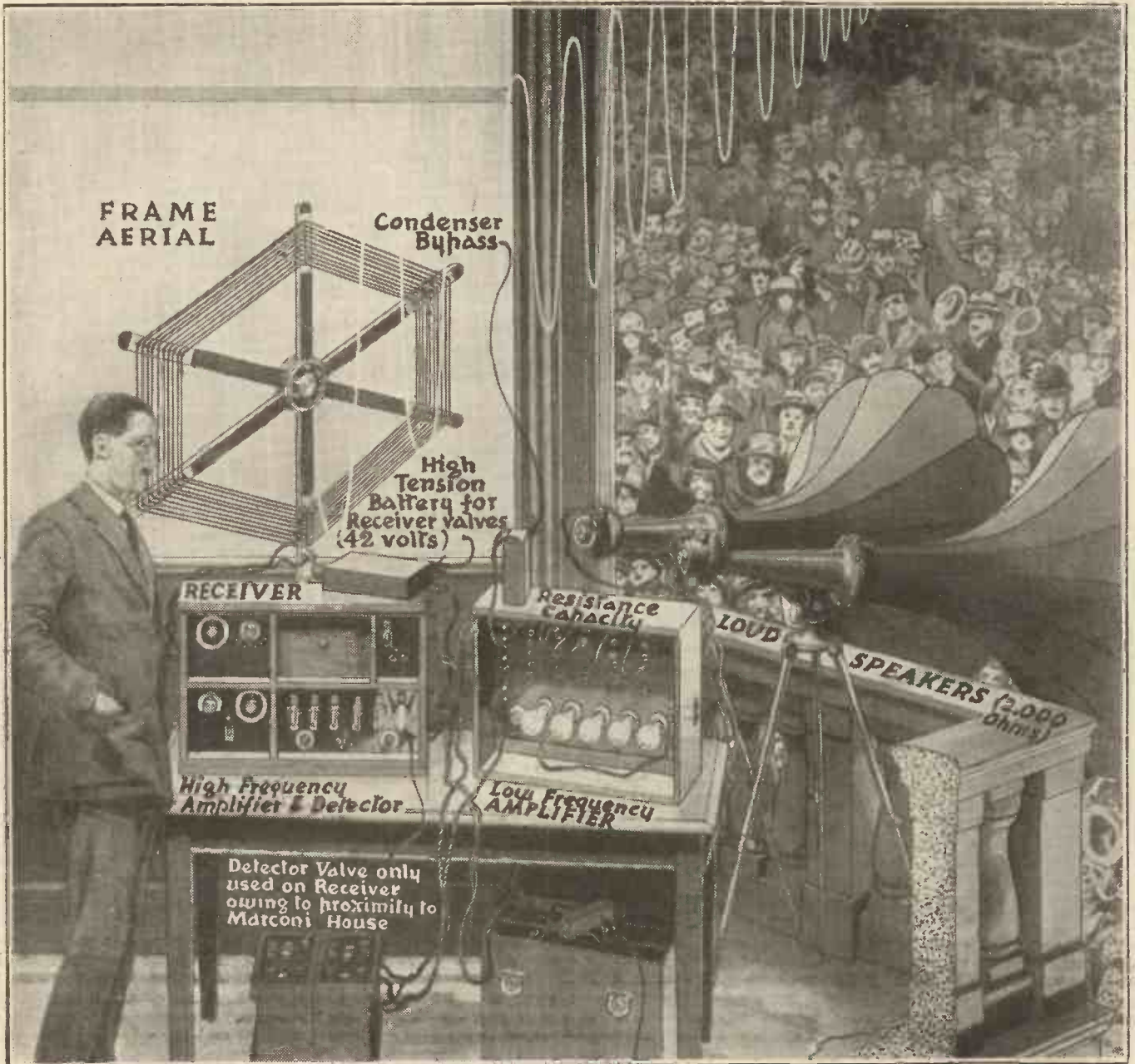
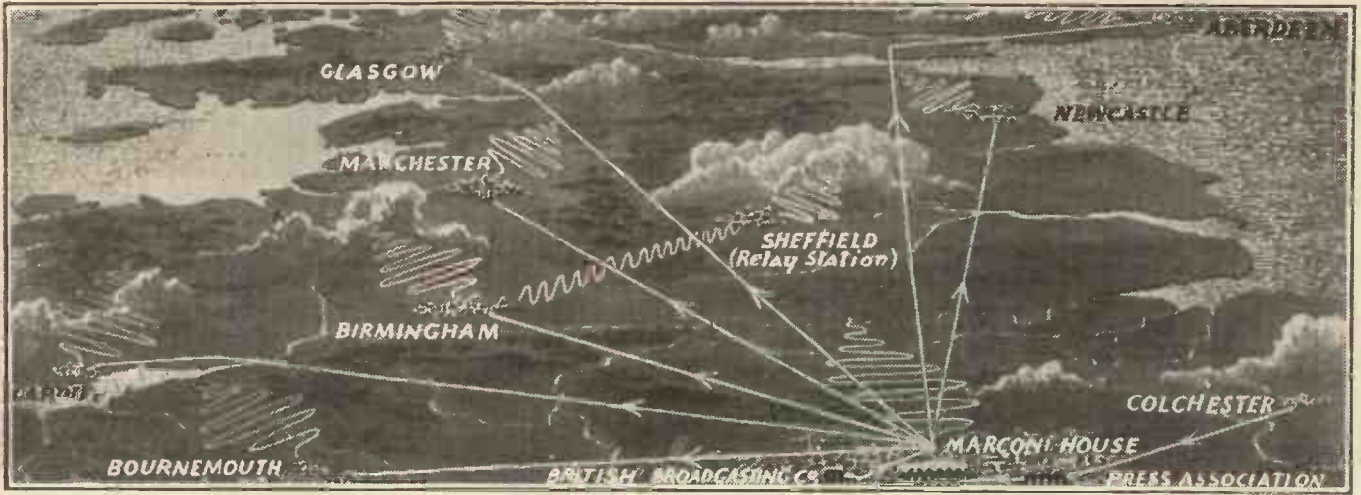
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HOW RELAY CONCERTS ARE BROADCAST TO CROWDS



Two Minutes Interval-Please!

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

A Few More "Howlers."

AS a result, not unexpected, of my disclosures of the devastation which the cult of radio amongst the little lads is causing in their outlook on history, several more pedagogues have hurled in a number of "horrible examples, from which I select the following as an awful warning:

"King Alfred burnt out all the valves, and therefore took the cake."

"When King Edward heard of his son being drowned, he never oscillated again."

"Cannons were first used at Crey, and so were valves by Doctor Fleming."

"Shakespeare wrote poems and invented Ariel."

"Julius Cæsar's funeral was broadcasted by Uncle Antony."

The Future.

Not so long ago the chief engineer of the B.B.C., who runs that company's stations so clockworkly (wow!) that he has time regularly to dash into print, advised you and I and all of us to look to the future. Speaking for self and partner (see "David Copperfield"), I do. Otherwise I should not burn good amps. and volts over these notes. But speaking as a member of the local debating society, I say that the noble engineer's admonition is disputable. Other authorities bid us lie in the present. This, also, I do. Bills, coughs, and editors are ever present. I always understood that Mr. Old Moore had a monopoly of prophecy (to the immense disgust of the Post Office, which abhors monopolies, even imaginary ones). Nevertheless, quoting in advance all those protective clauses so dear to the amateur prophet, I venture to remark as follows. When we who write, and read, and broadcast, and listen are old—really old—with beards and great-grandchildren, and all the other concomitants of age, television will have been brought to a fine art—and banned. The fellow with the secret telesquinter will be hounded about by the cops as ruthlessly as is the man with cocaine in his vest pocket, or the man with a secret brewing plant in Scrymgeourland.

Prospects of Television.

Are we, then, to relinquish our efforts to win the "Wireless Review's" prize? Perish the thought! Let the good work of separating that sprightly paper from £500 continue. As well try to prevent sunset by pulling down the Venetians as try to stop the coming of television. But oh! what will life be under its régime? The world will be one enormous optic, full of enthusiastic amateurs peeping round far-distant corners and through brick-walls. When a man wants a quiet five minutes to fill up his Capital Levy form, he will be dragged off to witness a dog-fight in Peking as it appears on a cloudy plate of glass, or will be pestered to death by the man next-door boasting that he "got last week's Mexican revolution on only forty-five valves. As clear as anything. Even see them selling oil concessions for dollar bills."

Yes, it will have to be banned. Life will be too diverting. I find this telephony broadcasting far too strong an incentive to sloth.

As sure as I settle down to a job of work, somebody is sure to tell me that my favourite trombone solo is to be played in two minutes. I reckon that I have lost £83 15s. by listening to 2 LO when I might have been writing. I have thought sometimes that the B.B.C. might share this loss fifty-fifty, and then, again, I have thought that they might not. Those *wha hae wi' Wallace* bled do not flourish siller around on the slightest excuse, nor at the whim of your faithful essayist.

But when to broadcasting is added television, when I may be called from my

Nor would I deny that the art of wireless has received valuable help from the Press, though I can recall the days when articles on that subject, however juicy, came back, rejected, with the force, rapidity, and precision of boomerangs. Such articles as appeared in the newspapers in the—er—late Victorian period of wireless, were written mostly by members of the staff and were a great joy. We found them grateful and comforting, and used to clip them out for consumption during night-shifts.

We used to treasure up gems such as: "Mr. Marconi, in an interview, stated that he had invented a receiver which would send quicker than any photographic appliance hitherto used in telepathy. He hopes to be able to send messages farther than the remotest station than beyond which messages have previously been sent further"; or, "As I watched the lurid spark of the master-magician, Marconi, flicking the air-waves through boundless space, and heard the guttural croak of the great condensers as they did their work, I was spellbound at the marvels of modern science."

We also were spellbound at the marvels of modern reporting. Not so long ago, a well-known daily referred to one of the most prominent men in radio development as "a wireless operator at Carnarvon," a compliment at which every operator must have glowed.

American Enterprise.

I myself came into contact with the New York Press when the Wellman airship attempted to cross the Atlantic in 1910. I had nothing to tell the fellow who plunged into my cabin at 2 a.m., as we lay at anchor, and I said it with the eloquence of the angry man aroused from long-desired slumber.

Next day, whilst walking up Forty-First Street (I think), I was astonished to see my name in heavy block letters at the top of a column on the front page of the ——. There, in Newyorkese, was a description of myself ("Blake interviewed in cabin. Says radio is the goods"), my views on the prospects of wireless and Wellmanism, the success of the Giants at baseball, and the probable tonnage of the wax-insect crop of the Upper Yangtse. I have never blushed since.

A Few Humble Suggestions.

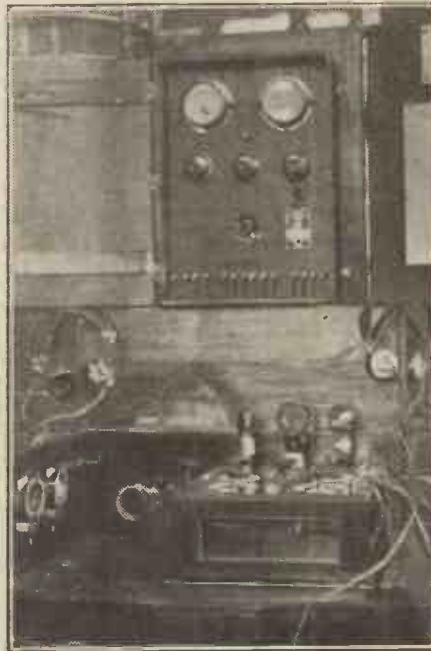
These are addressed to the B.B.C. Lord Darling is temporarily disengaged. Why not induce him to give us a talk on "Things I want to know what they are."

Why cannot we have more debates? These could take place in the 2 LO Salon. I suggest the following:

Mr. Reith and Sir Landon Ronald on "Bagpipes considered as musical haggises."

Mr. George Robey and Mr. Harry Tate on "Wireless."

M. Coué and Dean Inge on "For better and better or worse and worse."



The receiving station constructed by the boys of the Palmer Schools, Wokingham.

literary exertions to witness a misty reproduction of Chelsea scoring half of no goals against West Ham—slightly jammed by a vision of Colchester oyster feast—life, I say, will be too complex, and I shall vote for Protection.

The Voice of the Press.

I yield to none in my admiration of certain aspects of the daily Press—its power, its advertising value, its versatility, its wonderful organisation and the pure, clanging brass of its reporting staffs. The successful reporter reports first and corrects afterwards; he has the imagination of Jules Verne and the nerve of a "drummer."

Propel him through the front-door, and he next arrives *via* the ash-lift. Tell him nothing; he will paraphrase it to the length of half a column. Tell him the answer is a lemon, and he will wax lyrical about lemons, transporting his readers to Andalusia before he finishes.

A SIMPLE VALVE-CRYSTAL RECEIVER.

PART III.

In this week's article the constructional details for the switches are given, and the wiring of the components is described.

THE slot for the main switch should next be made, as was shown in dotted lines in Fig. 5. This is best done with a slitting saw held in a fret-saw frame, as it is rather far from the edges. Or, if the ebonite has been for several hours in a warm room, the slot can be made by drilling out a series of holes, breaking away the portions between, and using a small file to work the edges to the required size. The fixing holes are made by using the metal face plate of the



Fig. 9. A "close up" of the wiring of the switch.

switch as a template. The fixing holes for the filament rheostat are similarly located by using the metal front as a template.

Polishing the Panel.

The pillar carrying the adjustable cat's-whisker is screwed in from the face of the panel, and soldered underneath to a brass strip connecting it to the centre arm of the single-pole switch. Or, if the pillar is long enough, a holding nut may be screwed down hard on to it on both sides of panel, to make a strong job. The screw for the crystal cup is inserted from underneath the panel, and clamps down the connecting lead to the main switch. The

cup itself is screwed down on to the projecting end of the screw.

When drilling is completed, the panel should be surfaced with very fine emery paper on a flat block, finishing off with well-worn pieces. If a semi-gloss is required, the

rubbing should be continued with rotten-stone or bath-brick dust, finishing off by oil rubbing with a piece of flannel. A high polish is, however, undesirable, as it reduces the insulation of the ebonite. The panel may then be engraved as shown in Fig. 1. This will cost a few shillings extra, but it adds considerably to the finished appearance of the set.

The panel is now ready for wiring up. The wiring diagram given in Fig. 8, which is drawn looking at the underside of the panel, clearly shows the connections to be made.

Wiring-up the Switch.

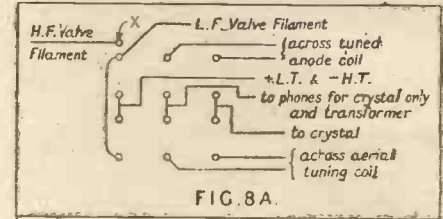
The only "tricky" part in the wiring is the switch. With the three-pole type, as previously mentioned, it is necessary to add an extra contact by screwing a thin strip of sheet brass into the base of the switch, and bending it over parallel with the points, as shown in Fig. 8b, so that it makes contact with the contact springs where the switch is turned down—i.e. into the "two-valve" position. Fig. 8a is a plan of the switch connections and bridges, the "extra" point being shown at X, just above the two end points, connected by a bridge wire.

The bridges are made by simply twisting a piece of wire through or around the tinned points and applying a soldering iron.

Fig. 9 is a close-up photo of the switch when wired up.

Fig. 10 is a photograph of the wiring completed for the filaments, and aerial and earth circuits (shown in thick white systoflex), and the detector circuit and "valve-crystal" switch (shown in dark, thin systoflex). Fig. 11 shows the underside of the panel completely wired.

When wiring-up, a wire should never be cut if a further connection is required from the terminal you have reached. For instance, the wire from the earth terminal, Fig. 8, is taken first to one terminal of the coil holder, then to the aerial condenser, then to one terminal of the switch, then to



the grid biasing terminal, and finally terminates on the transformer secondary. Similarly, the negative L.T. starts from the grid bias terminal, goes to L.T., then to the fixed condensers across the batteries, and ends at the filament rheostat.

Final Connections.

For wiring, tinned copper wire should be used, and 20 S.W.G. is the most suitable thickness, as it is sufficiently stiff to remain in position, and at the same time is manageable. Between the terminal points it should be covered with systoflex. Where a screw connection can be made by clamping the wire between metal surfaces, this is as good as soldering, particularly if the screws are tightened up with a spanner.

The switch and transformer connections are made by soldering the leads to the tinned tags provided. In soldering, both the wire

(Continued on page 742.)

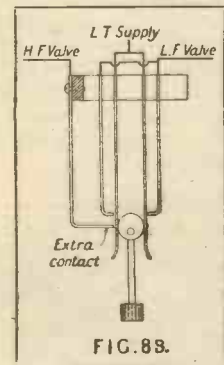


FIG. 8B.

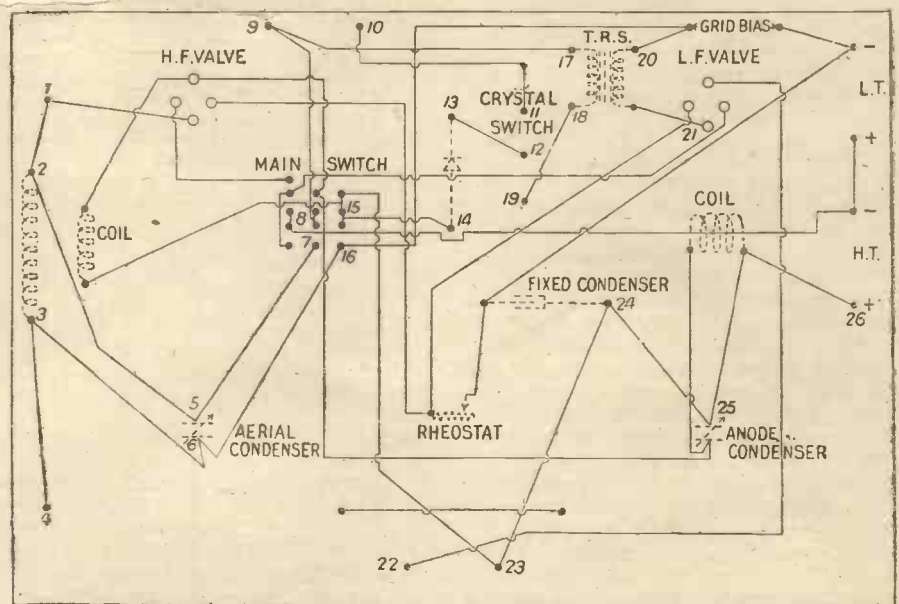


Fig. 8. Full wiring diagram.

PRACTICAL NOTES ON "SCREENING."

By "THE EXPERIMENTER."

Amateurs who may be contemplating the construction of super-sensitive receivers, such as those employing several valves and super-regeneration, dual amplification or multi-valve amplifiers, will find the following article in which various methods of screening are described, extremely useful.

ALTHOUGH self-styled "experts" frequently speak of "shielding" as a cure for all parasitic noise trouble liable to occur in a wireless receiving set, it is seldom that really useful instructions concerning this method are given. Quite a common belief exists that it is only necessary to place a sheet of conducting material between a receiver and a source of interference in order to eliminate such unwanted noises, but this is by no means the case.

Satisfactory screening is only obtained when the receiver is completely enclosed by metallic screens which form complete circuits both in horizontal and vertical directions. For instance, the panel of a receiver can be removed, and the inside of the case completely lined with tinfoil without effecting a complete screening from, for instance, local power mains. If, however, the complete installation was enclosed in a hermetically sealed metal container, complete freedom from interference might be obtained, but only at the expense of the total loss of legitimate signals.

As a matter of fact, the writer has proved by experiment that local interference, such as is caused by electric tramways, railways, power mains, generators, etc., is best met by using a counterpoise capacity earth, and as much screening of the set as possible, such screening being taken directly to earth. But the elimination of interference so obtained is due more to the employment of a capacity earth than to the screening, as "noises" arising from the above causes are mainly conveyed by means of earth currents due to leakage more than by electro-magnetic waves.

Screening L.F. Transformers.

Obviously, such interference is of a low-frequency nature, and for this reason stages of low-frequency valve amplification should be avoided, and, preferably, crystal rectification employed.

Screening alone is *not* a method that the amateur can employ to eliminate outside interference, but screening can prove very useful when used in the receiver itself to protect one component from the magnetic field of another. For instance, in the case of receivers employing several stages of dual amplification, the partial screening of the low-frequency transformers is always advantageous. Such screening should be directly connected to earth together with the core of the transformer, and the danger of interaction between the low-frequency transformers can be considerably reduced.

Circuits employing super-regeneration and

low-frequency amplification are considerably improved by dealing with the low-frequency transformers in the above manner.

Other parts of dual amplification (reflex) and super-regeneration receivers, well worth screening, are large-capacity condensers and grid-leaks. Very good results have been obtained by the writer by doing this, although possibly theory would lead one to believe such to be useless expedients.

In the Case of H.F.

The screening is best carried out with thin copper sheeting, which should be so arranged that it encloses the component

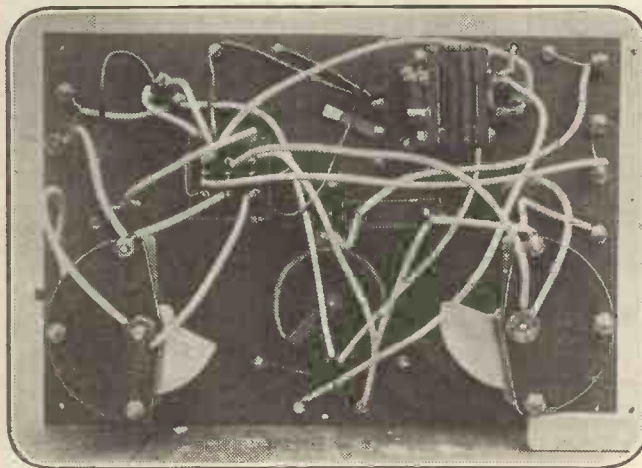


Fig. 11. The panel completely wired up.

A SIMPLE VALVE-CRYSTAL RECEIVER.

(Continued from page 741.)

and terminal should first be cleaned with fine emery paper. The wire is then threaded through the hole provided, or is twisted once or twice around the tag, and a small quantity of flux smeared on the joint. The application of a clean, hot soldering iron carrying a small globule of solder will then complete the joint.

The Switching.

In Fig. 8 the aerial circuit is marked 1, 2, 3, 4 with the tuning condenser in parallel, via the points 2, 5, 6, 3. The simple crystal circuit is traced through 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, back to 6. With the crystal switch on "valve," the main switch on 1, and the phones on the lower positions, the L.F. valve is amplifying the crystal output,

as tightly as possible without actually touching it. All corners, etc., should be soldered so that not the slightest unnecessary crack remains.

Experiments have proved that unless the latter is done much of the value of the shielding is lost.

High-frequency transformers can be shielded when several are in use with considerable increase in the efficiency of a receiver, but in this case shielding must be carried out in a different manner, as the use of metal sheet would affect the capacity value of the component considerably.

A Shielding Cage.

Very fine wire should be used—36-gauge would not be too small—and this should so be arranged, with the assistance of suitable insulating supports, that a wide-meshed cage, closely fitting over the transformer, is formed. For instance, supposing the dimensions of a transformer to be screened were 2 inches in diameter by $\frac{1}{2}$ inch deep, four complete and metallically connected circles of the screening wire, each $2\frac{1}{4}$ inches in diameter, horizontally connected by eleven or so other wires radiating from the centre of the top circle, and running over the edge and holding the whole together basket fashion.

This shielding cage should then be connected to earth. Using a treble dual amplification receiver, in which three valves are each made to amplify at both high- and low-frequency, this method of preventing undue interaction between components in the high-frequency circuits proved so valuable that without it the circuit could almost be classed as a failure.

It has been suggested that it is beneficial to screen the large oscillator coils in Armstrong super-regeneration receivers, but, although this writer has experimented considerably in this direction, he has not personally discovered that this is the case, although, even if it does no good, it is not likely to do any harm.

and the circuit from the point 9 is through 17, 18, 19, 12, and then as before; whilst the rectified currents applied to the valve at 20, 21, pass from the plate through the phone terminals 22, 23, and thence through 24, 25, to the high-tension positive at 26.

If careful attention is paid to this part of the circuit much possible wiring trouble will be saved.

(To be concluded.)

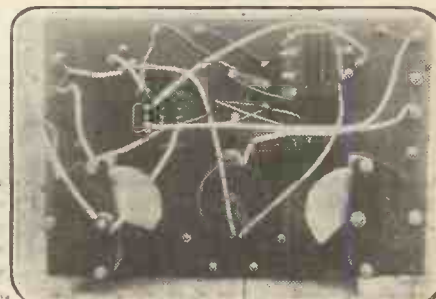
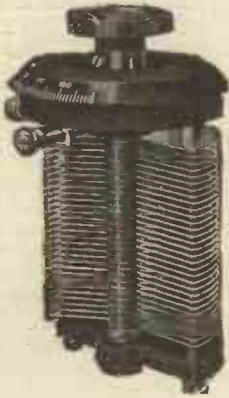


Fig. 10. A view of the partly wired panel.

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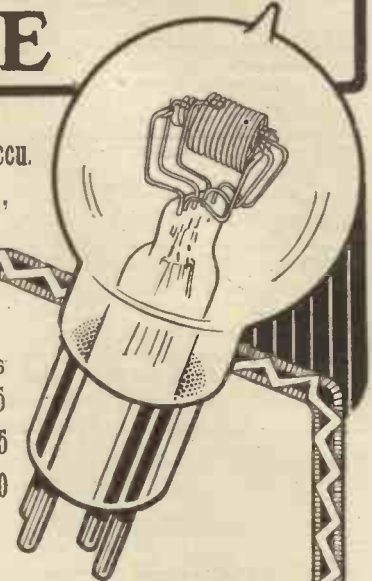
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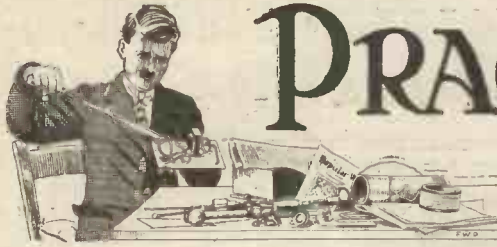
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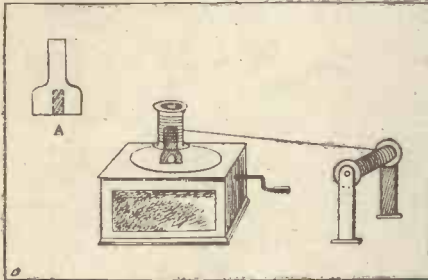


PRACTICAL IDEAS for the AMATEUR.

RE-WINDING TRANSFORMERS AND TELEPHONES.

AS only very few amateurs possess a lathe, the process of hand-winding becomes very tedious. Most people have, however, or are able to obtain access to, an ordinary gramophone. By utilising this modern article of amusement, re-winding transformers and telephones becomes quite a simple matter.

On the top of the turn-table will be found the knob on which the record is placed. A piece of wood, A, is shaped as per diagram



to fit over this tightly, and also shaped at the top to fit into the former or telephone bobbin.

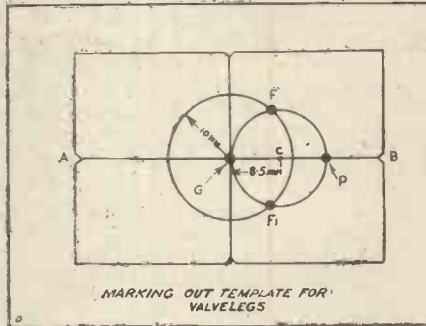
The wire spool is mounted so as to run freely, and should be as far as possible on a level with the former. The gramophone is then wound up, and the wire can be held between the fingers and wound on evenly. One winding of the gramophone will do a great number of turns, but it will be necessary to re-wind until the desired quantity of wire is on the former.

By following the above instructions it will become an easy matter for anyone, and not only is an enormous amount of time saved, but the winding is quite up to lathe standard.

HOW TO MAKE A VALVE HOLDER TEMPLATE.

IN constructing home-built sets, it is often convenient to use some simple method for marking out the positions of valve legs, giving greater accuracy than the primitive plan of transferring leg positions by paper or other means.

The method described below is strictly geometrical, and gives spacings for standard valves with the minimum amount of trouble. The template may be made from a thin strip of brass or a scrap condenser vane, and can be used over and over again.



Having selected a suitable piece of material, a line A B is scribed across the centre, from which the dimensions are struck, the first part of the process being to describe a circle with a radius of 10 millimetres from the point G in the figure reproduced here-with. Now set the dividers to 8.5 millimetres, and mark this distance from the point C on the line A B, which gives the point C. With C as centre and C G as radius, describe a circle.

The points of intersection of the two circles F and F₁, mark the positions of the filament legs, and the point where the circle cuts the line A B at P represents the position of the plate, or anode, leg. The position of the grid leg is represented by the centre of the first circle G.

Extremely Useful.

These four points should be drilled with a $\frac{1}{16}$ -in. drill, which is sufficient to allow the point of a scriber to enter when using the template on a panel or valve holder. It will be noticed in the illustration that a square piece of metal is used for the template, and that four V notches are cut, one on each side, these notches corresponding with the centre lines of the template. The idea is that when the centre lines of the template are laid over those of the panel the valve legs are all arranged squarely and in the same relative position to each other.

This template will prove very useful every time a valve set is constructed, for not only will it come in useful for mounting valve-sockets, but also for fitting the holders for H.F. plug-in transformers. A metal should preferably be used for the template, as if cardboard or stiff paper is utilised it will be found that the holes will be enlarged after a time and the template will become inaccurate.

AUTOMATIC SWITCHING.

AS will be seen by glancing at Fig. 2, the receiving circuit is just the ordinary common or garden H.F. and detector. The two-valve amplifier connected thereto does not offer any particular hardship in the way of construction. The various switching devices, however, are what should be noticed. The amateur owning this set is rather fond of going to bed early, but does not like the inconvenience of getting up again to switch off the radio set. The little "gadget" (shown in dotted circle) in Fig. 2 obviates the necessity of him arising. Fig. 1 shows an enlarged view of this switch. As will be

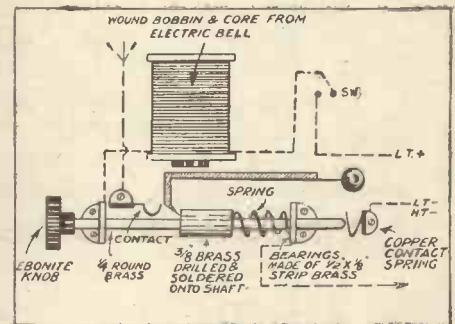


Fig. 1.

seen, the filament and high-tension current are cut off and the aerial joined to the earth when the bell push is pressed. This ensures everything being switched off and the set left in perfect safety.

The triple-contact double-pole switch marked B in Fig. 2 is for use when it is desired to use the headphones (or loud speakers) in series with each other, or separately, as required.

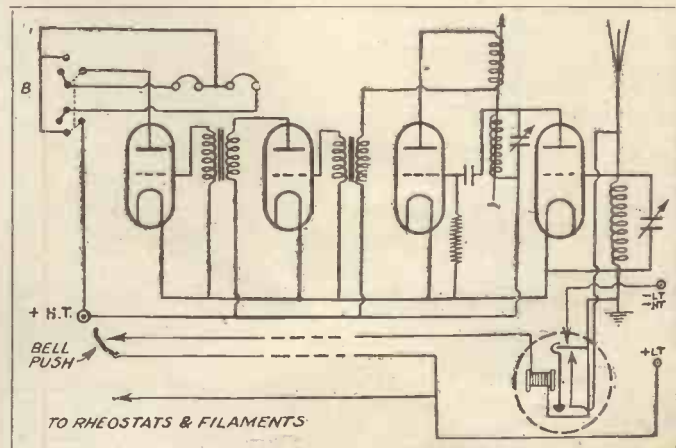


Fig. 2. A circuit employing the automatic switch.

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Contributors include: Alan A. Campbell Swinton, Esq., F.R.S., M.I.E.E.; Philip Coursey, Esq., B.Sc.; Capt. P. P. Eckersley; Prof. J. A. Fleming, M.A., D.Sc., F.R.S.; Prof. G. W. O. Howe, D.Sc., M.I.E.E.; Leslie McMichael, Esq., M.I. Rad.E.; J. C. W. Reith, Esq., General Manager of the B.B.C.; James Swinburne, Esq., F.R.S.

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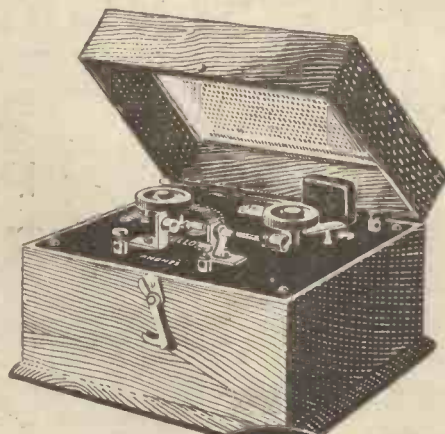
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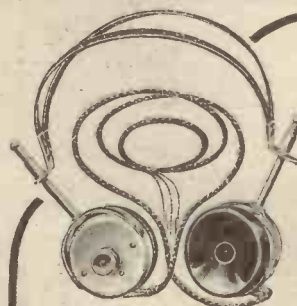
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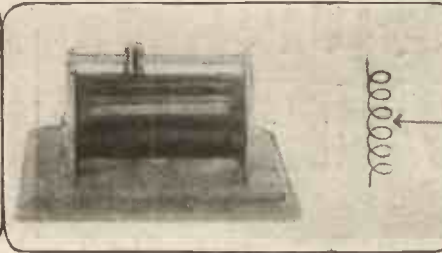
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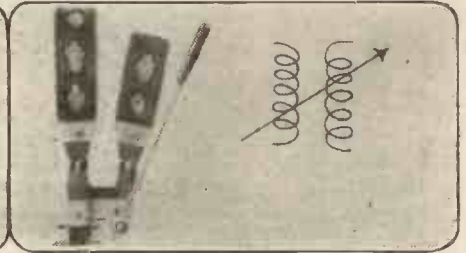
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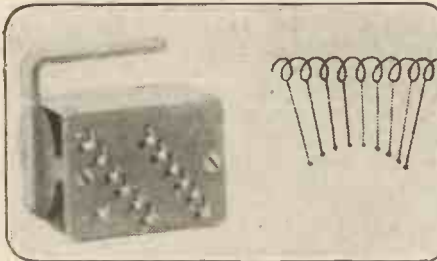
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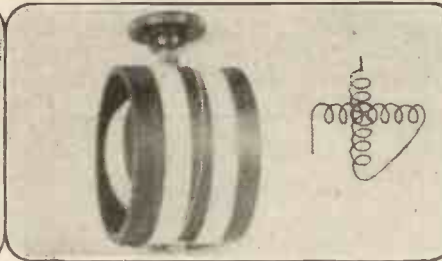
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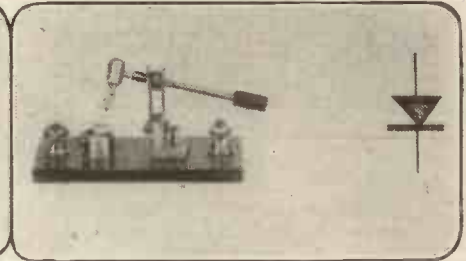
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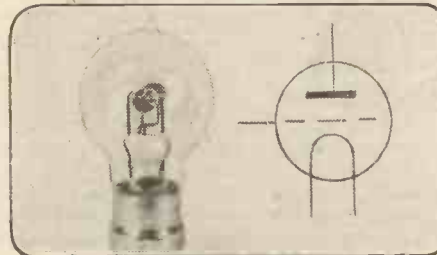
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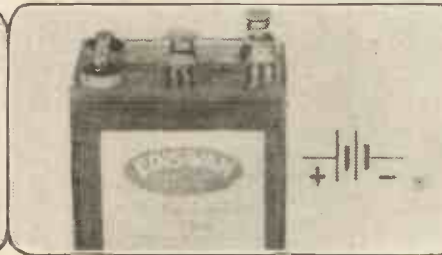
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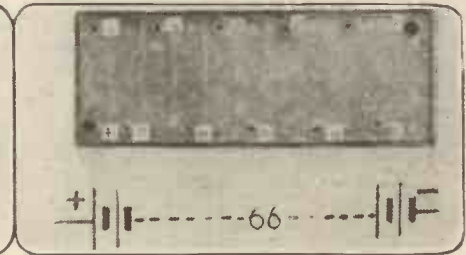
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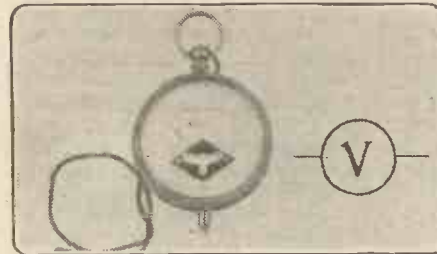
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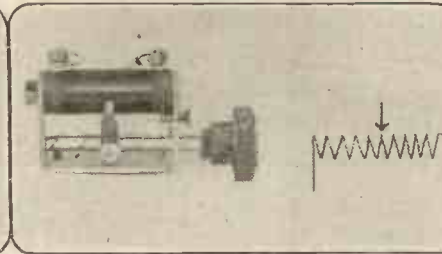
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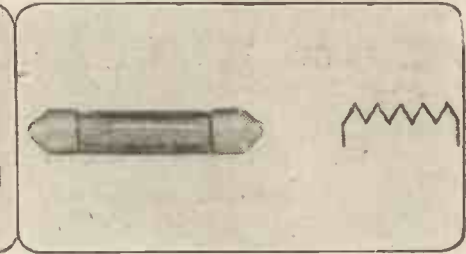
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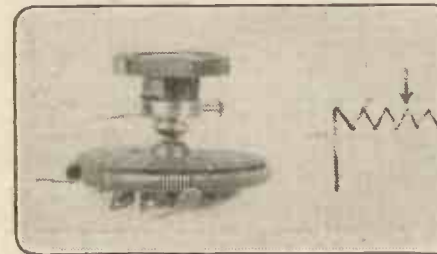
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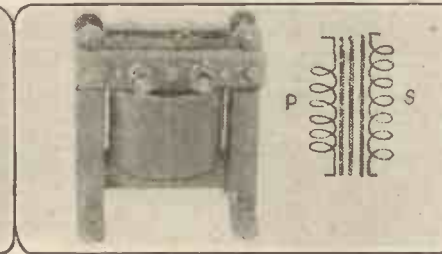
POTENTIOMETER.



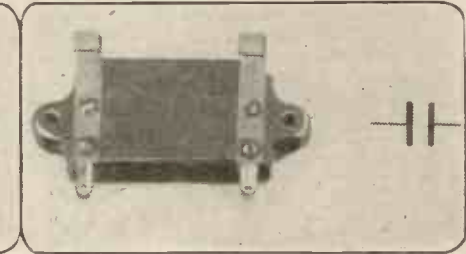
GRID LEAK



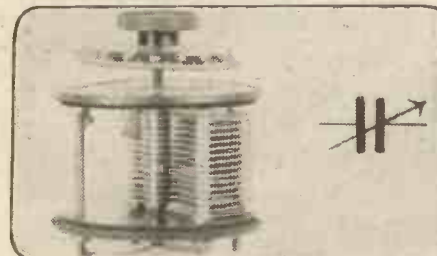
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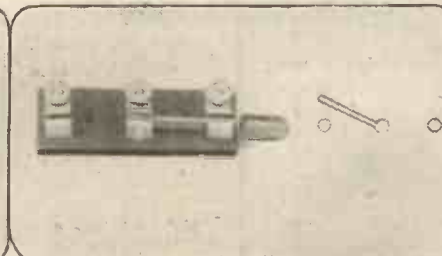
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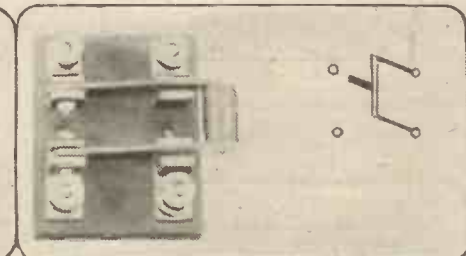
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MOST amateurs possessing home-made crystal sets with the coil and sliding contact device, find sooner or later that such a tuner has several disadvantages.

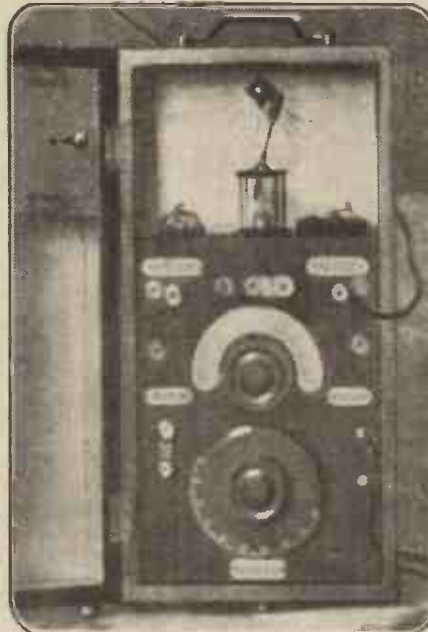
Firstly, there is difficulty in getting the sliding contact to remain on the desired turn of coil. Secondly, the slightest trace of dust often prevents maximum reception. Dead-end effect is a third bad point, although this may be partially overcome by connecting the loose end of coil to the earth terminal. Again, in process of time, through the constant friction of sliding contact upon coil, small particles of the wire are liable to short-circuit a number of turns, this again weakening reception.

Necessary Components.

A way out of these difficulties has been to construct a variometer, consisting of a smaller cylindrical former wound with wire, capable of being rotated within a larger coil, also wound, both coils being inductively and directly coupled. The ball-shaped variometer is the most efficient of this class of tuner, but requires a deal of patience to construct, especially in the windings.

To avoid the tedious work thus involved, and yet maintain the efficiency of such a tuner, the writer constructed a novel variometer in a few hours at the cost of only 3s. 6d., and has found it to work as good as the ball-shaped variometer, exceptionally fine tuning being possible. It eliminates dead-end effects and ensures close inductive coupling.

This tuner, used in circuit shown in inset 3 receives 5 S C (two miles distant) very clearly without any "earth" connection, using an iron bedstead for aerial.



A receiver fitted with a tuner, as described in this article.

The following are required :

Sheet of cardboard, 13½ in. by 13½ in.	—
Piece of wood, 1½ in. by 1½ in. by 2 in.	—
Small pins	—
Seccotine	—
4 in. brass strip, ½ in. wide	0 3
Eight ⅜ in. screws	0 2
Ivory scale, 0-180 degrees	0 4
Switch arm	0 9
4 oz. reel D.C.C. 22	1 0
4 oz. reel D.C.C. 26	1 0
Total Cost	3 6

Take the sheet of cardboard and carefully mark as shown in Fig. 1, afterwards cutting out accurately with a sharp knife.

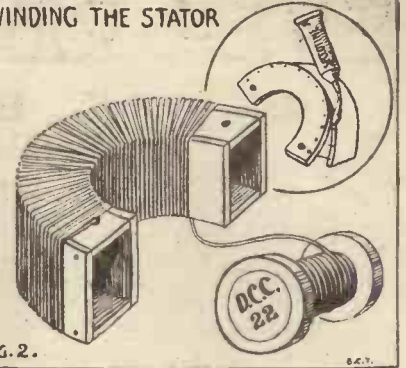
Bend each of the four strips into a semi-circular curve, taking care cardboard does not crack in so doing.

Insert twelve small pins at equal distances into one of the stator sides (inset 2), pressing same in turn into the edge of longest strip of cardboard. The other side is next similarly affixed.

Now ease open each side and insert a little seccotine between the joins (inset 2), after pressing pins in tightly again.

Having formed the rotor in like manner,

WINDING THE STATOR



soak both parts in melted tallow. The pins may be removed once the secotone has set.

Whilst the two formers are placed aside to permit tallow and secotone hardening, the brass strip should be prepared as follows :
 Bore four small ⅛ in. holes in the form of a square at one end of strip, ¼ in. apart. Cut out a slot at the other end ⅜ in. wide by ½ in. in length, ½ in. from the end. Give the strip a half twist (Fig. 3, A), holding it 1½ in. from either end, and after the wooden block (Fig. 3, B) has been shaped out with a penknife to fit firmly into one end of rotor, affix it to brass strip, using four ⅜ in. screws.

The Finished Set.

Having made two small holes in the ends of stator and rotor for affixing wire, give the stator 100 turns of D.C.C. 22 and the rotor 70 turns of D.C.C. 26 (Fig. 2).

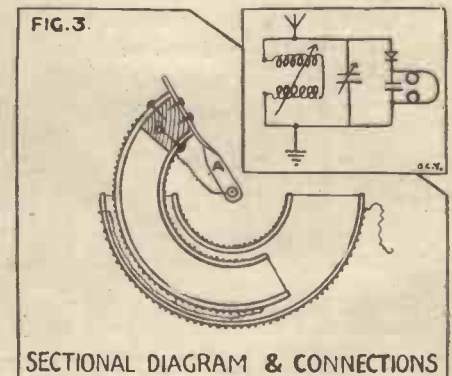
Presuming the tuner is to be mounted as shown in the illustration, affix stator to panel by means of a small bolt and nut at either end.

Bore a ¼ in. hole through panel exactly half-way between and on an exact level with ends of stator. Through this, pass the switch arm, after having affixed the bearing (usually supplied with same), immediately over it.

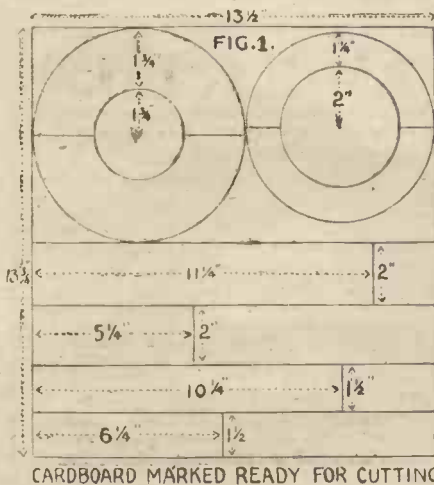
Having screwed the rotor to wooden plug, insert it halfway into stator, passing the slot in brass strip over protruding end of switch rod. This slot will allow rotor to be adjusted before finally tightening nuts, so that it will pass easily in and out of stator.

All that remains to be done now is to connect the starting end of rotor winding to finishing end of stator winding, using about 8 in. of flex for this purpose. The remaining loose ends are connected to two terminals, the end of rotor winding being best connected to brass strip at plug (Fig. 3), a further wire fastened between the nuts at end of switch rod passing to the other terminal.

FIG. 3.



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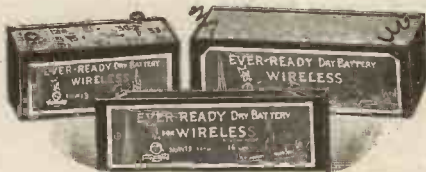
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THOUGH the war of the programmes may continue to wage furiously between the "high-brow," who demands daily doses of the three "B's"—Bach, Brahms, and Beethoven—and the "low-brow," who wants to start jazz at 11.30 a.m., one thing is certain, progress has



Mr. George Parker.

been made in the art of programme-making, and it is safe to say that all classes of music-lovers have been amply catered for, while a seasonable modicum of humour, "the salt of the air as well as of the earth," has leavened the whole. Amongst the real humorists recently heard must be mentioned Mr. Louis Hertel. One of the cleverest of conjurers and prestidigitateurs, it is almost a pity that, for broadcasting purposes, he has to confine himself to his humorous character studies, but these are of such quality that the stage and the properties are not missed.

Mr. Hertel has made a special study of rustic types, and his "Owd Gaffer" is always welcome. He has acted in many quarters of the globe, and is a prime favourite in Egypt, where he has performed before the Sultan, the High Commissioner, and all the powers that be. During the war he joined the 7th Middlesex Regiment, and served from 1914 until 1919, when he was able to take up his musical career again.

Mr. Hertel radios well by reason of his quick grasp of distances, and his character studies, therefore, are bound always to meet with due appreciation.

The Opera Season.

On the vocal side we have had many of the artistes of the British National Opera Company, which has once more opened at Covent Garden on January 7th, for another season, during which doubtless many of the operas will be broadcast from 2 L O, it will be interesting to note the difference between the artistes when singing directly before the microphone and on the stage. Amongst those who have contributed to the Sunday programmes of 2 L O are William Anderson and Mr. George Parker, and in the provinces Miss Doris Lemon and Mr. William Michael.

Mr. Parker has had a most varied career, dividing his time between mining and engi-

neering, and singing. He commenced his vocal career as a boy in the choir at Leeds parish church, when he sang some of the most famous scores of Bach, Brahms, and Mendelssohn; from thence he went to Manchester Cathedral, and then to Westminster Abbey. While there he was appointed a Gentleman of His Majesty's Chapel Royal, the duties of which post are to sing at the services of Buckingham and St. James's Palaces and at Marlborough House. Mr. Parker has long since been an established favourite at all the great concert halls, and met also with great success as the Desert Lover in "Chu Chin Chow" at His Majesty's Theatre.

A Peculiar Experience.

The provincial stations continue to lead in the framing of good programmes, and it is difficult to make a choice of outstanding features. Bournemouth, perhaps, has most quickly established itself, and is, of course, greatly influenced by the example of the Municipal Orchestra. A marked success has been obtained by the quartette led by Reginald S. Mouat, whose name it bears. He is principal violin and permanent soloist



Miss Marguerite Bamberg.

also at 6 B M and was previously over two years principal violin under Sir Dan Godfrey in the Municipal Orchestra itself. Of Scottish and French extraction, Mr. Mouat has had the widest of musical experiences, and since joining the Bournemouth Station has played over fifty solos, amongst the most successful being those played recently, which included movements from Mendelssohn's and Beethoven's Concertos and Haydn's Quartette in D.

Another excellent performance was given by the Wilton Ainsley Quartette led by Miss Marguerite Bamberg, whose solo was Wieniawski's "Romance." Also a recruit from Sir Dan Godfrey's orchestra, Miss Bamberg is well known in London and the provinces.

Amongst her experiences she relates the following. At one hotel where she was staying on a tour, her room, obtained at the last minute, was on the third floor. Waking up in the night, Miss Bamberg was startled by the sight of a black cat seated on the window-sill.

Thinking it belonged to the hotel, and alarmed for its safety, she advanced to the window, cautiously stretched out her hand, fearing to alarm it, when the cat vanished. Melted into the air, it seemed, and when having returned to her bed puzzled by its vanishing trick, lo, there was the cat back again! Miss Bamberg frankly admits that

it seemed a clear case for the Psychological Society. The next night the same thing occurred, and in the morning she decided to make inquiries as to whether Room 43 was haunted by black cats. Alas, the explanation was a ludicrous one. Near the hotel was a wind vane with a cat at the head. At a certain angle of the moonlight, the cat's shadow was precipitated on to the sill, and that's that. But, with two nights disturbed, "who said black cats were lucky?"

Miss Olive Franks is a charming singer who has been heard at Cardiff. She has been singing since the mature age of eight. A member of the Rutland Boughton Festival School at Bristol, a branch of the famous Glastonbury School, Miss Franks sang the principal parts in their productions, including "Bethlehem," which has just succeeded Boughton's great play, "The Immortal Hour," at the Regent Theatre, King's Cross. Miss Franks has made a special study of oratorio work, but her songs at Cardiff were well chosen and unhackneyed, especially "Sea Echoes" (Montague Phillips) and "The Naiad" (Granville Bantock.)

Popular Dance Bands.

Lovers of jazz music will rejoice in the arrangements made, whereby the dance music from the Piccadilly Hotel is to be broadcast. Hitherto we have had the Savoy Orpheans at the Savoy Hotel, one of the best, but the Piccadilly has no less than three dance bands, the London Band from the London Hippodrome, (which was made up of specially picked men to replace the famous American band), Jack Hylton's Band, also very well known, and De Groot's Orchestra. The latter is conducted by Mr. De Groot, who is also a composer, writing much of the music he uses himself, and therefore admirably fitted to the various occasions.

The dance programmes provided every evening during the Christmas week proved very welcome to a great many people, and I know of several families that held quite large parties simply for the sake of taking advantage of the Savoy Bands and enjoying a couple of hours dancing at the end of the evening.



Miss Olive Franks.



Mr. R. S. Mouat.



Mr. Louis Hertel.

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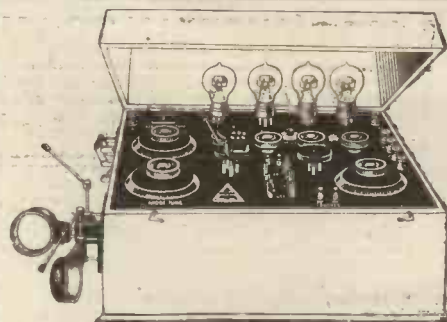
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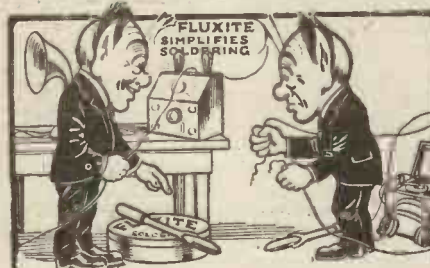
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BUT not of Great Britain. Had he been —er—worthy to occupy that eminent position I could have made the whole wireless crowd, from pirates to peanut merchants, happy long ago, for Geary is as plasticine in my hands. However, other countries also suffer from Post Offices, and Geary actually became P.M.G. of San Matador, by means of a gross abuse of valves and a crystal. But let's begin at the first stud.

The sad fact is that I owe Geary another plonk because he entered my house last week with a cheap cigar, and several other suspicious expressions of friendliness, and left it with my best coil-holder, which, he has since alleged, must have clung to his sleeve as he brushed past it.

After Geary played traitor to the revolution in the Central American Republic of San Matador he settled down in the town of Latabarba—which may be roughly translated "Tin Whiskers"—as Minister of Sports and Pastimes, a post awarded to him by the grateful president. In the San Matadorian annals of sport Geary's International Hop-scotch Team will for ever be remembered, and his famous bill to legalise "uffins" in draughts brought down three cabinets in a week. As the cabinets were brought down mostly by rifle fire that period was known as the Fiesta of Sanginary Ninepins.

A Black Outlook.

Geary lodged in the house of one Marco Pi, the Prefect of Police, who had a face-mat like a feather broom. In fact, that feature of his front landscape so annoyed Geary that Geary could talk to him only when they were looking in opposite directions. One day, a week before Geary's great horse-racing festival was due, they were seated in the patio, lovingly back to back, sharing a bottle of the local moisture, and watching a goat eating the boots off the Colonial Secretary, who was slumbering outside the offices of the Ministry of Labour.

The Prefect was gloomy. Nothing to arrest for a whole week past. Holy Position! What a country of saints! He groused steadily to Geary, who declared himself utterly desolated at the state of sport.

"Then, again, Geary of my soul," went on the Prefect. "Regard this wine. It is not so superlatively good that better could not discover itself to us."

"Truly," replied Geary, "the wine seems itself to be somewhat quisby."

"But if one possessed more money one might remedy the evil."

"If one had more money one would not be here. Am I right?" answered Geary.

"You have reason, señor. Doubtless one would pass with rapidity to fair Andalusia of the Spain. Ay de mi! Consecrated turtles! Bread of Peter! Bones of St. Stidolf!" (Etc., etc.).

"Shut up!" growled Geary. "You mean Clapham."

Again the persistent Pi returned to the charge:

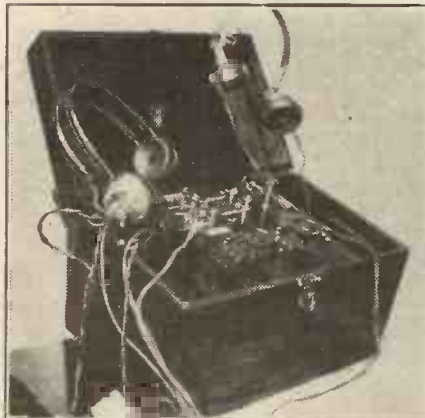
"If one could but foresee the victor of the forthcoming equine festival all would be indeed simple. One might do the bets with one's friends in security."

"What new madness, friend Pi?"

A Brilliant Scheme.

In his excitement, the Prefect nearly turned round, but remembering that his boarder loved not his beautiful whiskers, he loosened his coupling again.

"Take more wine, amigo. Take the bottle. Now you have equipment of telephonia without the wire. Eh? Suppose you sit in my friend Pedro's garden, which, as you know, is but a pace or two on the hither side of the—oh, dammit—what you call the winning-pole. Verree nize man. Verree nize gardin. Yez? No? 'Scuse me, mister. Bueno! You pass the word on telephonia



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wot 'orse look lika win. I seet 'ere. I get 'im. Maka bets queek, queek. To us the dollars. How you say?"

"By the finger-joints of Carlos Quinto!" said Geary to himself. "This human furze-bush has rung the bell. That's a real idea." Pi was bumping about in his chair in a great state of excitement, in agonies on account of the fact that he must not turn round. "It might be done, but some legal colour would be imparted to the act if I were in authority over the state telegraphs."

"That to me is equal. All will arrange itself. Frederico Esquemalda shall be arrest. I myself will regulate that," replied Pi the Prefect.

"Then it's a go. Collar the Postmaster-General and make your will—for you'll have a lot of money to bequeath."

Geary rose and left the patio, the Prefect remaining petrified with joy, though a little intrigued by Geary's sombre reference to testamentary dispositions.

Geary went straight to the President.

"Wake up, old sin and sorrow, and attend to the affairs of state," he shouted.

The President languidly rolled a cigarette,

and waved his slender, lemon-tinted fingers as a sign of attention.

"Do you know the sound of two dollars being knocked together? I thought so. Good! Now, speaking of the Festival of Caballeria, doubtless you desire that Blanche, your fiery steed, shall outstrip all others."

The President sighed, and placed both hands on his heart.

"Ah, excellent Geary, all my hopes—and many duros—repose upon Blanche. But what do you make?"

Geary changed the subject.

"D'ye know, Manuel—it is Manuel, isn't it, or p'raps it's Alonzo—never mind, d'ye know I think the noble republic of San Matador is languishing beneath the heel of bureaucracy. We are official-ridden. Look at the Minister of Marine. There ain't any marine. Look—"

"But I owe him much money," said the President, with a disturbed air.

"Look at the Minister of Public Celebrations, and the Minister of Tripe Factories, and twenty-seven more I could mention. You ought—pardon me, Alberto, if I seem to overstep the bounds of—er—well, anyway, you ought to combine some of these jobs. You could make enough dough in six months to pay off all those bloodsuckers. Look here, I'm overworked already, what with this ludo conference, and what not, but I'll take on the police as well—for the good of the state, of course—see?"

Geary's Double Office.

"But I cannot remove the excellent P without due cause," complained the President.

"Of course you can't. Quite right. But you can remove him for the illicit use of wireless. Send the P.M.G. to Pi's house an hour after the race, and he'll find the outfit."

"Geary, thou art a statesman, I perceive. And if all this be done, what of Blanche?"

"Oh, Blanche! Blowed if I didn't forget Blanche in my zeal for the state." Geary took from his waistcoat pocket a glittering object, and displayed it on his palm.

"This is a magic crystal, as used by all the most successful English jockeys. Give this to him who rides Blanche. Instruct him to handle it with extreme solicitude. He shall carry it in his hand during the great race, and when he passes the garden of Pedro, the cousin of the unspeakable Pi, he shall place the crystal upon Blanche's back, beneath the saddle. The result will be that Blanche shall fly like the wind. Right. Catch hold of it. And don't forget to address me as His Excellency Señor Don Aloysius Geary, Minister of Sports, Posts and Telegraphs, and Prefect of Police."

Then Geary handed the President a splendid prickly carborundum crystal.

Pi and the P.M.G. arrested each other simultaneously, but Geary filled their places very efficiently, and with great profit to himself.

RADIOFORIAL

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

The Biggin Hill tests seem to have created a very wide interest. In the train, tram, and bus, at lunch and dinner, I have heard people talking about Captain West's experiments, the accent of K D K A's announcer, and the possible developments of long-distance transmissions on 100 metre wave-lengths.

The Radiola Concert, too, caught the public fancy, and a good many people appear to have preferred the short concert in place of the promised speech by M. Poincare!

But one aspect of the Radiola Concert, as relayed from 2 L O, seems to have escaped general attention.

A series of wireless concerts "exchanged" by 2 L O and Radiola, would have a wonderful effect on the Entente Cordiale.

Relayed wireless offers us a great propaganda weapon which, if used correctly, cannot but help to strengthen our friendship with France, and counteract those who desire estranged relations with our ally of the Great War.

Relayed wireless enables us to get right into the French home: it enables us to get into touch with the French nation as no other form of friendliness could. And we should now return the courtesy of the Radiola people and let them relay a concert from 2 L O. Wireless can do enormous good in this way; by its means the peoples of two great nations can get to know each other, to understand each other, and to realise that, at heart, both the French and British have a warm regard for each other. Let us hope the B.B.C. will follow this up.

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.

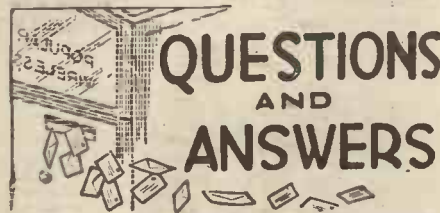
The Editor will be very pleased to recommend readers of POPULAR WIRELESS who have any intentions to patent, or who desire advice on patent questions, to our patent agent. Letters dealing with patent questions, if sent to the Editor,

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.

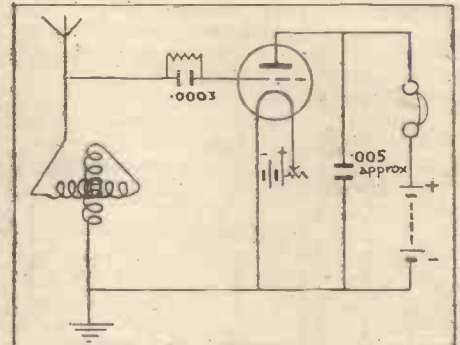


B. E. (Epping).—I have a crystal set with one stage of H.F. and get 2 L O quite clearly. I now wish to add two stages of I.F. to work a loud speaker. What circuit do you advise for the three valves and crystal? I am using basket coils for A.T.I. and tuned anode.

This circuit should work a loud speaker clearly at Epping, and the reproduction should be very pure as

you are using a crystal detector. No reaction is incorporated, as this type of circuit will not allow of the inclusion of intervalve reaction permitted by the P.M.G. The only way of obtaining reaction is by coupling the anode coil to the A.T.I., but this will, of course, tend to energise the aerial.

M. B. C. (Eltham).—I have the following apparatus in my possession. One broadcasting wave-length variometer, one variable leak and grid condenser combined, one

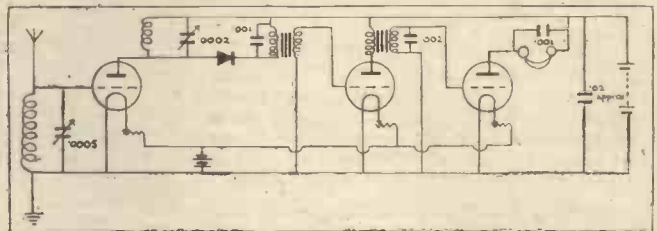


R valve, filament resistance, one .005 fixed condenser, I.T. and H.T. batteries, etc. What circuit do you advise? I do not wish to use any variable condensers.

The circuit herewith is one of the simplest single-valve "hook-ups," the variometer being the sole method of tuning. Results on such a circuit will not, however, be much better than those obtained with a simple crystal receiver.

"MODULATOR" (Penarth).—I have two Igranic duo-lateral coils, Nos. 50 and 75, which ultimately I intend incorporating in a valve set. For the present, however, I wish to include them in a crystal receiver as primary

(Continued on page 755.)



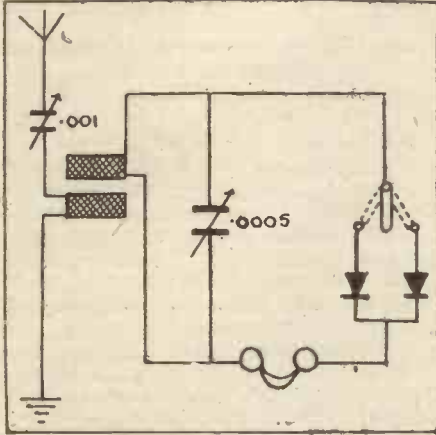
WIRELESS HAS A LOT TO ANSWER FOR!



QUESTIONS & ANSWERS.

(Continued from page 754.)

and secondary inductance in a two-coil holder. I also wish to include a switch for placing either of two crystals in circuit. What value variable condensers do you recommend, and where should they be placed? Using the No. 50 coil as A.T.I. a .001 variable condenser should be placed in series, while one of



.0005 mfd. should be shunted across the No. 75 secondary coil. By the circuit herewith you will see that a single-pole double-throw switch is used for changing over the crystals.

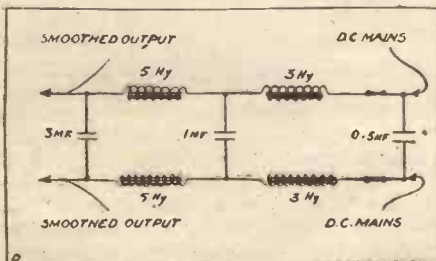
L. W. C. (Bourne End).—Can H.F. amplification be added to the "P.W." Set?

This could be done, but it would necessitate the re-wiring of the whole set so that it would no longer be the useful combination receiver it is now. If the combination were to be retained it would be necessary to alter the whole lay-out of the set, and the handling of the set would be very critical. We advise you not to attempt the addition of such an amplifier to this set. If a three-valve reflex receiver containing an H.F. valve is required, the one that appeared in "W.R." of Dec. 15th will most likely meet your requirements.

P. R. B. (Chadwell Heath).—I have a three-valve reflex receiver, the first valve acting as an H.F. amplifier, second as "dual," and third as L.F. amplifier, and as this set is very powerful I should like to be able to cut out the H.F. valve without having to revise the set and insert switches. Can this be done?

Yes, this can be done quite simply, and is a good plan if you wish to listen to local transmissions when the H.F. valve is not required. The best plan is to attach a fixed condenser of about .0001 mfd. capacity to a four-leg valve plug in socket, but neglecting the filament legs. Thus the two ends of the condenser are connected to the grid and plate pins of the valve plug, so that when the plug is inserted (in place of the valve) the H.F. impulses are passed straight through the condenser, and so on to the grid of the second valve. Slight alteration in tuning will be necessary, as the insertion of this condenser is bound to upset the tuning to a certain extent. On local transmissions very good results can be obtained by this device, no appreciable loss of signal strength occurring.

G. P. K. (London).—Can you give me a circuit for smoothing out the commutator ripples in an H.T. supply from D.C. mains?



The accompanying circuit should be quite O.K. By means of a bank of chokes and condensers, direct current with a superimposed commutator ripple may be effectively smoothed out. Such an arrangement is shown in the diagram.

This method of obtaining a "ripple-less" D.C. of high voltage is useful for power amplification and also for the transmission of telephony.

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BROWN Featherweight Headphones shown here turn the scale at just six ounces, including cords. They are, therefore, ideal for ladies and children where weight is an important consideration.

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120 ohms	58/-
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Its staggered magnets, polished ebonite earpieces, burnished aluminium cases, together with its glossy and comfortable headbands, combine to make the famous BROWN Featherweight a masterpiece of engineering production.

No wonder it holds the record for popularity—its sales have necessitated three-fold factory extensions in an honest endeavour to cope with the incessant demand.

Remember that the same thoroughness which characterises all BROWN products is manifested in every detail of manufacture. For your next pair of Headphones be sure to choose a BROWN—there is a type to suit your requirements and your pocket.

Featherweight

Brown Headphones

G. A., Ltd.



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.

Scarborough Radio Society.

On Sunday, December 23rd, a very successful concert was given to raise funds for this society. Artistes from the Scarborough theatres gave their services, and the concert was organised by members of the society.

Radio Association.

The hon. sec. expresses regret that, owing to the unprecedented demand for badges and pennants, which has far outrun the supply, he has been unable to fulfil all the orders he has received from members and branch secretaries; he has, however, made arrangements that all will be supplied in the near future. He would suggest to members that they should, wherever possible, procure their supplies from the branch secretaries, as this will help the branches financially and ease the work at headquarters.

Hon. sec., S. Landman, Sentinel House, Southampton Row, W.C. 2.

North Middlesex Wireless Club.

At the club meeting held recently at Shaftesbury Hall, Bowes Park, N., members who were present heard a lecture on "Selective Reception," by Mr W. H. Norvill, of Autoveyors, Ltd. The chair was taken by the president of the club, Mr. A. G. Arthur, who briefly introduced the lecturer.

Hon. sec., H. A. Green, 100, Pellatt Grove, Wood Green, N. 22.

Kensington Radio Society.

At the December monthly meeting the lecturer of the evening, Mr. L. Bland Flagg, showed, by means of diagrams, how to use the various types of jacks and plugs on multi-valve sets.

Hon. sec., Mr. Murchie, 33, Elm Bank Gardens, Barnes.

The Southampton and District Radio Society.*

The sequel to the recent crystal competition for the reception of Bournemouth broadcasting took place in December at the headquarters of the above society, when Dr. McDougall presented the prizes to the successful competitors.

Hon. sec., Mr. P. Sawyer, 55, Waterloo Road, Southampton.

Tottenham Wireless Society.

Prof. A. M. Low, A.C.G.I., D.Sc., the president of the society, was present on December 19th to talk on "Television."

Hon. sec., S. J. Glyde, Winchelsea Road, Bruce Grove, Tottenham, N.17.

Radio Association of Ireland.

A special meeting of the Radio Association of Ireland was held on Wednesday night, the 19th Dec., in the Wireless Department, Municipal Technical Institute, Kevin Street, Dublin, Mr. J. Honan presiding.

January 31st.—Paper on "The Oscillating Valve Viewed as a Converter," by T. J. Monaghan, B.Sc., A.M.I.E.E.

An interesting development is the production of "The Irish Radio Journal," which has been secured as the official organ of the association.

Dulwich and District Wireless and Experimental Association.

At a recent meeting, the first item on the programme after the ordinary business, was the

report of the meeting of the South London League of Radio Societies by the two delegates, Messrs. Bartlett and King.

Hon. sec., Mr. L. Pilbeam, at 499, Lordship Lane, East Dulwich, S.E. 22.

The Leeds Radio Society.*

The 46th general meeting was held in December, the president, A. M. Bage, Esq., occupying the chair. The past president of the society, Professor R. Whiddington, M.A., D.Sc., lectured upon "Atomic Physics."

On December 14th an open meeting and demonstration was held.

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



The boys at the King's Canadian Camp School, Bushey Park, enjoy an open air wireless concert.

Catalogues Book Reviews Etc.

Radio and High-Frequency Currents (3s. 6d. net, Crosby Lockwood & Son, Ludgate Hill, E.C.4). As a companion to "Alternating Currents, Their Theory and Transmission," which we had the pleasure of reviewing some short time ago, this book is admirable, and treats the subject with such an excellent thoroughness that it will doubtless be adopted as a standard textbook. All wireless amateurs desirous of studying radio work in such a way as to obtain a really good working knowledge of the theory of both reception and transmission, more in respect of the latter, cannot do better than obtain this book.

Some very fine headphones have recently been placed on the market by

Messrs. H. C. Phillips & Sons, Ltd., of 81, Turnmill St., E.C.1. These are very sensitive and are fitted with stalloy diaphragms and nickel-plated steel headband with the usual adjustments. The earpieces are of crystallate. These 'phones are sold at 17/6, and we understand that they are obtainable from most dealers.

Birmingham readers should note that they can obtain some very good apparatus at reasonable prices from F. J. Tickle, Hampton-in-Arden, Birmingham.

The Korland H.F. "Valve."

We have recently been requested to test out the Korland H.F. "valve" (Price 30/-). This "valve" requires no filament battery, and the makers state that: "High tension can be applied across the filament areas up to 20,000 volts without hurting it. It will not work on reflex-circuits, only straight-forward high-frequency circuits, tuned anode, transformer coupled, and reactance capacity coupling. It makes circuits extremely sensitive, and requires careful tuning. Reaction is to be a little tighter than in the case of an ordinary valve. Potential varies from 4 to 200 on plate."

We publish below the report of experiments made by our Technical Staff with this new "valve."

Results of Tests with Korland H.F. "Valve."

BY THE TECHNICAL STAFF.

On 2 L O at 15 miles: Ordinary valve H.F., second H.F., Detector, L.F. L.S. signals—R 10.

On 2 L O at 15 miles: Korland valve, H.F., Detector L.F. Signals (after retuning)—almost R 10; but signals less pure.

On 5 I T at 90 miles: First combination. L.S. signals—R 6.

On 5 I T at 90 miles: with Korland valve. L.S. signals—R 2 (after retuning).

On 2 B D at 400 miles: First combination, L.S. signals—R 4. On 2 B D at 400 miles: with Korland valve. L.S. signals—Nil.

Amplification factor appears to be about .6. Grid curve appears to assume a straight line horizontal across vertical axis. Used in reflex set I H.F. dual and L.F., the Korland operates inasmuch as it passes the H.F. from the H.F. valve to the crystal. Amplification still on the minus side.

N.B.—R=signal strength; L.S.=Loud speaker.

It will be seen from the above report that owing to the fact that H.F. amplification does not give marked increased volume of signals at short distances there is very little difference between the insertion of the Korland "valve" and the cutting out of the H.F. stage altogether.

But when the Korland "valve" is employed for H.F. amplification for distances exceeding the ranges covered by an ordinary detecting element, the Technical Staff have found no amplification whatever. In fact, the amplification factor was found to be on the minus side, and the grid curve assumes a straight line horizontal across the vertical. Therefore, we cannot recommend this "valve."

THE WEEK'S BROADCASTING PROGRAMMES.

SIMULTANEOUS BROADCASTING EVENTS.

Sunday, January 13th.—At 3.0 p.m. Organ Recital from Kingsway Hall. 5.0-5.30. Children's Corner S.B. from Bournemouth. 7.0. The B.B.C. Literary Critic.
 Monday, January 14th.—A Symphony programme by Augmented Orchestra.
 Tuesday, January 15th.—An evening of Plays—"The Blacksmith's Serenade." S.B. to Glasgow. The Rt. Hon. Stanley M. Bruce, M.C. (Prime Minister of Australia).
 Wednesday, January 16th.—The B.B.C. Dramatic Critic. 7.45. "Aida," Act 1 (Verdi), relayed from the Opera House, Covent Garden. S.B. to all stations except Manchester. 8.40. "Aida," Act 2. do. do.
 Thursday, January 17th.—7.0. The B.B.C. Musical Critic. Talk by the Radio Society of Great Britain.
 Friday, January 18th.—7.0. The B.B.C. Film Critic. 9.45. "Othello," Act 3, relayed from the Royal Opera House, Covent Garden. S.B. to all stations.
 Saturday, January 19th.—Dance Music. S.B. to all stations.

LONDON (2 L O).

Sunday, January 13th.—Address by the Rev. C. E. Raven, M.A., Rector of Bletchingley, Surrey. Suitable instrumental and vocal programme.
 Monday, January 14th.—Symphony Concert conducted by Mr. Stanton Jefferies. Maurice Cole, solo pianoforte.
 Tuesday, January 15th.—An evening of Plays produced by Mr. Nigel Playfair.
 Wednesday, January 16th.—"Aida," Acts 1 and 2.
 Thursday, January 17th.—Popular programme by the Wireless Orchestra.
 Friday, January 18th.—Popular programme, and a Studio Party with John Henry as the host.
 Saturday, January 19th.—Popular Dance and Instrumental programme.

BIRMINGHAM (5 I T).

Sunday, January 13th.—8.40. The Right Rev. Bishop Hamilton Baynes of Birmingham Cathedral.
 Monday, January 14th.—See simultaneous.
 Tuesday, January 15th.—Miscellaneous programme, including the Yardley Dramatic Society.
 Wednesday, January 16th.—See simultaneous.
 Thursday, January 17th.—Programme relayed from London.
 Friday, January 18th.—Pianoforte Lecture-Recital by Wilfred Ridgway.
 Saturday, January 19th.—Popular Orchestral night.

CARDIFF (5 W A).

Sunday, January 13th.—Address by the Rev. J. H. Lewis, B.D. Dvorak night.
 Monday, January 14th.—See simultaneous.
 Tuesday, January 15th.—Shakespeare night, "King John," by the Station Repertory Company.
 Wednesday, January 16th.—"Mr. Everyman." Programme from London.
 Thursday, January 17th.—Dance programme.
 Friday, January 18th.—The Caerphilly Male Voice Choir.
 Saturday, January 19th.—Popular night.

MANCHESTER (2 Z Y).

Sunday, January 13th.—The Very Rev. B. Butler. Pianoforte Solo by Edward Isaacs.
 Monday, January 14th.—S.B.
 Tuesday, January 15th.—Orchestral and vocal night.
 Wednesday, January 16th.—Choral and orchestral night, including Beethoven's Choral Symphony.
 Thursday, January 17th.—General Concert.
 Friday, January 18th.—The Garner Schofield Dance Band.
 Saturday, January 19th.—The Jester's Concert Party.

NEWCASTLE (5 N O).

Sunday, January 13th.—The Rev. George Aitken. Hermann McLeod's Quintet.
 Monday, January 14th.—S.B.
 Tuesday, January 15th.—General orchestral and vocal programme.
 Wednesday, January 16th.—S.B.
 Thursday, January 17th.—General Concert.
 Friday, January 18th.—Concert mainly relayed from London.
 Saturday, January 19th.—Dance night.

BOURNEMOUTH (6 B M).

Sunday, January 13th.—"Elijah" Part 2.
 Monday, January 14th.—S.B.
 Tuesday, January 15th.—Irish night.
 Wednesday, January 16th.—S.B.
 Thursday, January 17th.—The Bournemouth Welsh Male Voice Party.
 Friday, January 18th.—Third Symphony Concert—Russian Night.
 Saturday, January 19th.—The Blue Lagoon Dance Orchestra.

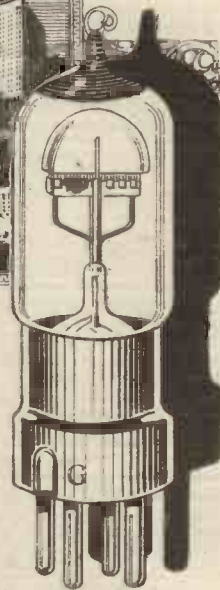
(Continued on page 758.)

Cossor



3 a.m!

—WJZ, WHAZ, WGY, and many other U.S.A. Broadcasting Stations are within easy reach of Cossor P.2 (red top) users



WIRELESS enthusiasts sufficiently keen to forsake the comfort of their beds at 3 a.m. should first make quite certain that they are using the right type of apparatus.

The aerial should be high, though not necessarily long, and its insulation should be above suspicion. Accumulations of soot and fog are certainly not conducive to long-distance reception—and a Saturday afternoon spent overhauling the aerial equipment will be time well spent.

The Receiving Set should contain at least one high-frequency valve, and this should certainly be a COSSOR P.2 (with red top)—the only Valve designed specifically for long-distance work. The other Valves should be of the P.1 type, recognised by all wireless experts as ideal for rectifying and amplifying the weak currents received over distances of several thousands of miles.

The secret of their efficiency lies in the fact that the hood-shaped Anode almost totally encloses the electron stream given off by the filament, whereas in other Valves a considerable proportion of this valuable emission is wasted.

Although we possess a number of letters from COSSOR users relating to their success in receiving American Broadcasting direct on one P.1 Valve only, we are inclined to think that these cases are freak results, and recommend that at least two Valves (one P.1 and one P.2) are necessary, while an additional P.1 as a Note Magnifier, to give a good volume of sound, would often be an advantage.

Reduction in Prices

From January 1st, the prices of Cossor P.1 and P.2 Valves have been reduced.

- P.1 For Detector and Low-Frequency amplification **12/6**
- P.2 (With red top) For High-Frequency amplification **12/6**

WUNCCELLS

The new Dull Emitters working on 8-volt and consuming less current than any valve on the market. One Battery only required—not three.

- P.3 (With green top) corresponds in characteristics to P.1 **30/-**
- P.4 (With blue top) for High-Frequency use... .. **30/-**

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to 59/6 per week, on enlistment, and all found.
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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
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First-class English make, 6V, 60-amp hours, 22/9 ea.
MAUDE RUBBER CO., 58, PRAED ST., LONDON, W.2.

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Magnetism and Electricity for Home Study. By
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ALL BRITISH 1 VALVE AMPLIFIER

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post 1/-. Complete parts for Crystal Vari-
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drilled ebonite panel, wiring plan, etc., everything
complete, 12/6, post 1/-. Particulars and general
list post free.

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Coomes' Crystal Set

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Variometer tuned, enclosed crystal. Fitted in
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not including accessories.

"IONOPHONE" Valve and Crystal Set, 18-18-0,
plus 6/- B.B.C. Fees. Not including accessories.
Particulars of our 2, 3, 4 and 5 Valve Sets sent
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Trade Terms on Request.

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Tel. No.: City 4460.
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Tel. No.: 1379.

THE WEEK'S BROAD- CASTING PROGRAMMES.

(Continued from page 757.)

GLASGOW (5 S C).

Sunday, January 13th.—The Rev. Eric A. Sutton, B.A.
Monday, January 14th.—S.B.

Tuesday, January 15th.—S.B., also Request Pro-
gramme by Orchestra.

Wednesday, January 16th.—The entire programme
from London.

Thursday, January 17th.—Orchestral night.

Friday, January 18th.—Percival Steeds, B.A., in
"David Copperfield."

Saturday, January 19th.—Orchestral night.

ABERDEEN (2 B D).

Sunday, January 13th.—The Rev. John E. Penman.

Monday, January 14th.—The Flashlight Concert Party
Tuesday, January 15th.—Classical night.

Wednesday, January 16th.—S.B. Local dance pro-
gramme.

Thursday, January 17th.—Vocal and instrumental
music. Aberdeen Battalion Boys' Brigade Band.

Friday, January 18th.—Mozart night.

Saturday, January 19th.—Students' night.



THE "MAY" CIRCUIT.

The Editor, POPULAR WIRELESS.

Dear Sir,—As another who has been
successful with the "May" circuit, I should
like to endorse the remarks of Francis
Fielding in a recent issue of your popular
journal.

Whilst offering my sympathy to James
Harvey, he need not be downhearted; he is
happily unconscious of the possibilities of
the circuit he so freely condemns, whilst he
hears the roar of 2 L O at 14 miles. I hear
6 B M, 250 miles, quite clearly when the
'phones are worn by someone else, and 2 B D,
370 miles, comes in quite easy, and is
wonderfully clear.

The new station at Brussels and L' Ecole,
etc., Paris, 400 miles, are very fine indeed.
They are easily picked up, but the adjust-
ments require to be very exact, the speech
then being of ordinary conversational
strength.

A variable leak and vernier rheostat are
invaluable with this set. With these and a
McClelland variometer failure seems im-
possible.

Being so impressed with my first trial of a
rough hook up of this circuit, I designed a
small compact panel to which variometer,
.001 cond, 'phones and batteries could be
quickly connected, making the set more
compact and easier to handle.

The writer knows several who get all the
British and French broadcasting stations
well with this circuit.

"EXPERIMENTER."

THE JAMMING PROBLEM.

The Editor, POPULAR WIRELESS.

Dear Sir,—I would like to comment upon
two letters appearing in a recent number
of your journal.

The first is signed by F. Woodward, of
Glasgow. He states that with the "P.W."
Combination Set and one L.F. valve he
receives the Glasgow station at a strength
equal to four valves. There are only two
charitable explanations to such an absurd

statement: Either he is hopelessly over-
stating the results due to his enthusiasm
for the circuit, or that he has never heard
a good four-valve set.

The other letter is one dealing with spark
jamming. I think that for pure selfishness
the average broadcast listener would take
first prize. He has already succeeded in
closing the amateur transmitter down, and
now he wants to close down the commercial
stations. Again, he usually uses very bad
instruments from the point of view of
selectivity, and then blames the transmit-
ting station. I admit that the spark stations
are not things of unadulterated joy, but on
the other hand the work they do is more
important than all the broadcasting stations
in the world.

What would be the use of sending the
S.O.S. on a sharply tuned C.W. set? I have
operated a set within eight miles of Land's
End station when it has been using 5 kw.,
and have had no difficulty in tuning him out
on ordinary loose-coupled circuits on the
amateur's wave-length of 440 metres. The
amateurs of two years ago put up with
jamming as an unavoidable evil, and
although they sometimes grouched, they did
not expect that the stations would close
down or even alter their method of trans-
mitting. I hope that some of this spirit
may reach the broadcast listener.

I am,

Yours faithfully,

A. S. BROWN.

103, Lower Road, S.E.16.

The Editor, POPULAR WIRELESS.

Dear Sir,—With reference to the letter
from your Cliftonville correspondent on the
above subject, I should like to mention that
during the three months I spent on the
Thanet coast this summer I found it
absolutely peaceful compared with what we
have to put up with on the South Coast. If
your correspondent wants to know what
interference is, let him pay a visit to our
district and try his wireless set. Not only
will he get the strong spark station at
Newhaven, but all the shipping in the
Channel thrown in.

Yours very truly,

A. AISBITT GIBSON.

Thalassa, 8, Aymer Road, Hove.

B.B.C. PROGRAMMES.

The Editor, POPULAR WIRELESS.

Dear Sir,—I shall be glad if you will
kindly allow a little space in your most ex-
cellent paper for a few remarks in reply to
your correspondent's letter, E. M. O.
(Beckenham), appearing in a recent issue.

I think E. M. O. is adopting a most un-
reasonable attitude when he so severely
criticises the programmes given to us by the
B.B.C. From the varied items which are
transmitted daily from 2 L O, surely there
is something that appeals to this grumbling
individual. Or has he reached that standard
of education that he has nothing more to
learn from such "talks" and music?

Finally, I would ask E. M. O. to study
carefully the programmes for the week
preceding Christmas, and if he still considers
them unsatisfactory, I would respectfully
suggest that he for ever holds his peace.

Yours faithfully,

R. W. TULLY.

6, Bedford Road,

Crouch End, N.8.

(Continued on page 760.)

HULLO, EVERYBODY!!

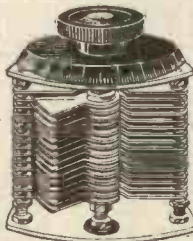
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Buy Best Goods at Low Prices.
No Post Orders at These Prices.

Terminals (comp. with Nuts), Telephone doz.	1/3
Large W.O. 4 for 5d., doz.	1/3
W. O. Pillar 4 for 5d., doz.	1/3
Small Pillar 1d. each; doz.	9d.
Switch Arm, 12 Studs and Nuts, the lot	1/-
Small Variometers, 250/650, with knob and bush	3/-, 2/8, 2/4
Larger Variometers, 250/650	4/9, 3/9, 2/11
Igranic Variometers, Ebonite, 350/650	15/-
2-Way Coil Holders, for Duolateral Coils, 5/6, 4/6	
3-Way Coil Holders, for Duolateral Coils, 6/11, 5/11	
Phillips R Type Valves	
Stop Pins, with shoulder ... 2 a 1d.; doz.	5d.
Fixed Condensers, .001 10d.; up to .005	1/3
Fixed Condensers, .006 up to .01	1/6
Valve Pins, doz. 6d.	9d.
2, 4, 5 B.A. Nuts	3 doz. 6d.
Basket Coils	Set of 6 2/-
Spade Terminals	doz. 4d.
Vario Couplers, with Knob, Wound D.C.C.	4/11
Glass Enclosed Whisker Detector	1/6
High-Class Whisker Detector (large), enclosed	2/6
Fine Perikon, 2 Crystals, enclosed	3/-
Small Perikon, 2 Crystals	2/-
Bell Wire, D.C.C., 1.C. 2 og.	10 yds. 6d.
Twin Flex	12 yds., 1/7; 4 yds., 9d.
Plug Coils, Ebonite	1/9
Extra Quality, ditto on base	1/9, 1/3
Pillar Terminals, Nut and Washer, 2 B.A. large	2 for 6d.
Switch Arms	8d., 9d., 10d., 1/-
Filament Resistances	1/8, 1/10, 2/-, 4/6
Igranic Resistances	7d.
Igranic Vernier	4/-
4 Cat's-Whiskers, one gold	1/4
Single Basket Coil Holders	1/4 1/2
Variable Grid Leaks	1/5
Bretwood Variable Grid Leaks, guaranteed 3 years	3/-
Pin Terminals, screw pattern, 1/3 doz.; 2 for Spade Terminals, screw pattern, 1/3 doz.	3d.
Shaw's Genuine Hertzite	9d., 1/-
Grid Leaks and Condensers, .0003, 3/-, 2/3, 1/-	
Valve Sockets, with shoulder	doz. 2/-
Basket Coils, Duplex Waxless, set of 5 for 100,000 ohm Resistance	1/6
Variometers on Ebonite, ball rotor, wound D.C.C.	8/11, 7/11, 6/11
D.C.C. Wound Tapped Coils	2/-, 1/9, 1/6
Double Phone Cords	pair 9 1/2 d.
Wound Coils, 12 by 4, best quality	2/6
Wound Coils, 6 by 3, best quality	1/9
D.P.D.T. Switches, special	1/3
S.P.D.T. on Ebonite	1/8 to 2/9
D.P.D.T. on Ebonite	1/11 to 2/3
2 B.A. Rod, 12 in.	2 for 5d.
Basket Coil Holders, for 3 coils	5/6
Plug and Socket, brass	pair 1 1/2 d.
Fixed Condensers, .01	1/6
Pocket Lamp Batteries (best)	6 for 2/3
Special Filament Resistance, very fine value	2/-
D.P.D.T., Nickel Switches for panel mounting	2/-
Fil. Res. Dials, 0-10	7d.
Real Ebonite Slider Knob and Plunger	6d.
Set of Names (12), engraved black or white	10d.
Insulated Hooks	each 6d.
Copper Foil	per foot 4d.
Best Zincite and Boronite, 6d. each, pair	1/-
Xtraudion Valves (E.E.C.)	15/-
Ebonite Turned Valve-Holder and Nuts	1/-
Shellac	bottle 5 1/2 d.
Tinned Copper, 16, 18, 20 gauge in stock.	
Formo Fil. Resistances, best	2/6
Accumulator (Rotax), 6 v. 80 amp.	33/-
" " " 4 v. 40 amps.	17/6
" " " 4 v. 60 amps.	21/-
Rubber Lead-in Wire, 10 yards	1/6

HONEST GOODS AT THE RIGHT PRICE.

RAYMOND VARIABLE CONDENSERS.



Without Dial.	
*001 6/6	
*00075 5/6	
*0005 4/9	
*0003 4/2	
*0002 3/-	
*0001 2/8	
Fully Assembled with knob, pointer, bush, screws and connections, aluminium end plates.	
*001 7/6	
*00075 6/9	
*0005 5/9	
*0003 5/2	

HEADPHONES.

4000 ohms "Sidde" genuine	14/9
4000 " Brunet	15/11
4000 " N. & K.	12/6
4000 " Fellow's Lightweight	18/6
Premier B.B.C. 4,000 ohms, very fine value	16/11
Sterling 4,000 ohms, latest model, B.B.C.	25/-
N. & K. Standard, latest model	14/9
Raymond, 4,000 ohms, high-class	12/11

ERICSSON "EV" TYPE PHONES
4000 ohms. Thousands sold last season.
Lovely tone. 13/9 per pair. Post 1/- pair

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MARCONI D.E.R.	21/-
EDISWAN A.R.D.E.	21/-
EDISWAN, COSSOR P.1	12/6
MULLARD ORA	12/6
MARCONI R	12/6

L.F. Intervale Transformers.

5-1 Radio Instruments, Ltd. (1)	25/-
5-1 Igranic shrouded (2)	21/-
5-1 Formo shrouded 18/- (3) Plain	15/-
5-1 Raymond	12/6

On Transformers (1) (2) and (3) goods to the value of 1d. in the 1/- given free to callers.

H.T. Batteries (very best only). No Post Orders.	
60 v. with plugs	8/9, 10/6 & 12/6
36 v.	5/-, 5/6 & 5/9

CRYSTAL SETS, ALL KINDS

10/6, 12/6, 17/6, 21/-, 28/6

EDISON BELL, LISSEN, DUBILIER parts stocked

LARGE NUMBER OF BARGAINS
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NO POST ORDERS except for goods in this column, and at prices marked, which include all post, rail and packing charges. U. K. only.
ALL ORDERS EXECUTED AT THE EARLIEST POSSIBLE MOMENT, IN STRICT ROTATION.

Accumulators, high-class goods, 4 v. 40 amps.	20/-
Fixed Condensers, .0003 to .001	1/4
Fixed Condensers, .002 to .005	1/8
Fixed Condensers, .006	2/-
Ebonite Valve Holders, 8 nuts, each 1/6, 3 for 4/-	
Ebonite Dials and Knob, turned ebonite, 2/-, 2/6	
D.P.D.T. Switches, small size, on ebonite base	3/3
S.P.D.T. Switches, small size, on ebonite base	2/9
Variable Grid Leak (Bretwood), guar. 3 yrs.	3/6
Variable Grid Leak, pencil pattern	2/6
Two-way Coil Holders, 3 qualities, all good value	5/6, 6/6, 7/6
Three-way ditto, as above	6/9, 7/6, 8/9
Twin Flex for Extension Leads, 12 yds.	2/3
Grid Leak and Condenser, .0002, .0003, .0005	2/9
Grid Leak, 2 megohms	1/4
Pin Terminals, screw pattern, for phone leads	6 for 1/-
Spade Terminals, screw pattern, for phone leads	6 for 1/-
Ebonite Coil Plugs, high-class article, each 1/3, 6 for 6/9	
4 Cat's-whiskers (gold, silver, etc.)	6d.
Bell Wire, D.C.C., I.R.C., 10 yds.	1/-
100,000 ohms Resistance	2/-, 2/6
Switch Arms, very good quality, complete with 12 studs	2/-
Valve Sockets, polished, with shoulder and nuts	doz. 1/6, 3 doz. 4/-
Shaw's Genuine Hertzite Crystal	1/6
Double Phone Cords, with screw terminals	1/6
Basket Coil Holders, for 3 coils, on stand	6/-
Basket Coil Holders, single, with coil plug	2/9
Filament Resistances (not cheap rubbish)	2/6, 2/8, 3/-
Very Special ditto (limited number)	2/9
Terminals, Telephone, with nut, doz. 1/9;	3 doz. 4/-
Terminals, Large W.O. pattern, with nut	doz 1/9; 3 doz. 4/-
Terminals, Large Pillar, with nut, doz. 1/9;	6 doz. 8/-
Terminals, Extra Large 2 B.A., with nut,	6 for 2/6, doz. 4/6
Variometers and knob, 250/650	4/6
Basket Coils, up to 3,500 metres, set of 6	2/6
Spring Washers	3 doz. 2/-
Crystal Detectors, all best quality, not Junk, Enclosed, large whisker	3/3
Crystal Detectors, enclosed, smaller whisker	2/9
Crystal Detectors, enclosed, large, Perikon, 2 crystals	3/9
Crystal Detectors, enclosed, slightly smaller ditto	3/3
Many Other Detectors, open type, 2/-, 2/6, 2/9, 3/-	
L.F. Intervale Transformers, Radio Instruments, Ltd.	25/-
L.F. Intervale Transformers, Igranic (shrouded)	21/-
L.F. Intervale Transformers, Formo, 15/-	18/-
L.F. Intervale Transformers, Raymond	13/9
Variometer, on Ebonite Ball Rotor	10/-
Igranic Variometers, Inside Winding	15/-
Sets of 12 Name Tabs, black or white	1/-
2 B.A. Nuts	per gross 1/10
Real Ebonite Slider Knob and Plunger	1/-
Insulating Sleeving, all colours, 6 yds.	2/9
Amplion Junior Loud-speaker	42/6
Best Knobs, Bushed 2 B.A.	4 for 1/6
Brunet Phones, 4,000 ohms	18/6
N. and K. Standard, 4,000 ohms	16/11
B.B.C. Best Phones, 4,600 ohms	17/11
Fellow's Lightweight Phones, 4,000 ohms.	
Similar to Brown's	18/6
D.P.D.T. Nickel Switches for panel m'nt.	2/6

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Cut to any size required in high grade easily worked material 1/2 in. thick, 1d per sq. in.; 3/4 in. thick, 1d per sq. in. Mail Orders—Add 6d. towards cost of packing and post. Panels drilled and/or engraved to your own paper pattern. It's cheaper than buying drills. Estimates free
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CABINETS YOU WANT.
"ICKETT'S CABINETS"—they're good value, from 1/6 each, highly polished. Cabinet (P.W.) Works, Albion Rd., Bexley Heath, S.E. Write for lists.



ANOTHER GOOD THING.

Yes! We have no Spaghetti. You don't need it if you use square tinned copper rod for wiring panels. Very efficient on H.F. circuits, it looks neat and stays put. 2 ft. lengths 3/- doz. plus post.

SPARKS RADIO SUPPLIES,
43, Great Portland Street, W.1.

The "Bastina" Valve Amplifier for Crystal Sets Gives wonderfully loud results. Price £4:1:0. Complete with Dull Emitter Valve and Batteries.
F. BASTIN & CO., 79, Tamworth Rd., CROYDON.

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Basinghall street, London, E.C. 2.

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AGAIN!—34ft. HANKS OF STRANDED COPPER RUBBER COVERED WIRE 1/3.

Post 3d.

Valves Repaired

WITH NEW BULBS AND FILAMENT. 7/6 POST FREE.

TECHNICAL ODDS AND ENDS.

The "Peanut" Valve.

THIS dull-emitter valve, more properly called the "Wecovalve" and familiarly known as the "Pipsqueak" is made by Mullard's, and marketed by the Western Electric and Radio Communication. It is extremely small, both in size and rating, but can put up a wonderful performance. It is particularly adapted for working on a dry cell, the filament consumption being 0.25 amp. at about 0.9 to 1.1 volts. For detecting, the anode voltage is 20, and for amplifying, about 20 to 45 volts. One rather useful little point that struck me is that, as the filament resistance is about 4 ohms, the ordinary rheostat works quite well, using about 2 volts, of course, instead of the usual six.

On Test.

This valve behaved very well on a reflex circuit, which, as you know, is a pretty good test. It gave signals with only 0.6 volts on the filament, and the signals came up to full strength at 0.9 volts. When the voltage was raised above 1.0 volts the signals were above average strength. It also behaved well as the second H.F. or L.F. valve, provided the filament voltage was kept well up to about 0.9. Incidentally, if you want to try it, take care to get the adapter, as it will not plug-in without it.

The Armstrong Super.

I was looking through some recent patents the other day, and came across the British Application of E. H. Armstrong, which deals with his famous Super Regenerator. Of all the dozens of descriptions of this circuit which I have read at different times, I never came across a better one than that which is contained in the specification. There are twelve circuit diagrams, showing different modifications of the main idea, and all fully described. In many cases, detailed values are given for the various components. In case you want to look it up, the British number is 182,135 (application date in Great Britain, June 26, 1922).

Reinartz Comes Second.

It must have been disappointing for John Reinartz, who only missed, by a few minutes, being the first American amateur to establish two-way communication with Europe. He was just beaten by F. H. Schnell (Traffic Manager of the American Radio Relay League), who was "on the air" at the time and was the first to make contact with M. Deloy, the well-known French amateur. Anyway, Reinartz had the satisfaction that all three used circuits designed by him.

Some Reception!

How is this for a record in selectivity? The U.S.S. "Colorado" received five different messages on one aerial, on wave-lengths of 600, 1,300, 2,300, 4,300, and 4,600 metres, whilst her transmitting aerial, a few feet away, was sending over 3,000 miles on 1,430 metres, with two 10 kw. water-cooled valves and a 45 amp. input—and all simultaneously! The transmitter, naturally, is a very special one, which emits a pure wave, free from harmonics and mush; otherwise the reception would have been hopeless.

A Neat Control Unit.

I saw an extremely neat two-valve control unit the other day, made by Kraut, of Ashley Street, Nottingham, which combines two rheostats, fixed condenser, and grid-leak all in the one unit. It thus provides practically a complete fitting for controlling an H.F. valve and detector, and struck me as a very handy unit for constructors.

J. H. T. R.

CORRESPONDENCE.

(Continued from page 758.)

The Editor, POPULAR WIRELESS.

Dear Sir,—In a recent issue you published a query from a correspondent who complains of a rushing noise in his 'phones when a tramcar enters his street.

Having experienced a similar nuisance and overcome it, the following may be of service to him and others.

Our earth wire was at that time connected to the house water-pipes, and, after numerous experiments in shielding, etc.,

without result, it was suddenly found that the interference was being caused by the street water-main lying close to the tram rail.

After disconnecting the wire from the water-pipe, and using a buried earth in the garden, the noise has been to all intents and purposes eliminated.

Yours faithfully,

"TWO-VALVE."

Bath.

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 **LAKE "G-W" SLIDER**. 100 per cent. efficient! Price 1/-, or post free 1/3 from J. & J. LAKE CO., 457, Romford Road, London, E.7. Some ENGLISH and Continental territories available



BOXES: We have very cheap line box parts ready fixing, 1/2" Find, hardwood, 8 1/2" x 7" x 6 1/2", 9" doz. sets, or samples 1/3 per set. D/D free, suitable Wireless boxes, etc. Buy now. **NORMANS, 59, Mount Pleasant, W.C. 1.**

BATY'S TUNED ANODE, 300/1000 metres, 12/6 complete. Condenser Coil and Grid Condenser. "We find it very satisfactory and tuning extremely accurate." "Popular Wireless," Nov. 24th. **ERNEST J. BATY, 157, Lunstable Road, LUTON.**

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50ft Sent anywhere. Ask for 0/- Gift Voucher Value, 8/6 off above price. For 14 days only. List 2d. Amateu used by service. 1ms road. All right

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. **JOHN W. MILLER, 70-71, FARRINGTON STREET, E.C. 4.**

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To improve reception and get Louder signals, clean your Crystal with CARBON. In bottles, PRICE 6d. of most dealers, or sample for 7d. (stamps) direct from: **THE LONDON SCIENTIFIC SUPPLY CO., 56-56, Chancery Lane, London, W.C. 2.**

SINGLE RECEIVERS.

2,000 ohms, guaranteed O.K. British Manufacture 4/6. Continental 3/9. Post 4 pence. **Double Headphones, 4,000 ohms. British 10/- per pair. Continental 8/- per pair. Post 6 pence.**

All goods guaranteed tested on Crystal. **F. HOWE, 67, Little Heath, Charlton, S.E. 7.**

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HENRY BUTCHER & Co.

Have Received Instructions to Sell by Auction on

THURSDAY, JAN. 17th, 1924

AND FOLLOWING DAY at 11 a.m.

Large Quantities of Ex-Govt.

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Accessories, Material, Stores, Cable, etc. Comprising Approximately 300 Marconi Tuners, 10,000 Telephone Jacks & Plugs, 100 miles V.I.R. and Lead-Covered Cable, 1,250 Single Earphones, 500 pairs Headphones, 500 "Marconi" Condensers, 45 "Marconi" Wireless Sets, 200 2-way Telephone Switches, 100 "Marconi" Inductances, 2 8-Valve Amplifiers, 500 Telephone Boxes, 200 cwt. Telephone Cord, 10 Field Telephones, 2,000 Telephone Jacks, 12 Telegraph Sets, 12 "Marconi" Detectors, 60 Aeroplane Indicators, 50 Portable Telephones, 100 Telephone Relays, 500 Ebonite Accumulator Cases, 150 Induction Coils, 100 Morse-Tapping Keys, 25 Liquid Compasses, 100 Glass Battery Tanks, 6,000 Sheets Thin Ebonite, 1,000 Tripods, 60 Coils 42g. Wire, 3 cwt. Black Enamelled Wire, 19 8.W.G. 14 large X-ray Spark Coils, 14 Mahogany Surgical Cases, 50 Galvanometers, 12 Clinometers, 2 Automatic Primer Meters, 200 pairs Receivers, 100 Hand Sets, 300 Dewar Switches, 21 Vibrating Sets, together with large quantities of Marconi instruments of every description.

ON VIEW 3 DAYS Preceding Sale Day and Morning of Sale. Catalogue (if ready) may be obtained from Messrs. **HENRY BUTCHER & Co., Auctioneers, Valuers and Surveyors, 63 & 64, Chancery Lane, London, W.C. 2.**

Why do you clean a Joint?

The current dealt in by your receiver is only small, but it is precisely for that reason that all sources of loss must be avoided—that is why you clean a joint before soldering. That is the reason, too, for carefully choosing the lay-out of your receiver, short leads, and so on. **BUT MOST VITAL OF ALL ARE THE PARTS THEMSELVES WHICH YOU USE, for a receiver is built of parts, and IF IN EACH PART THERE IS A LOSS OF EFFICIENCY, NO MATTER HOW SMALL, THINK HOW THIS AFFECTS THE FINISHED INSTRUMENT.**

1. Your variable condenser must not absorb any of the power put through it. (LISSEN Mark II. Mica Variable (prov. pat.) Condenser turns through 720° of scale.)
2. Your Vernier Condenser in H.F. circuits should be capable of the finest possible variation of capacity—it should have small area to influence or be influenced by stray capacity.
3. Your fixed Condensers should be silent, constant, unaffected by temperature change—they should DELIVER ALL THEIR STORED-UP ENERGY. (Prices: LISSEN Fixed Condensers '0001 to '0009 capacity, 2/-; '001 to '002, 2/6; '003 to '006, 3/-.)
4. You cannot expect to get distant stations if your radio frequency amplification has any peaks and depressions within its range.
5. If you wish to make your receiver exceptionally sensitive you can employ a component in the anode circuit of the first H.F. valve, which will provide fully variable non-radiating reaction, and make your receiver so responsive that under many conditions reception is possible without both aerial and earth connections.
6. If you use a Variable Grid Leak, be sure the resistant element is one which is chemically correct.
7. The same thing applies where a stabilising resistance is required.
8. If you are using a "straight" circuit, your first stage transformer is important, for here you can make or mar your reproduction.
9. For reflex circuits use a transformer which is peculiarly adapted to meet the conditions present.
10. Where a light transformer is desired, get one of the best you can.
11. When choosing an inductance, make sure it covers a wide range without loss of efficiency at any point.
12. Your filament control should be one which will enable your valve to detect with great clearness.
13. If you use plug-in coils, use only coils with which it is possible to obtain a coupling purely magnetic, so that the coils can be kept as far apart as possible, in this way obtaining extremely sharp tuning.

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 mfd. condenser in parallel.			TABLE 2. Wavelength range when used as Secondary Coils with .001 mfd. condenser in parallel.		
No. of Coil	Minimum Wavelength.	Maximum Wavelength.	Minimum Wavelength.	Maximum Wavelength.	PRICE
25	185	350	100	325	4/10
30	235	440	130	425	4/10
35	285	530	160	490	4/10
40	360	675	200	635	4/10
50	480	850	250	800	5/-
60	500	950	295	900	5/4
75	600	1,300	360	1,100	5/4
100	820	1,700	500	1,550	6/9
150	965	2,300	700	2,150	7/7
200	1,885	3,200	925	3,000	8/5
250	2,300	3,800	1,100	3,600	8/9
300	2,500	4,600	1,400	4,300	9/2

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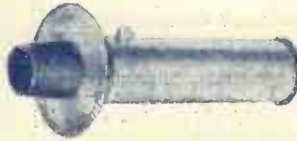
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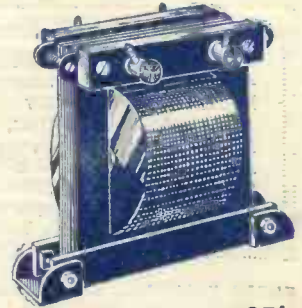
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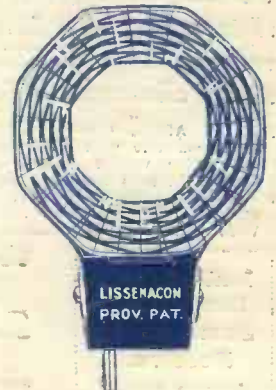
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