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# Amateur Wireless

And Electrics

Vol. VIII. No. 197

SATURDAY, MARCH 13, 1926

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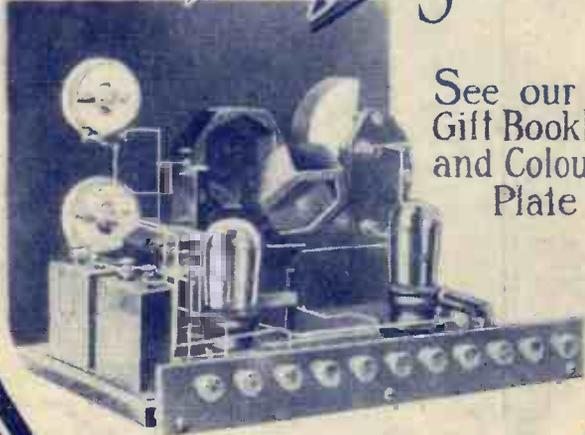
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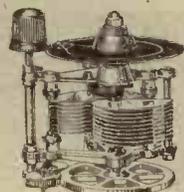
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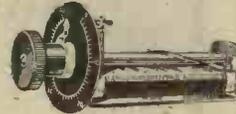


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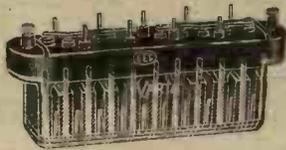


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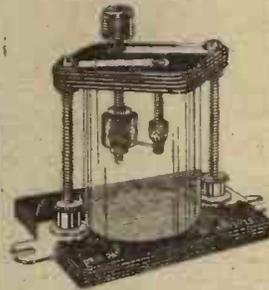
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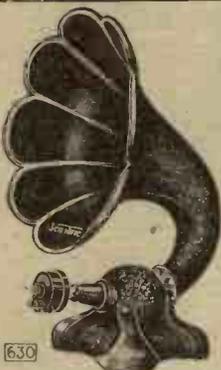
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# Amateur Wireless

## and Electrics

The Leading Radio Weekly for the Constructor, Listener  
and Experimenter

Vol. VIII. No. 197

Edited by BERNARD E. JONES  
Technical Adviser: SYDNEY BRYDON, D.Sc., M.I.E.E.

MARCH 13, 1926

### Chief Contents

	PAGE
Indoor Aerials for Crystal Sets - - - - -	403
An Improved High-tension Battery - - - - -	405
Improvising Neutralising Condensers - - - - -	406
Next Week at 2 L O - - - - -	407
The B.S.A. Four-valver - - - - -	408
On Your Wavelength - - - - -	413
The Telestereograph - - - - -	415
What a Valve is Made Of - - - - -	415
Our Information Bureau - - - - -	416
A Simple Hartley Receiver—20-200 Metres - - - - -	417
"A.W." Tests of Apparatus - - - - -	418
Practical Odds and Ends - - - - -	419
A Four-valve Receiver for Family Use - - - - -	420
Modern Travel—A Probable Innovation - - - - -	423
Programmes and Policy - - - - -	426
Wireless in the Queen's Hospital, Birmingham - - - - -	428

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General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets.

Contributions are always welcome, will be promptly considered, and if used will be paid for.

Queries should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed.

Communications should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," La Belle Sauvage, London, E.C.4.

## INDOOR AERIALS FOR CRYSTAL SETS

IN view of the results of some experiments that I have carried out recently, I am beginning to wonder whether crystal users who live in or near a broadcasting centre are not wasting a good deal of time and money by erecting outdoor aerials, for with a special type of indoor aerial, which costs less than two shillings to erect, really wonderful reception is obtainable in most cases at quite big ranges.

Until lately I have always regarded my own house as a blind spot so far as indoor aerial reception is concerned, for even with a valve set I can obtain only the poorest results when a frame is used. This idea, however, has been entirely changed, and at the present time I am obtaining with an indoor aerial crystal

reception which is quite as good as that given by the outdoor wire. My station is between twenty-five and thirty miles in a straight line from 2 L O and about forty from Daventry. Both of these come in really well with the indoor contrivance, and when the latter is not working Radio-Paris is often to be heard. Recently I was consulted by some friends living at Hampstead who much desired to install a crystal set, but feared that they would not be able to do so since there was no possibility of erecting any kind of outdoor wire. Rather wondering what would happen, I rigged up a trial crystal set from odd parts and installed an indoor aerial of the kind which I previously found so successful. As soon as the catwhisker touched the crystal 2 L O's afternoon transmission came in at such strength that music was clearly audible a yard or more away from the telephones.

When a good set was bought and wired

up signal strength with two pairs of telephones in use was quite as great as is comfortable, and I am sure that a small loud-speaker would have given ample volume with the addition of a single note magnifier. In this particular case the aerial is installed in a first-floor room and the house itself is surrounded by tall buildings.

I am not claiming that with the indoor aerial it will be possible everywhere to obtain clear reception of a main station up to thirty miles, or that in every house the signal strength of a local station will be as great as it is in this case at Hampstead. My point is rather that here are two instances of excellent reception in different houses on an indoor aerial, and

that it may be well worth while for those who would like to have receivers but are prevented for any reason from putting up an outdoor wire to see whether an indoor aerial will work satisfactorily in their homes. Other experiments in different localities have all been equally successful with but a single exception. To make the test is not a costly business; if it succeeds, then a set may be installed, whilst if the indoor aerial does not give satisfactory results one is little the poorer financially.

### Materials

The materials required for the type of indoor aerial recommended are ½ lb. of No. 20 double-cotton-covered wire, which will cost 1s. 6d. or so; from four to six small "egg" insulators at about a penny apiece, some stout string and a few nails. When the aerial has been put up it will not usually be difficult to induce a friend to bring his crystal set and try it out.

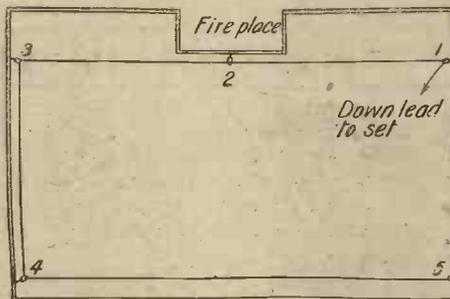


Fig. 1.—An Efficient Indoor Aerial.

Fig. 1 shows the way in which the aerial is fitted up in a typical room. To each of the insulators a short piece of string is fastened, and they are fixed by means of this to nails driven into the picture rail. Should there be no picture rail, Rawlplugs and screw-eyes may be used instead. The number of insulators used will depend upon the size and shape of the room. If there are few projections four may suffice, whilst six may be necessary in some cases. Fix up the insulators first of all, mounting them so that they will carry the wire four inches or so from the wall. If there is no picture rail the Rawlplugs should be put in from a foot to eighteen inches below the ceiling. Now get a friend to hold the reel of wire and pass the end first of all through the insulator from which the down-lead to the receiving set is to be taken. Carry on from insulator to insulator, merely passing the wire through each and not making it fast in any way until the last one (5 in Fig. 1) is reached. Make the end fast here, taking it twice through the hole in the insulator and then twisting it two or three times round the standing part of the wire.

**A Good Earth Necessary**

Now go back to the starting point, pull the wire tight, and measure off sufficient to reach the aerial terminal of the receiving set with about a foot to spare. Keeping the wire stretched, pass its end twice through the first insulator and make fast by tying it in a single knot and pulling tight. If you use white double-cotton-covered wire, white insulators and white whipcord (obtainable from any saddler) instead of string, the aerial will be quite inconspicuous. With the indoor aerial a good earth is essential. This may be obtained by running a length of the wire—there will be plenty left on the reel for the purpose—to a water-pipe and fixing it either by solder or with an earth clip, which can be bought from any wireless shop. Do not forget that the water-pipe must go direct to earth.

Those who wish to construct crystal sets especially for use with an indoor aerial will find it worth while to pay some attention to the question of efficiency. A circuit which I have found extremely good for this kind of work is that shown in Fig. 3. C1 and C2 are both variable condensers of good quality, each having a capacity of .0005 microfarad. If only one variable condenser is used it should occupy the position of C1—that is, it should be in series with the tuning coil. The coil itself may be a No. 60 plug-in inductance, or one of suitable size may be made up on a low-loss former, the turns being air spaced. In Fig. 4 is seen another circuit with which I have had very good results on an indoor aerial. The inductance here is of a pattern which has rather gone out of fashion during the last two or three years for wireless reception. It is a coil wound with enamel-covered

wire and provided with a slider which travels upon a 1/4-in. square brass rod. Many old hands at the game will have a coil of this type on their shelves, though probably it will contain far too many

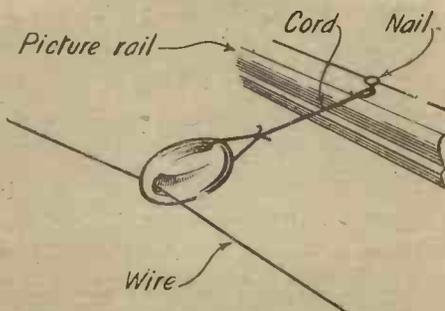


Fig. 2.—Method of Supporting Aerial.

turns, since most coils were made to tune up to 2,000 metres or more.

It is easy to find by experiment how many turns are required for the purpose and to remove the others; or, better still, a new inductance specially wound may

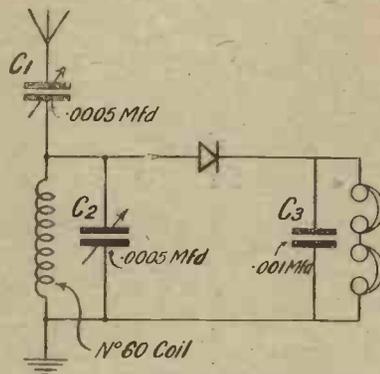


Fig. 3.—A Recommended Circuit

be made up and mounted between the old end-pieces, the slider rod being considerably shortened. If desired, the slider may be dispensed with, the coil being tapped at the middle turn and then at every second or third turn to within about ten

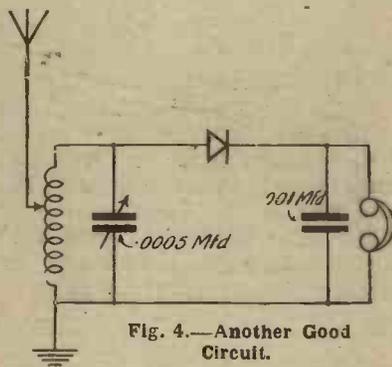


Fig. 4.—Another Good Circuit.

of the earth end. Whichever method is adopted, the best position for the aerial connection is easily found by experiment. Remember, though, that the "best position" for an indoor aerial may be quite different from that for an outdoor wire.

Unless he is fortunate enough to live within crystal range of two main stations

the user of an indoor aerial will be "tied" to the transmissions of one station; this would, however, be the case anyhow in such circumstances with a crystal set even if an outdoor aerial were used. There is thus no need to make the set ultra-selective, and when one is close to a main station tuning becomes noticeably flat, though it is usually rather sharper with the indoor aerial than with the outdoor.

I feel that if the possibilities of the indoor aerial were realised large numbers of people who at present are doing without wireless either because they cannot erect an outdoor wire, or because they have some objection to doing so, would find that there is no longer any reason why receiving sets should not be installed. There are others, again, who are deterred from making use of wireless by the cost of putting up an outdoor wire. To them the two-shilling indoor aerial may come as a boon and a blessing. THERMION.

**CONDENSERS AND TUNING RANGE**

THE tendency to-day is to use quite small variable condensers in parallel with the various tuning coils of the set. With a condenser whose maximum capacity is not greater than .0003 microfarad quite a big wavelength range can be covered, provided that the capacity is really small at the minimum setting. It used to be considered good enough if the minimum capacity of a variable condenser was about 10 per cent. of the maximum. To-day we look for something much better than this.

When buying a condenser obtain, if possible, guaranteed minimum capacity figures. If these are not available, turn the moving plates to the zero position and examine them to see that they are right out of mesh with the fixed. If the moving plates are thick, the spacing between them and the fixed is small, and if they are never quite out of mesh then the minimum capacity of the condenser will be high and the tuning range will be comparatively small. H. W.

A motor-car specially built and equipped for the Post Office will be brought into use in a few weeks' time to trace "howlers." The car, which will be fitted with the latest type of direction-finder, portable receiving set and frame aerial, will patrol London areas affected until oscillators have been hunted down.

The Birmingham station has been permanently connected by land-line to the Memorial Carillon tower at Loughborough, in Leicestershire, which contains the finest and largest combination of bells in the country. Recitals of bell music will be frequently relayed to 5IT and occasionally to 5XX.

# AN IMPROVED HIGH-TENSION BATTERY

WHEN a section of an ordinary H.T. battery "gives out" or otherwise develops a serious defect, it is usually necessary to purchase another complete battery. A minor defect may sometimes be located and cut out by pulling the battery to pieces, but such an undertaking involves a good deal of trouble and, being an extremely "messy" job, does not appeal to the average enthusiast.

The battery to be described is designed on the visible and interchangeable section

teries then being connected together in series via the spring strips, which press firmly down upon the positive and negative strips of adjacent batteries.

The box is made from good-quality hard wood  $\frac{3}{8}$  in. in thickness, the outside dimensions being  $9\frac{7}{16}$  in. by 6 in. by  $3\frac{1}{2}$  in. deep, and the central partition being equal in depth to the height of the cardboard battery casings. There should be a space of  $\frac{1}{2}$  in. between the tops of the battery casings and the top edge of the box.

The lid of the box, a most important affair, should receive special attention. This should be cut from a selected piece of hard wood and carefully fitted flush over the top of the box. It should be marked off and drilled as shown in Fig. 3 and fitted with 21 valve sockets, 19 long strips and two short strips, these being arranged as shown in Figs. 1 and 2. The figures against each socket hole indicate the voltage at each step. The long strips are  $2\frac{1}{4}$  in. long by  $\frac{3}{8}$  in. wide, and the short strips  $1\frac{1}{2}$  in. long by  $\frac{3}{8}$  in. wide.

Fig. 4 shows the method of attaching the strips to the under side of the lid. A small brass washer is placed under the shoulder of each valve socket, the strips

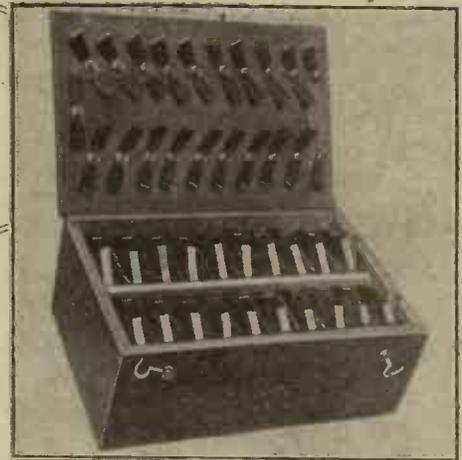


Fig. 1.—The Battery Open.

positive (short strips) nearest the hinged side of the lid. This is most important. (See Fig. 2.)

Next and finally comes the adjustments

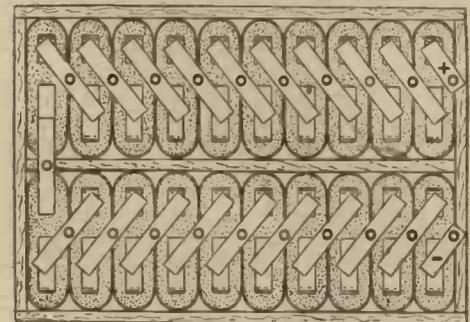


Fig. 2.—Arrangement of Contacting Springs.

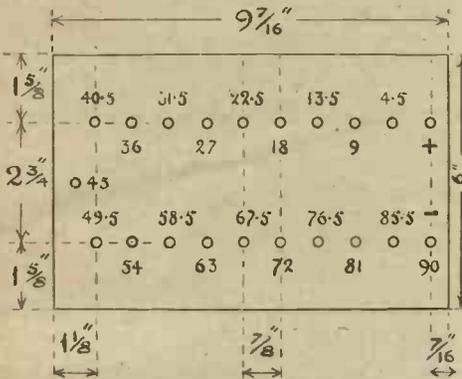


Fig. 3.—Layout of Lid.

principle, as distinct from the more orthodox block system, each section comprising an ordinary  $4\frac{1}{2}$ -volt flashlamp refill (standard size), which can be replaced at any time with the absolute minimum of trouble and expense. Moreover, one does not have to wade through the usual process of soldering all the sections together in series; these connections are made automatically by simply closing the lid of the wooden casing. The construction of the device can be successfully undertaken by any beginner, and the necessary materials and parts are simple and easily obtained.

The accompanying photographs and sketches should make the idea quite clear. Twenty standard-size  $4\frac{1}{2}$ -volt flashlamp refills are placed in a two-compartment wooden box which is fitted with a flush wooden lid carrying, on the under side, a series of short springy brass strips so arranged to connect all the batteries in series when the lid is fastened down. The strips are attached to the lid by means of ordinary valve sockets, so that each socket may be utilised as a tapping point at the junction where the negative pole of one battery joins the positive pole of another. Thus by using twenty  $4\frac{1}{2}$ -volt batteries we have a 90-volt H.T. unit which is variable in  $4\frac{1}{2}$ -volt stages from  $4\frac{1}{2}$  to 90 volts. Fig. 1 shows the general arrangement of the device, and Fig. 2 shows what happens when the lid is closed, the bat-

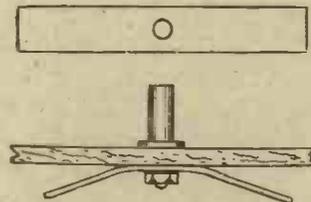


Fig. 4.—Method of Attaching Strips to Under Side of Lid.

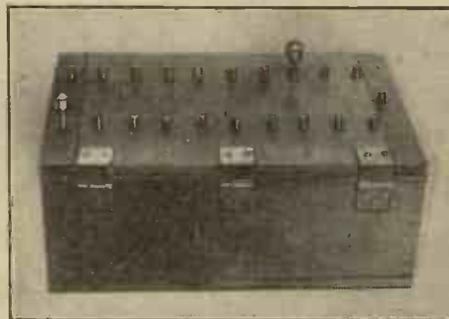


Fig. 5.—The Complete Battery.

then being simply clamped under the nuts of the sockets on the under side and bent down to the approximate angle shown.

The lid may now be attached to the top of the box by means of two or three strong hinges, preferably of the type shown in Fig. 5, and two stout fasteners, and the batteries placed in position, with all the

to the contact strips and battery strips, the latter being bent well up, and shortened if necessary, and the former swivelled slightly to right or left in order to engage their respective batteries and then tightened.

To make quite sure that all strips are making efficient contact between the batteries, a simple test should be made by means of a pocket voltmeter or a 4-volt bulb between each pair of sockets, and if necessary the lid should be opened and further adjustments made to the strips which correspond with any doubtful sockets. If all the strips are properly adjusted the lid may remain closed until the battery becomes exhausted through hard use, when it is then only necessary to renew the refills, or until it becomes necessary to renew any section which may develop a premature defect.

The writer can confidently recommend this as a most interesting proposition to any reader who would effect that much-talked-of economy in plate current.

O. J. R.

The wavelength of the Berne station in Switzerland has just been changed from 315 to 302 metres. Gratz has decided to transmit on 397 metres, as its previous wavelength was found to interfere badly with Newcastle.

# IMPROVISING NEUTRALISING CONDENSERS

A PERSONAL EXPERIENCE

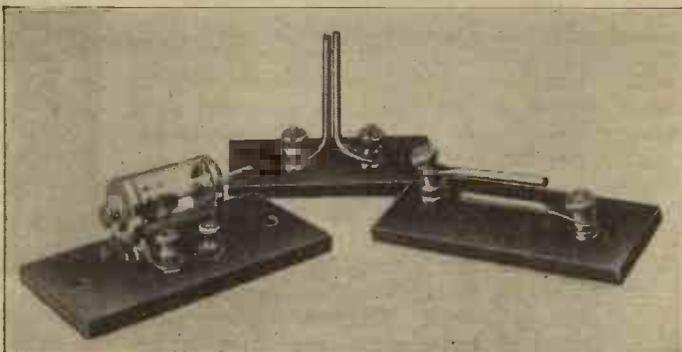
THE arm-chair beckoned. In my hand was the latest thriller, and my favourite pipe was in full blast. I was content, and the worries of the office receded into infinity, when in burst Timkins—I call him The Tinker—in a rush as usual.

"Charlie, old boy, have you got a balancing condenser to spare? I have almost completed my new Harmodyne, and now I am hung up for the sake of a little condenser!"

"As a matter of fact I haven't, old boy," I replied, "but we can surely improvise one." Regretfully I left my cosy corner and page one of one of the most promising thrillers.

In The Tinker's attic workshop—beg pardon, laboratory—we took stock of the various contents of many scrap-boxes; all kinds of odds and ends were set aside, and two hours' work saw three brand-new types of neutralising condenser.

The first one proved the easiest to construct, for a discarded crystal detector needs only a slight modification to be turned into a very efficient balancing condenser. One of The Tinker's scrap-boxes yielded two large terminal nuts; these were to form the "plates" of our condenser. A short length of screwed brass rod was fitted into this nut, the whole passed through the hole in the crystal cup, and secured there by a second nut. The latter is hidden in the crystal cup, for the original cover of



Three Novel Neutralising Condensers.

the cup had to be replaced on account of The Tinker's plea: "Better put it back, old man, for I thought of building a new reflex, the Orthodyne, next week."

The other nut was reamed out to fit over the end of the catwhisker arm, and forced into position by a few gentle hammer taps. A small ebonite base was next cut from a scrap panel, and our balancing condenser was complete.

To prevent the two "plates" touching, which might have disastrous effects in some circuits where the full H.T. is across the balancing condenser, one nut was covered with a thin sheet of mica. This was cemented on with shellac varnish.

We had caught the fever, and looked around the laboratory for other odds and ends that could be made into neutralising condensers. Seeing some pieces of very thick copper wire, The Tinker suggested that they might be used as the "plates" of a tiny condenser. The idea seemed good, and we set to work; the result was one of the simplest condensers ever made. Two pieces of the thick copper wire, each about

2½ in. long, were flattened out at the end, and two holes were drilled through the flattened portion to take a binding post. To prevent the wires touching each other, one wire was raised ¼ in. above the other by placing a nut under one of the terminals. The capacity of this condenser is adjusted by swinging one of the wires nearer or farther away from the other. The

binding post serves not only for making connections, but also for locking the copper wire in the correct position.

The Tinker was highly pleased with his brain wave, and admired the new condenser between puffs at his pipe. (All true experimenters smoke pipes, by the way!) He had only one complaint to make: "A bit on the big side, don't you think?" He suggested bending the wires upwards, and so balancing condenser No. 3 saw the light. The general construction was similar to the previous effort, only the wires were bent upwards about ¼ in. from the holes in the posts.

To prevent a short-circuit caused by the wires touching seemed rather difficult, until we finally decided to slip a short piece of glass tube over one of the wires. With his usual speed The Tinker began to file cuts into the one and only piece of glass tube he had. As one would expect, the tube broke several times, until only a piece about 1 in. long was left. This he handed to me, to make the best of a bad job.

C. A. O.

## HINTS ON USING POWER VALVES

THE chief purpose of the power receiving valve is to secure a good measure of pure undistorted amplification in the note magnifier. The valve is kept working on the straight portion of its characteristic curve by means of a high anode potential, with a corresponding negative bias on the grid.

In the interests of economy, it is advisable to have an accumulator H.T. battery to supply the high plate voltage. The accumulator H.T. is absolutely noiseless and is a great improvement on the dry battery, especially where loud-speaker reception is concerned. Either dull- or bright-emitter power valves are obtainable and both types give equally good results. For 6-volt accumulators such types as the L.S.5 and the Mullard D.F.A.1 are recom-

mended. There are also numerous valves now on the market of the 3- and 4-volt class.

In conclusion, the reader is strongly advised to try the effect of a good power valve in his L.F. stage. Not only will the volume be increased, but the tonal purity will be immeasurably improved.

G. M.

## STABILISING THE CATWHISKER

CRYSTAL users who are troubled with the catwhisker being shaken off a sensitive spot on the crystal may try this method of overcoming the difficulty. Obtain a piece of fine muslin and tie it on to the crystal cup, thereby covering the surface of the crystal.

It will be found that the muslin will keep the catwhisker in place.

M.

## TESTING THE H.T. BATTERY

THE H.T. battery, particularly if composed of flashlamp batteries, should be tested frequently. A voltmeter is usually recommended, but readings taken unit by unit with a cheap voltmeter are apt to be misleading. A 4½-volt unit that is "dead" for all practical purposes will often give a reading of about 3 volts in such circumstances, and may be allowed to retain its place in the H.T. box under false pretences.

A simpler and, in the writer's view, a more reliable test is to put a 3½-volt flashlamp bulb across each battery. Such a bulb requires an appreciable current to light the filament brightly, and if each unit that fails to cause the lamp to glow is discarded, little trouble is likely to be experienced.

H. P.

# NEXT WEEK AT 2LO

By THE LISTENER

A GENIAL atmosphere prevails in the London programmes of next week. On Sunday afternoon the concerted music will be provided by the band of H.M. Grenadier Guards, with the solo violinist Issy Schlaen, a brilliant young player well known in the classical musical world. The singers are Miss Carmen Hill, the famous Chappell ballad concert singer, and Miss Dorothy Freshwater, who will give three poems with musical settings. The evening programme will be carried out by De Groot from the Piccadilly Hotel, with Mr. E. Murray Stewart as vocalist.

The programmes for Monday are also of a miscellaneous type. The first three-quarters of an hour include folk songs by the Galloway Duo, with Mr. Foden Williams as entertainer, followed by syncopated duets by Mr. Ronald Munro and Mr. Harry Mills.

At 8.40 commences the relay from the Alhambra Theatre, Bradford, where the B.N.O.C. are concluding a spring season. The last act of *Rigoletto* will be given.

Later follows Mr. Albert Sandler and his orchestra at Eastbourne. The first of the week's "feature" items is a recital of Indian music by Miss Maud McCarthy. This singer has studied her songs in Benares and Madras, and comes recommended by Rabindranath Tagore, whose songs she sings. In private life she is the wife of Mr. John Foulds, composer of the "World Requiem" and other works. Miss McCarthy accompanies herself on a unique instrument, the vina, which is like an extended guitar with two

Samuel Kutcher's arm will be sufficiently recovered from a recent accident that he may lead. He is well known also as leader of Mr. Anthony Bernard's London Chamber Orchestra, as well as of the Trio, in which he joins issue with Mr. Adolphe



Photo: Langflier Ltd.

Solomon

Hallis (pianist) and Miss May Mukle ('cellist).

Mr. Hallis is the pianist of the evening, and he will assist the Kutcher Quartet in Mr. Vaughan Williams' work "On Wenlock Edge," the vocalist being Mr. Tom Goodey, the principal tenor in *The Immortal Hour*, in which opera he is taking the place of Mr. William Heseltine.

most programmes. At 8 o'clock the bells of Armagh Cathedral will be relayed. Light orchestral items are in the programme, with favourite Irish ballads by Miss Molly O'Callaghan, recitations by Florence Marks of the Belfast station, stories by Mr. Jerome Murphy and songs by Mr. Denis O'Neil.

The rest of the week contains two important broadcasts: On Thursday the great German conductor, Mr. Felix Weingartner, conducts the Wireless Symphony Orchestra in the London studio. The programme includes Schumann's Pianoforte Concerto in A minor, for which the famous pianist Solomon makes his first appearance before the microphone. He will be remembered for his London debut as a child prodigy pianist in June, 1910, when so great an impression was made that later a committee provided funds to enable him to complete his studies. He has studied now under Mathilde Verne, Rumschisky, Cortot, Lazare-Levy and Dupre in Paris, and has just returned from a tour in America.

Lighter fare prevails on Friday, when a musical version, arranged for broadcasting, of Offenbach's *Daughter of the Drum Major* will be given.

The week's feature is the performance by the Shakespeare-Rutterford Trio. This consists of Lloyd Shakespeare, famed for his cornet playing, Mr. Ernest Rutterford, the concertina and saxophone artiste, and Miss Gladys Millage, solo pianist.

For the closing of the week Saturday has a version of the ever popular "Under Two



Felix Weingartner.



Carmen Hill.



Foden Williams.

bodies, a large and a small one, with long strings between.

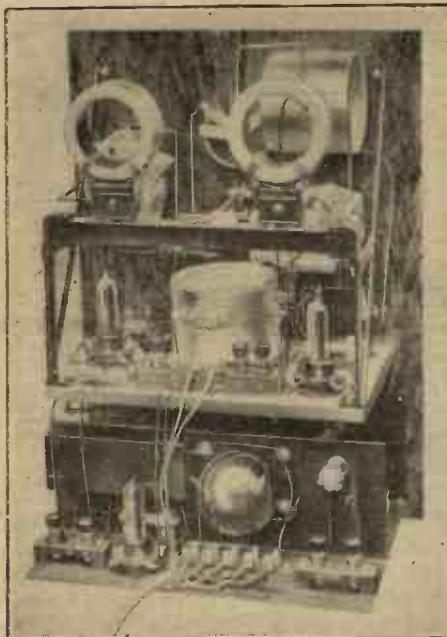
The chamber music for Tuesday is announced to be given by the Kutcher Quartet, and it is to be hoped that Mr.

Later will be given a short pianoforte recital by Miss Marcelle Meyer, the French pianist.

Wednesday is St. Patrick's Day, and naturally the Irish element will prevail in

Flags," by Ouida, which will be given in the form of six "radioviews."

At 9.40 is announced to appear before the microphone the comedian known as "Wee Georgie Wood."



Rear View of panel of B.S.A. Four-valver.

IN the past every valve set I have owned I have built myself. All told I may have built fifty. Some have been very good, some have been just good, some have been bad, and a few absolutely horrid.

A receiver which I now own and have not built is a "B.S.A." This firm has been famous for years as manufacturers of rifles, cycles and motor-cycles; but it has only just come into the radio game. It has certainly come in at the top, though.

The receiver contains nothing particularly startling in the way of design. It is just a "straight" four-valver, with one H.F. (tuned-anode), detector and two L.F. stages. The reaction is applied to the anode coil. The tuning condensers, two in number, are fitted with excellent slow-

## THE B.S.A. FOUR-VALVER

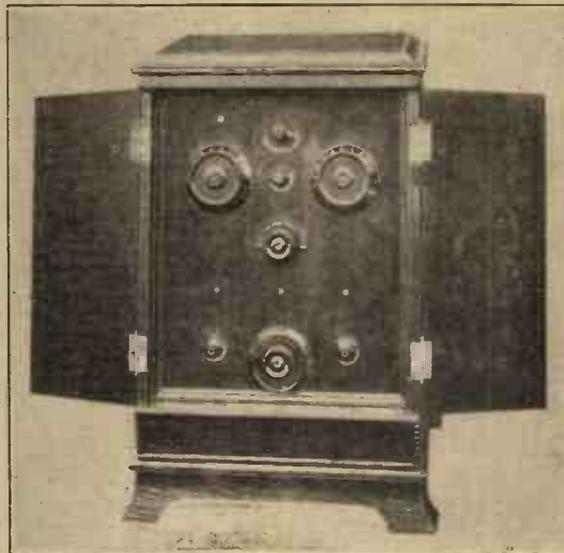
motion dials, and the vanes are cut for "square-law" effect. The general excellence of the set seems to be due to good workmanship and knowledge in the placing of components.

There are three Wecovalves and a power valve (PA4). One filament resistance controls the heat of the H.F. and detector valve. The first stage L.F. valve and the power valve are fed through fixed resistances. All battery connections are led from the back of the set in a twisted covered cord. One I.T. battery is used for all four valves, but connections are provided for separate H.T. batteries for the H.F. and detector and the L.F. stages.

Tuning is quite reasonably selective, without being unduly critical. On a decent P.M.G. aerial a large number of stations can be heard on the phones, which are plugged in to work with the H.F. and detector stages. I found it possible to hear all the British main stations at readable strength on the phones; but Manchester was swamped by London when that station (local) was working. On the other hand, Cardiff could be tuned in easily and gave quite good results on the loud-speaker. Excellent loud-speaker results were obtained from London, Bournemouth, Hamburg, Munster and Glasgow. The set is arranged to take in the higher wavelength stations by simply

pulling out a plug. Daventry is very loud indeed.

The primary of the first interval transformer is tapped, and a dial on the panel allows that tapping to be used which gives the best results both as regards volume and quality. This proved very useful in reception from Daventry, as the power was rather too much for the valves,

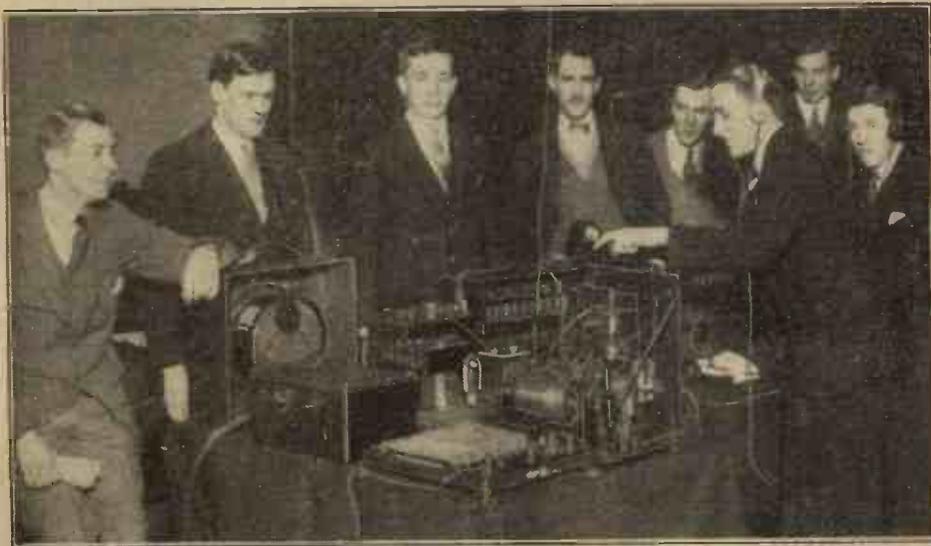


Front View showing Arrangement of panel.

though they are provided with automatic grid bias. By selecting a low transformer tapping, Daventry was made to give very good quality.

Tested out thoroughly, this "shop-made" set was found to give loud-speaker reception sufficient for a large room from six stations, including Daventry, and fair loud-speaker reception, sufficient for the enjoyment of folk with normal hearing sitting within five or six feet of the instrument from five or six other British and foreign stations. In fact there was a choice of at least a dozen programmes from the loud-speaker and a choice of at least twice that number on the phones.

I have had sets that would give me as many stations, more perhaps, on the phones, but they have not been quite so easy to tune. I have had sets that gave louder reception on the loud-speaker and others that were, perhaps, just a little better in quality. But no set I have yet built has combined really good-quality loud-speaker work from four or five stations, reasonably good results from a number of others, ease of tuning and phone reception facilities which I have not yet thoroughly investigated. 5 Y.M.



### ON THE SHORT WAVES

Mr. P. H. Dorle lecturing to members of the Institution of Electrical Engineers on transmitting and receiving on 45 metres.

Königswusterhausen is at present relaying the Berlin programme from 5 or 6 p.m. onwards every evening.



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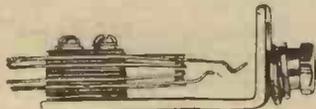
GREEN SPOT or } **12/6**  
 RED SPOT

# Cosmos

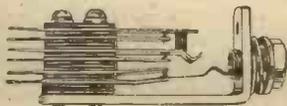
## RADIO VALVES



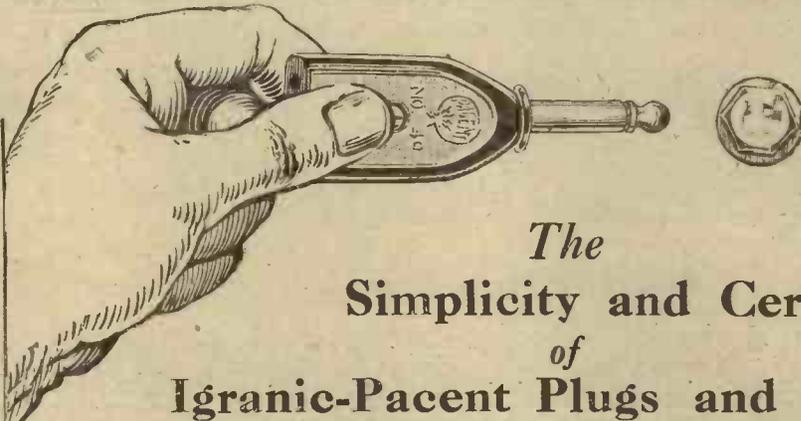
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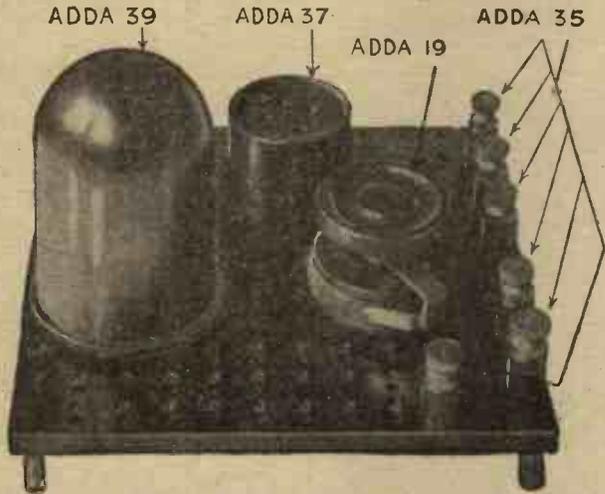
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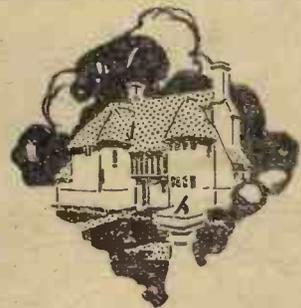
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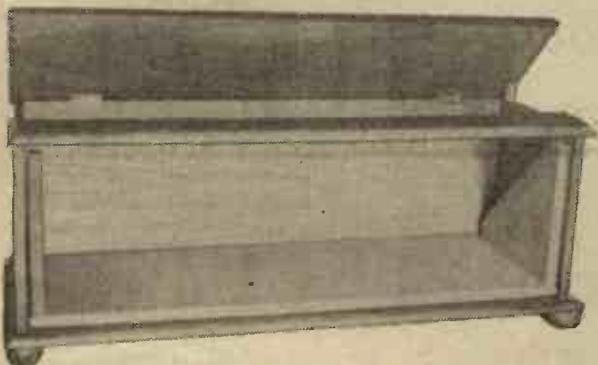


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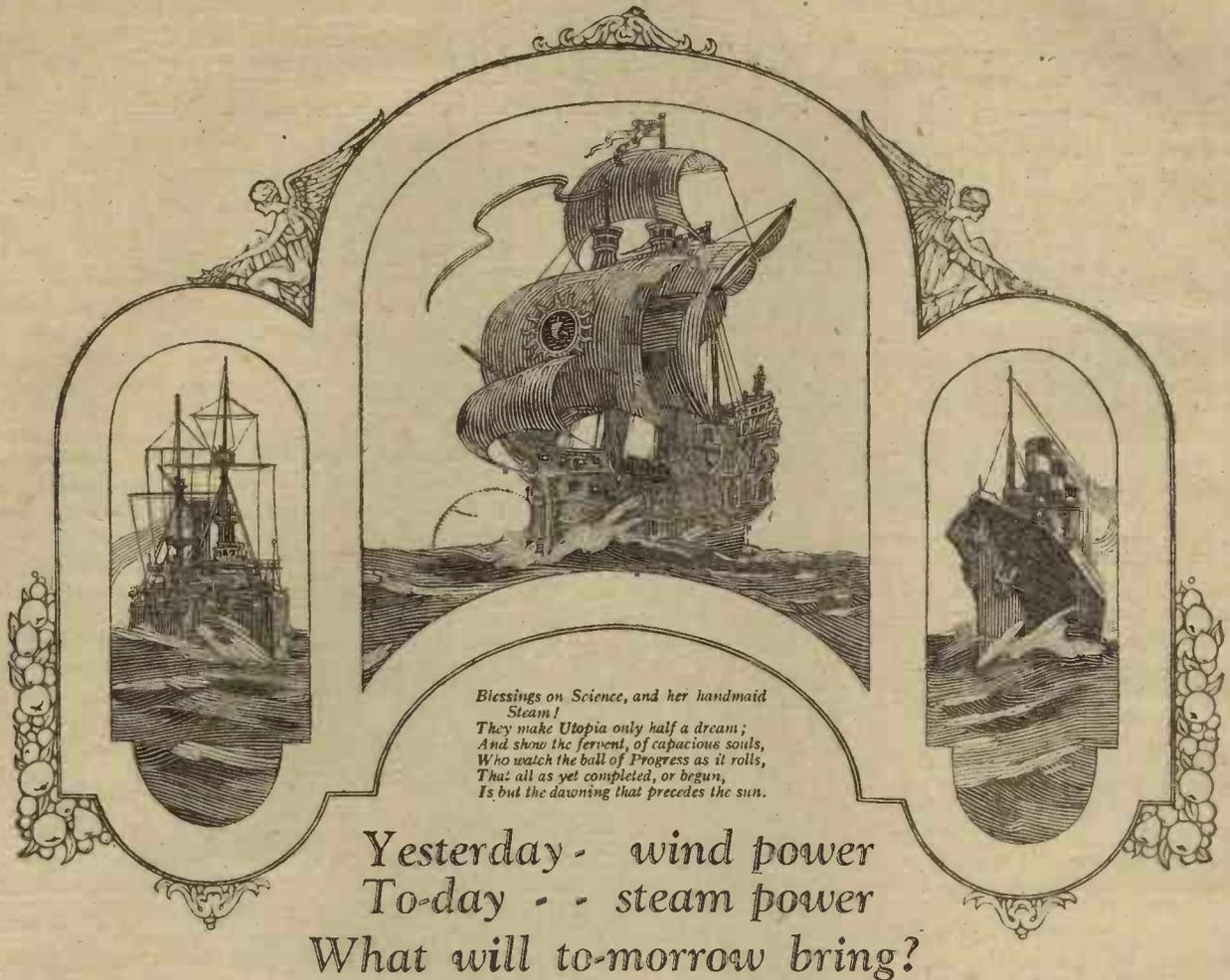
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Yesterday the uncertain and insensitive Coherer was the only Detector available for these pioneers. To-day it is but a relic of the almost forgotten past. The supremacy of the valve is unchallenged. Evolved by Fleming, improved by De Forest, one inventor after another has made

some notable contributions to ensure its greater efficiency and to increase its sensitivity.

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# Cossor Valves

# On Your Wavelength!

## The Future of the B.B.C.

AT the moment of writing full particulars of the report of the committee of inquiry into the future of broadcasting are not to hand. It is, however, rumoured on excellent authority that the report will make exactly the recommendations that I predicted in these columns when the committee first began its sittings. In other words, the B.B.C. may cease to exist at the end of the year, yet the B.B.C. will continue to carry on as usual! The proposals seem to be that the present company shall be brought to an end by the Government declining to renew its licence to broadcast, which expires on December 31 this year. This having been done, shareholders in the company will be repaid in full the amount of their holdings, and the control of broadcasting will pass into the hands of a Government committee. The staff of the present B.B.C. is likely to be unaltered, and we shall therefore miss none of our old favourites, who are at present employed either in the technical departments or upon programme organisation. This seems an eminently satisfactory solution of such difficulties as there were, since the monopoly of broadcasting will pass into the hands of the State and "grouzers" will no longer be able to declaim against the iniquity of permitting a private company to possess a monopoly. Further, the State will collect the money received from wireless licence fees for itself, and not on behalf of a private organisation. But in the end the whole business reminds one of the French saying: "The more it changes the more it remains precisely the same thing."

## 2RN

Have you heard the Dublin station yet? There is sometimes a little difficulty in doing so if the receiving set in use is not particularly selective, since 2RN's nominal wavelength of 390 metres is only 4 metres above Bournemouth and 2½ below Hamburg; on the whole, the Dublin station is much easier to pick up and to separate from the others than one might imagine from a glance at the wavelength figures. On certain evenings there is a good deal of mutual heterodyning going on between the three stations mentioned, and occasionally Graz, which works on 397 metres, takes a hand in this. Still, I find that 2RN frequently comes in very well indeed, and once you have got him his strength is surprisingly great. If you have not already heard the Dublin station he is well worth trying for, and he is quite easy to pick up if you are lucky enough to find him working at a time when Hamburg and Bournemouth have closed down for a spell.

There is another station which causes considerable interference with Hamburg and with Dublin when he is working at the same time as they are. This is Radio-Iberica, Madrid, whose wavelength is 392 metres. Luckily this station now confines his transmissions almost entirely to the afternoon and to the late evening, working either from 4 o'clock until 6 or 8 p.m., or from 10 p.m. until almost any hour the following morning when he puts on a late programme, as he occasionally does. The three Madrid stations, Radio-Iberica, Radio-Castilla and Union Radio generally work in with one another, arranging their transmission times so that they do not clash.

## Another Newcomer

Another distant station which has not been long on the ether is Prague, in Czecho-Slovakia, who works on 368 metres with a power rating of 5 kilowatts. If you can catch Prague transmitting at a time when London is silent, as you can do at 7 o'clock on Sunday evening when he starts a two-hours' concert, you will probably find no difficulty in tuning him in for his signals come in very strongly in many parts of this country. In and around London they are exceptionally good just now. Prague is not difficult to identify, even if you do not understand Czecho-Slovakian (which sounds rather like a succession of sneezes interrupted by coughs), for the announcer frequently makes use of French and English sentences. When London is working it takes an exceedingly selective set to bring in Prague all by himself—within twenty-five miles of 2LO's aerial, at any rate. I have already awarded myself several pats on the back for having accomplished the feat, and I may say that it was done *without* howling, thanks to the use of a neutrodyne receiver. Neutrodyning is apt to make tuning a little flat, and I use a wave-trap in connection with my set which enables some very pretty work to be done in the way of separating stations upon closely adjacent wavelengths.

## Try It at Home

We have read a great deal lately about the way in which wireless has helped doctors and nurses in hospitals to keep their patients cheerful. How many readers, I wonder, have thought of making use of the wireless receiving set in the sick room at home? At the present moment two of my youngsters are in bed with the prevailing "flu." When they were first laid up I rigged up a crystal set with an indoor aerial in their bedroom, placing it between the two beds and attaching two pairs of phones to its terminals. London's and Daventry's pro-

grammes help wonderfully to dispel the gloom which always accompanies the first stages of 'flu, and now that they are convalescent these transmissions keep them entertained—and quiet. If you are the father (or mother) of a family, I can confidently recommend the crystal set as one of the most useful adjuncts for the sick-room. Should it be found impossible to instal such a set in the sick-room itself, then a few yards of flex will enable long leads to be run from the telephone terminals of the set downstairs.

## Expensive Wavemeters!

Some few weeks ago I was bent on obtaining a really accurate wavemeter which would measure wavelengths as low as about 35 metres with reasonable accuracy. The instrument was to be suitable for both transmission and reception purposes, and I accordingly put out "feelers" to various manufacturers with a view to getting the lowest price for a good article. My first reply nearly caused heart failure. This particular firm would be glad of my esteemed order and would provide the instrument for seventy-six pounds! Several other replies came to hand the next day, but none of the instrument makers appeared to think that I had a limit to my pocket—or, at least, its contents. The lowest figure quoted was forty pounds, and now in desperation I am driven to make my own wavemeter at the cost of a couple of pounds, added to which there will be the calibration costs—in all about five pounds.

## Those "Experimenters!"

I really cannot understand how it is that so many amateurs who term themselves experimenters manage to do any useful work lacking as they do those essential articles—instruments. I have seen people who do not hesitate to spend fifteen or twenty pounds on a set of super-heterodyne parts, yet they do not aspire to possess the humble moving-coil voltmeter! It is true that some have a voltmeter, yet, sad to relate, it is of the moving-iron variety, worse than useless for its job, for it sucks away the life-blood of the battery and by the time half a dozen tests have been made the battery has lost many useful working hours of life. If you contemplate buying a voltmeter for H.T. battery measurement, aspire to a moving-coil instrument having a high ohmic resistance. Excellent little instruments having resistances as high as 40,000 ohms are now obtainable at a low price, and these instruments will serve not only as a voltmeter, but also current flow in milliamps. can be read from them when once the resistance is known. In any case, the

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## On Your Wavelength! (continued)

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moving-coil instrument is the only useful voltmeter for the careful experimenter, and a few extra shillings spent on such an instrument now are shillings saved.

### The Neon Tube

Some few weeks ago I happened to mention that the neon tube could be used as an indicator of high-frequency currents in a wavemeter. Since then I have received repeated requests for full details about this interesting item. In every case it was quite clear from the inquiry that the writer was interested in the idea from the point of view of reception only, and therefore I fear that my replies were not quite as expected, for although the lamp is used in conjunction with a wavemeter for reception purposes it does not glow; the glow is only apparent when using the wavemeter with a transmitter.

The wavemeter works on the absorption principle, and many amateurs can easily make up such a simple device with ordinary materials and without the neon tube. The method is as follows: Take a coil which will tune to the desired wavelength in a closed circuit and place across its ends a variable condenser. If this coil and condenser are placed in close proximity to the reaction coil of an oscillating valve receiver and the condenser dial rotated, a sharp click will be heard in the telephone receiver at a certain spot. This is when the two instruments are in resonance or in tune with one another, and if the wavelength to which the receiver is set is known, the wavemeter may have this wavelength indicated on the dial. Remember, however, that these tests should not be made whilst broadcasting is in progress and that the receiver need be only mildly oscillating and not tightly coupled. This wavemeter idea is, of course, no use on a crystal set, as the crystal does not generate any high-frequency current for the wavemeter to absorb.

### Grid Cells—Use and Abuse

The idea of using negative grid bias on low-frequency amplifiers in order to obtain greater volume and to render the set distortionless is now in general use, but I was somewhat startled to find that many people do not quite appreciate what they are doing when applying the grid bias, with the result that the inevitable distortion crops up again. It is possible to overdo bias despite belief to the contrary, but if one or two points are kept in mind this is not likely to occur. In the first place, if only 30 volts are used on the anode of the valve no grid bias is required, and with 60 volts only  $1\frac{1}{2}$  volts grid bias. After this latter voltage has been exceeded, however, it is pretty safe to use 3 to  $4\frac{1}{2}$  volts up to 90 volts, and as much as 9 volts when the 100-volt mark has been

exceeded, especially when low-impedance power valves are used.

Remember that when you apply grid bias to a valve you shift the curve; that is, you make the valve operate at a grid voltage which permits of amplification of both low and high frequencies in equal proportion. Therefore if you shift the curve too much or too little you are no better off, and in order to make quite sure that you are doing the right thing, a careful study should be made of the valve makers' instructions.

### Warmer Days

Spring has come upon us with a rush this year, for we have been enjoying mild soft weather ever since the last week in January. The evenings are lengthening out rapidly, and everything points to an early end of the best season of the year for reception. I am just beginning to notice a slight falling off in my own long-distance results, and probably many readers are finding the same thing. Personally I rather look forward to the coming of more difficult receiving conditions, for they provide the real test of efficiency. If you can bring your receiver to such a point of excellence that you can receive far-away stations during the spring and the summer you may feel quite sure that it will give you wonderful results when the longer hours of darkness come round once more.

In winter-time, when conditions are good, almost any receiving set that is not an absolute "dud" makes a certain amount of D.X. work possible; but in summer-time it is only the really good set that will continue to function satisfactorily. I do not mean to say that with such a set you will be able to hear weak and distant transmissions throughout the year. You will not; but you will always have a much wider choice of programmes than would be the case with a poor outfit. The Sunday afternoon pastime of searching for foreign stations provides quite a useful test of efficiency from now onwards.

### No More War?

I suppose that in the dim forgotten past, when one of our rude ancestors first fastened a piece of flint to a stick and so made a hatchet, there were not wanting prophets who declared that the coming of such a terrible weapon would shortly make war an impossibility. Gunpowder, the bayonet, the breech-loading rifle, high-explosive shells, aircraft and poison gas have each in their turn been declared by wiseacres of the past to be sure and certain preventors of war, for the simple reason that they would make it too terrible to be contemplated. And now no less a person than Senatore Marconi is reported to have said that in the near

future the development of television will make warfare impossible, since with its aid each side will be able to follow every movement of the other so that secrecy or surprise will cease to exist. Much as all of us would like to see war made impossible, I am afraid that television will not bring about the desired end. It is more likely to take us back to the old days of hand-to-hand fighting, when armies faced one another without any attempts to conceal their movements.

### The Announcer

I have often puzzled over the reason why the B.B.C. decided to hide the identity of the owner of that familiar voice: He said "Good night" to me, or apologised if he stuttered. I knew his every thought—at least, I believed so—in fact, I had conjured up an heroic atmosphere around that far-off introducer of my wireless items. To my cousins I pretended to know him and described his appearance. Believing in my integrity, their interest was aroused, their predatory habits asserted themselves until I needs must promise an introduction. Now I am no longer a hero—I cannot swear who the announcer is. Why did they shroud this hard-working, kindly voiced introducer? It is so hard on we sympathetic ones. No longer can one send boxes of lozenges when his tired voice is husky. It is unromantic to address a handkerchief to "The announcer who was on duty last Tuesday." Rather would one have started "My dear Mr. A.," and enclosed the handkerchief, and at the same time asked whether he was married and how many children.

### What I Know?

Yet I profess to know something of announcers, not by personal intercourse, but by dint of careful study. For instance, I listened to all the Christmas transmissions, and by dint of collecting notes I decided that an announcer, properly trained, was like a camel. During the Children's Hour he retired to some corner and there consumed vast quantities of buns and liquid, so that from 5.30 to 12 o'clock he sprightly and cheerfully lisped the announcements to us.

Poor dears, they now work day in and day out and nothing to tell their hearers what manner of men they are. Had I my way I should insist that at the foot of each programme a sketch of the announcer should be included, showing him at his favourite pastime. Would it be boiling the "Glaxo," or what?

Yet all must admit that the announcer is the chief artist of all. Then why the fog of obscurity? We have all written and pleaded that he shall be made known to us, yet not one whit will they relax.

THERMION.

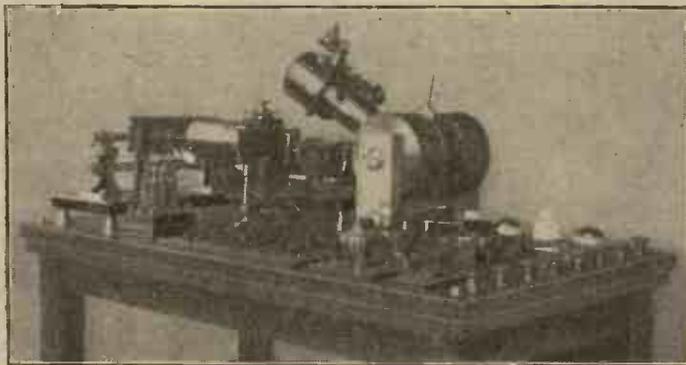
# THE TELESTEREOGRAPH

By T. THORNE BAKER

THE activities of Edouard Belin in the realms of television will be stopped for a few months owing to his indisposition. He has been ordered to the South of France for a much-needed rest of several months, which news comes as a severe setback after his recently-repeated promise that his system of television was just nearing completion. A photograph of the Lenglen-Wills tennis match at Cannes was wired the other day to Paris from Nice by his "telestereograph," or apparatus for ordinary photo-telegraphy.

The telestereograph, like any other instrument for sending pictures by wire, is just as likely as any other present system to be adapted in some way to the bigger problem. It depends on making use of the relief of a "carbon" photograph to operate a microphone which controls the

telegraphic signals; these on reception are made to operate a galvanometer, which exposes a sensitive film attached to a revolving drum. The apparatus is shown below.



The Belin Telestereograph.

Though not obvious at first sight, it is actually easier to work most apparatus for telegraphing pictures by wireless than by wire. Certainly there are atmospheric

deal with, and those subtle variations which are so difficult often to understand, but with sufficient power to transmit, the advantages of wireless are many. One of the biggest is due to the very large number of signals—or variations in current strength—that must be dealt with per second.

One of the most troublesome effects of a long line is that rapid signals are too "close together," run into each other, and so obliterate the details of the image. An extraordinary amount of distortion is also caused at times by induction effects from neighbouring lines.

It is for such reasons as these that wireless must be regarded as the ideal medium for television, though even here probably a very short wavelength will be required, for reasons which will be explained later.

## WHAT A VALVE IS MADE OF

ALTHOUGH there are many thousands of valve users, it is very doubtful if there are many who could answer the question, "Of what is a valve made?" correctly; yet the choice of materials for use in the various electrodes plays an important part in the designing and ultimate functioning of the valve, and is a great factor in the cost of the finished article.

### Choice of Materials

In giving consideration to the materials which shall be used, the manufacturer is guided to some extent by the purpose for which the valve is to be used. For example, in the case of receiving valves and transmitters up to a power of about 1.5 kilowatts, a glass can be used which has a fairly large lead content, with seals of the same material; the advantage of this glass is that it is readily "worked" at a comparatively low temperature. For higher-power valves, however, the use of "hard" (or boro-silicate) or even silica is advisable, if not a necessity. There is an exception to the last remark in the case of the water-cooled valve, but in this case it must be understood that the glass is kept cool during the running as compared with the ordinary transmitter. Again, the emission obtained from an ordinary tungsten filament is sufficient for the ordinary bright-emitter valve, but in the case of the transmitter a tungsten filament to which has

been added a small percentage of the mineral thorium is used to give the extra emission required.

### Dull-emitters

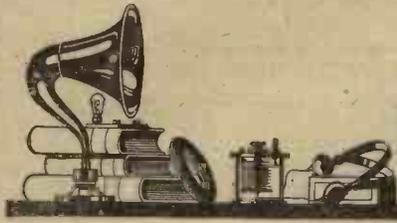
In the case of dull-emitter receiving valves a thoriated filament is used, and is treated during manufacture in such a manner as to bring the thorium to the surface of the filament. Some low-temperature emitters have what is known as "coated" filaments, that is to say, a filament having a core of one metal and a surface which is coated with barium oxide or some other oxide. The following points are of primary importance in the choice of materials for the anode and the grid: (1) The metal should have a high melting-point; (2) it should be capable of being drawn into wire of the required diameter or rolled into thin sheet to the size required; (3) it should be as strong as possible and inexpensive; (4) it should contain the minimum of occluded gas, because the bulk of this gas will have to be eliminated during the pumping process. Pure nickel with a melting-point of about 1,450 degrees C. fills most of these requirements, except in the case of large transmitting valves, where a metal with a higher melting-point is required. For this purpose molybdenum with a melting-point of about 2,500 degrees C. is often used, or in some cases tungsten.

### Seal Wires

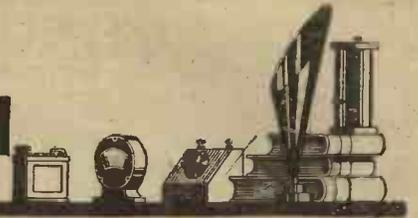
With regard to the seal wires or leads, which run through the pinch or seal of the valve, it is obvious that these must approximate the same expansion as the glass itself, as any difference in contraction or expansion would result in the fracture of the glass due to strain, or perhaps an air channel forming up the side of one of the lead-in wires and a consequent destruction of the vacuum. To this end platinum is used where the lead-in wires pass through the glass, and these are joined to copper outside the seal for connection to the pins on the cap of the valve. In many modern valves a platinum substitute in the form of a nickel-steel core coated with a thin layer of copper is used, as this form of seal is very much cheaper from a manufacturing point of view. 6 R J.

A broadcasting station is being erected in Poland at Cracow, and an ex-Prime Minister, in conjunction with the Polish electrical firm of Sila and Swiatlow, has been granted a concession to build a station and manufacture and sell radio equipment.

The Broadcasting Committee, presided over by the Earl of Crawford, is making good progress with the preparation of its report, which will shortly be in the hands of the Postmaster-General.



# OUR INFORMATION BUREAU



**RULES.**—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, layouts, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 440).

## Impedance

**Q.**—What is the meaning of the word "impedance"?—R. T. (Salford).

**A.**—This is the property of an alternating or oscillatory circuit by virtue of which it "impedes" the flow of current through it. It is measured in ohms, but must not be confused with the term "resistance," by which is meant the property of a circuit by which it opposes the flow of direct current. The impedance of an A.C. circuit includes the resistance.—B.

## Interference from Mains

**Q.**—When a house is lighted by A.C. is there less likelihood of interference from the mains if a counterpoise is used instead of a direct earth connection? If so, why?—D. G. (Essex).

**A.**—Much of the interference caused by electric light mains is due to earth currents which are picked up by the earth connection if one is used. When a counterpoise is used the only interference from the above source that can affect the set will be due to induction effects.—B.

## Accumulators

**Q.**—How can one tell at what is the greatest rate that a given accumulator should safely be discharged?—E. N. (Ilford).

**A.**—Failing the maker's instructions (which should always be followed if available), it will usually be safe to discharge an accumulator at a rate which is equal to an eighth of its actual ampere-hour capacity. For instance, a 40 ampere actual accumulator might be safely discharged at a rate of 5 amperes, while one of 30 hours capacity should not have a greater current than about  $3\frac{1}{2}$  amperes taken from it.—B.

## Aerials

**Q.**—I do not wish to erect an outside aerial unless it is necessary. I have been told that one inside the house is just as good. Is this so?—H. P. (Leeds).

**A.**—There are, of course, good and bad aerials of both kinds, but it is fairly safe to say that the best indoor aerial is a little inferior to one outside. It is true that the walls of a house do not prevent the passage of wireless waves, but at the same time they absorb a considerable proportion of the energy from waves which pass through them. If the same set is used on aerials of the two classes much better results will generally be obtained on the outside aerial.—J. F. J.

## Coupling Loud-speaker

**Q.**—I understand that, in order to protect the windings from the H.T. current, a loud-speaker may be coupled to the set by means of an L.F. choke coil and large condenser. Can you tell me the connections?—W. C. (Bradford).

**A.**—Connect the choke across the loud-speaker terminals of the set and then connect the loud-speaker across these terminals also, putting a large condenser (1 or 2 microfarads) in series with one of the leads to the loud-speaker. The explanation of the action is as follows: The current from the H.T. battery is prevented from flowing through the loud-speaker windings by the condenser which will not pass direct current. It can, however, reach the plate of the last valve through the

choke. The varying impulses, corresponding to the speech or music, find it easier to pass through the condenser and loud-speaker than through the choke coil, and therefore actuate the diaphragm.—J. F. J.

## Insulators

**Q.**—What is the object of using more than one insulator at the end of an aerial? Surely the weak currents due to received signals could not break down the insulation of one.—P. L. C. (Bolton).

**A.**—Several insulators are usually recommended, not in order to make sure that the insulation is not broken down but to minimise losses due to capacity. A small condenser is formed at the ends of the aerial wire, the aerial and the halyard forming the plates (especially when the latter is wire rope) and the insulator

## OUR WEEKLY NOTE

### LONG-DISTANCE CRYSTAL RECEPTION

Great interest is displayed by our readers in any crystal set which is stated to have received stations other than the local one and Daventry. The majority of such sets are of very simple construction, and to many it may not be clear why the range should be greater than the 30 miles usually quoted as the crystal set's limit.

The truth is that, although the set itself must be efficient, the aerial system is mainly responsible for abnormal ranges. It is a fact that most ships fitted with crystal receivers can, when off the British coast, receive most of the main stations clearly. Such receivers, when used on an ordinary amateur aerial, would be found no more sensitive than a broadcast crystal receiver. A ship's aerial is very near to the ideal. Two high masts elevate the aerial (of ample proportions) at a great distance above surrounding objects, while the whole metal hull of the vessel forms a most efficient earth-plate.

Thus it is unreasonable to expect that any "long-distance" crystal set will bring in far off stations when used on a poor aerial. On the other hand, an inefficient set would not do justice to the best aerial system. For long-distance crystal results both aerial system and set must be good.

THE BUREAU.

the dielectric. Some of the received energy will pass through this condenser, but as the total capacity, when several capacities are connected in series, is less than any one separately, the losses may be minimised by connecting several insulators in series at every point where an insulator is required.—B.

## Tuning Coils

**Q.**—How can I tell when I am using the best possible coils for a given station?—K. N. (Plymouth).

**A.**—When condensers are used in parallel with the coils the efficiency will be greatest when the station is tuned in with the condenser almost, but not quite, at its lowest capacity. If several degrees of the condenser have to be used a larger coil may be tried, while if the condenser has to be set at zero a smaller coil should be plugged in. It should be borne in mind, however, that a coil may be the most suitable one of a set even though the condenser must be set at a fairly high capacity for a given station, as it is not desirable to have a very large number of coils in most cases. When the aerial condenser is used in series with the A.T.I. its capacity should not be too small and the loudness of signals will indicate when the best size of coil is being used.—R. W.

## Distant Stations

**Q.**—I find that with my set some of the more distant stations can only be received when the set is oscillating. The moment the reaction-coil is moved to stop oscillation the stations are lost. What is the trouble? Nearer stations are received quite well.—H. L. (Wimbledon).

**A.**—The fact is simply that the distant stations you mention are just beyond the present range of your set. Anything you can do to increase the range will help to bring them in. Improving the aerial and earth, or adding H.F. amplification, will be of assistance. You will, however, find it almost impossible to use more than two H.F. stages on wavelengths below 500 metres. If everything is as efficient as you can make it, and two H.F. stages are already employed, you must be content with those stations which are within the range of the set.—B.

## An Amplifier Fault

**Q.**—Can you suggest a probable cause of the following trouble? When my set is first switched on signals come through all right, but soon fade away until nothing can be heard. Everything seems to be O.K. and I have traced the trouble to the last stage of my set which is resistance coupled. If the grid of this valve is touched with a finger the set begins working again, but signals fade away again after a short time.—A. M. B. (Andover).

**A.**—It looks very much as though the grid leak of the last stage had too high a resistance. The trouble would then be due to a "choking" effect. The sequence of events would be this. When the set was first switched on reception would be O.K. but, as the electrons accumulating on the grid of the last valve could not leak away fast enough, the potential of the grid would become continually more negative until amplification would be impossible. Touching the grid of the valve would allow the electrons to escape and the grid would then resume its normal potential, but the same process would at once commence again.—J. F. J.

## Coils

**Q.**—What size coils must I use in order to get all the British broadcasting, including Daventry?—T. B. (Worcester).

**A.**—The coil sizes will depend upon the circuit you are using and also upon the natural wavelength of your aerial system. Supposing that you are using a detector valve circuit, with or without L.F. amplification, and that the aerial condenser is connected in parallel, you will require a 35 or 50 aerial coil and a 50 or 75 reaction coil for the 300 to 500 metre waveband. For Daventry you should try a 150 or 200 coil in the aerial socket and a 200 or 250 for reaction. If the aerial condenser is used in series on the lower wavelengths (it should not be so connected for Daventry) one size larger coil will generally be required in the aerial circuit. If loose coupling is used the secondary coil will usually be one size larger than the aerial coil, if the A.T.C. is connected in parallel. This also applies to the anode coils if H.F. amplification is used. The above must not be taken as accurate but only as a basis for experiment, which alone can show which are the most suitable coil sizes in any particular set.—J. F. J.

# A SIMPLE HARTLEY RECEIVER—20-200 METRES

The second and concluding article on the construction of an efficient short-wave set

A DIMENSIONED diagram of the layout of the components is shown in Fig. 4. For clearness no wiring has been put into this diagram. The layout has been planned to reduce, so far as possible, all interaction between the fields of the various components. The wiring can be done by reference to Fig. 1 (p. 365, No. 196), using the minimum amount of wire consistent with getting all wires well spaced and well away from one another, both vertically and horizontally. As has been said before, in this set no H.T. positive terminals are provided, flex leads being taken from 1P for feeding the detector-valve plate and from one of the phone terminals for feeding the amplifier-valve plate.

In wiring up, it is well in this case to proceed with the filament circuit first, on the positive side. This wiring is done with the condenser panels in position, but with the filament resistances only mounted. When the positive filament leads have been put in the condensers can be put in position, when the rest of the wiring will be found to be quite easy, as there is plenty of space available to get round the various connections. With regard to the filament connections of the detector, it is better to make the top clip the negative. This allows a short connection from 1S to the negative filament lead.

## Aerial Connections

The aerial connection is by means of a 7-in. length of rubber-covered flex. One end is secured under the nut of the aerial terminal, and the other end is provided with a Baltic spring clip.

In wiring up the condensers advantage is taken of the fact that the whole frame and the moving plates are connected together electrically. To avoid hand- and body-capacity effects when tuning the frame and moving plates of the grid-tuning condenser should be connected to the low-potential side of the circuit—that is, to the negative side of the batteries and the earth. In the case of the reaction condenser the moving plates should be on the inductance side. There is a little hand capacity present in the reaction control in the set as built up, but it is not enough to be troublesome even on 20 metres. It alters the note as the hand is withdrawn from the reaction control knob, but does not throw the signal out of hearing.

In using the receiver, having made the customary tests to ascertain that connec-

tions have been properly made, try out with the biggest inductance first. Place the earth tap, which is connected from the middle terminal of the coil holder, on

detector and a DE5 as amplifier, with about 25 volts on the plate of the detector and about 80 on the plate of the amplifier valve and filaments at the normal voltage prescribed by the makers, the starting of oscillation is so easy that it is often difficult to tell whether the set is oscillating or not without touching the aerial terminal in the usual way. Reaction is, of course, increased by bringing more of the reaction condenser into circuit. It should be here remarked that though the reaction condenser is provided with a dial and scale, the scale could be dispensed with, because it is really only an ornament. There is no need to make any note of readings on it. If the grid-tuning condenser is calibrated for each coil it will be found to remain constant for a very considerable time, provided that

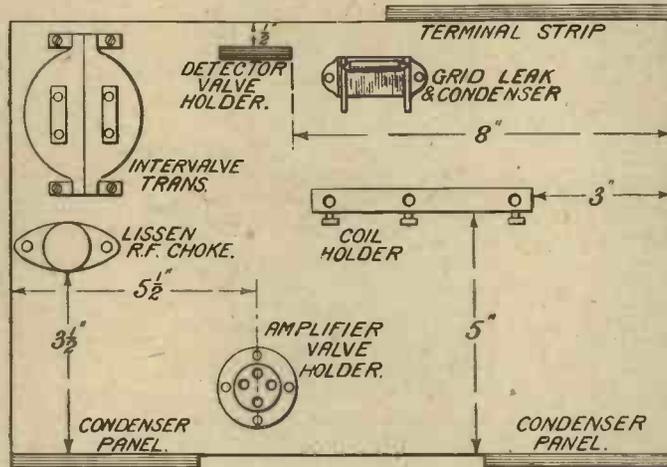


Fig. 4.—Layout of Components.

to the twentieth or twenty-first turn from the grid end of the inductance. Place the aerial tap on the first or second turn from the plate end. It may be found that a small condenser in series with the aerial is an advantage. In this case it will be worth while to build one of those small variable condensers known as neutrodyne condensers permanently into the set. If such a condenser is not immediately available the familiar method of twisting two 18-in. lengths of bell wire (covered) together will make a condenser of small capacity. The inner ends of the two wires are left unconnected to anything. The outer ends are connected, one to the aerial terminal and the other to the aerial lead

no change is made in the positions of the tappings to the coil and also that the dial has not shifted on the spindle. The setting of the reaction condenser makes so little difference to the setting of the grid-tuning condenser for any given wavelength that it is not readable on the scale.

## Tuning

Tuning is delightfully easy, but it may be found a help, if telephony stations are desired, to make an earth connection. This earth should be as short as possible. In any case, it will alter the tuning of the set slightly unless it is very short. The small capacity of the condensers and their very efficient square-law design give a very open scale, and stations very close together, such as those crowded together between 44 and 46 metres, can be separated if not absolutely on top of one another.

The receiver has proved very good on telephony. KDKA and the station on just under 42 metres which rebroadcasts the WGY programmes come in at excellent strength. The latter station has several times been heard when there was daylight at least half the distance. Numerous British and Continental amateur telephony stations have been tuned in, many of them at surprising strength. As regards morse signals, the receiver is truly world-wide in receptivity.

In some cases it may be found that, owing to some peculiarity in the wiring, the nature of the dielectric used for the condenser panel or the condenser itself, hand-capacity effects are unduly present and strong when the fingers are on the

(Concluded in third col. on page 422)

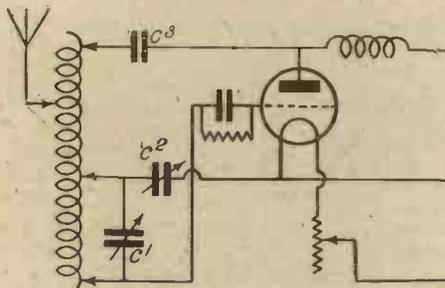


Fig. 5.—Method of Preventing Short-circuiting of Reaction Condenser.

from the lead-in tube. The wire can be wound up or unwound to give the necessary capacity.

Oscillation should commence with a faint hiss and with no sound of a "plop" or sudden bursting into oscillation. In the actual set from which this description was written, using a V24 valve as a de-

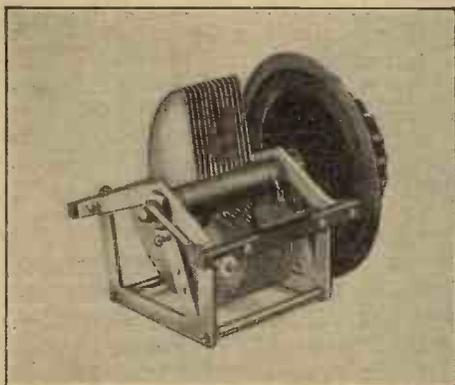
# "A.W." TESTS OF APPARATUS

Conducted in the "Amateur Wireless" Research and Test Department

## Wootophone Condenser

LOW-LOSS components, provided they are used in a part of the circuit where the initial losses are low, produce a noticeable increase in general efficiency. An ultra low-loss variable condenser is the Wootophone, a sample of which has been submitted to us for test by F. E. Wooten, Ltd., of 56, High Street, Oxford. The frame is a "skeleton" of aluminium and, although a small amount of metal is used, it is surprisingly rigid. The fixed and moving vanes are of stout brass sheet. The fixed vanes are insulated from the frame by means of two ebonite strips, and are electrically connected together by two slotted brass rods.

The moving vanes are connected to the frame by a positive contact in the form of a springy copper spiral. Rotation of the vanes is effected by a substantial Radion combined knob and dial, the large knob of which facilitates fine adjustment.



Wootophone Variable Condenser.

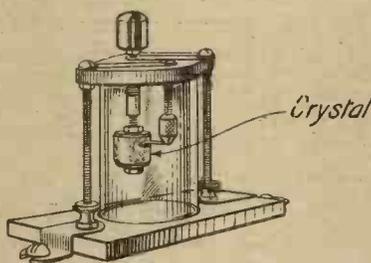
On test the minimum capacity was found to be small—approximately 14 micro-microfarads, whilst the maximum is well over .0005 microfarad. H.F. losses are low.

## The Tungstallite Detector

TUNGSTALLITE, LTD., of 47, Farringdon Road, London, E.C.1, are the manufacturers of an exceptionally efficient crystal detector which requires no fiddling adjustment. All that is necessary to find a sensitive spot is to turn the small ebonite knob in a clockwise direction, thus rotating a cylindrical crystal bolted to the spindle on which the knob is fixed. Resting on the surface of the crystal is a small pliable metal strip which, when the crystal rotates, searches the surface of the latter until the most sensitive spot is found. As the small knob is rotated the crystal is gradually moved in a direction parallel to its cylindrical axis, so that the metal strip

can make contact with any part of the crystal's surface. The crystal is enclosed in a coloured glass cylinder and is so mounted that the whole may be fixed either to a baseboard or to an ebonite panel. Metal clips are supplied for the latter purpose.

On test the efficiency of the crystal was found to be equal to our standard, the



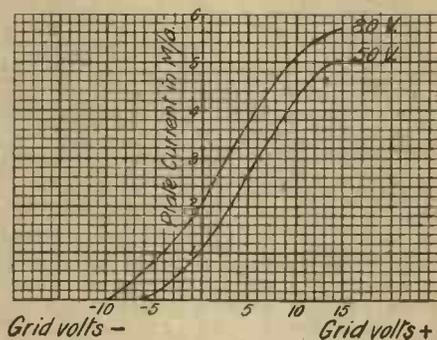
Tungstallite Crystal Detector.

best setting passing exactly the same current in microamperes from 2 L O's carrier wave. Sensitivity is good all over the surface, and we failed to find a really "dead" spot.

## Radion Valves

WE have received from Radions, Ltd., of Bollington, Macclesfield, samples of their valves, one of which (the general-purpose type) we have tested in our laboratory and obtained the curves illustrated.

In construction the valve has a vertical cylindrical plate enclosing a vertical filament inside a spiral grid. Each electrode possesses one support with the exception, of course, of the filament. All the ele-



Characteristics of Radion Valve.

ments are enclosed in a spherical glass bulb which is tinged with a red-brown colour, reducing filament glare. In appearance the valve is reminiscent of the old French R type.

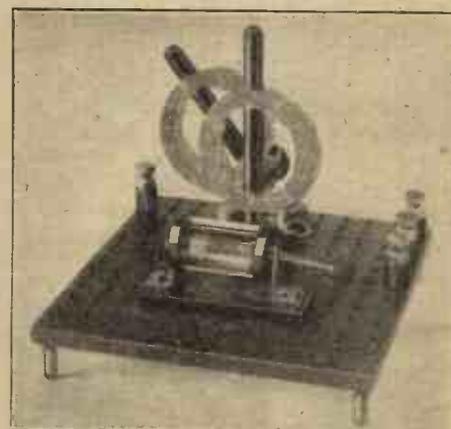
Tested on actual working conditions, the valve is an excellent rectifier. It fulfils this function more efficiently than as an H.F. or L.F. amplifier. The actual valve, tested in each of the three stages of a

valve receiver, required 35, 50 and 80 volts on the plate as an H.F. amplifier, detector and L.F. amplifier respectively. As an L.F. amplifier  $1\frac{1}{2}$  volts negative grid bias gave best results.

From these curves it can be seen that the amplification factor is 7.5, the impedance 27,000 ohms, and the mutual conductance about 2,800 ohms. The plate saturation current at 50 volts is 5 milli-amperes, whilst the filament passes .6 ampere at 4 volts, giving a wattage efficiency of 2 milliamperes per watt.

## The Blackadda System

WE have received from The Blackadda Radio Co., Ltd., of 48, Sadler Gate, Derby, a complete set of parts for building a crystal set in a novel fashion. The components are mounted on an ebonite panel perforated with 140 equally spaced holes, which is supported by four brass corner legs. In constructing the set the com-

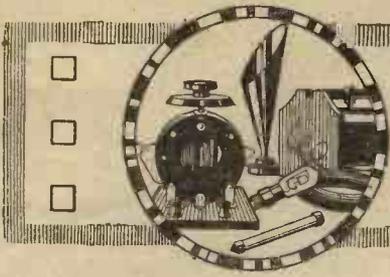


A Blackadda Crystal Set

ponents are fitted through indicated holes on the panel, all of which are numbered. Wiring is effected from point to point by pieces of insulated flexible wires supplied with the kit. The pieces of wire vary in length and are looped at each end.

Other circuits, of course, may be built up in a similar manner, there being no limit to the number of combinations. Special components are obtainable that will fit the panel, but for those who already possess components that they do not wish to discard, an adaptor may be obtained that will accommodate them.

On test the insulation resistance of the panel was found to be infinite. The crystal detector, of the well-known horizontal catwhisker type, is well made, but is slightly stiff in action. The coils wound on a special basket principle are quite efficient. Such a system will have a great appeal to those constructors who like to work by rule-of-thumb methods.

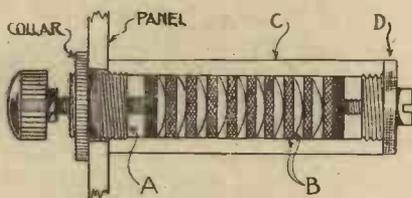


# PRACTICAL ODDS AND ENDS

## Renewing Grid Leaks

**M**OST users of the carbon-pellet type of grid leak will have noticed that as time passes it is necessary to screw the adjusting knob more and more towards the panel.

The pellets eventually become so compressed that all attempts at varying the



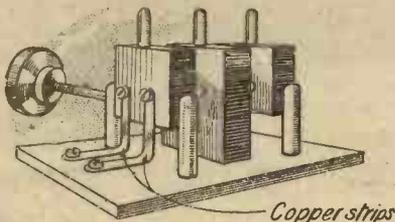
Section of Carbon-pellet Leak.

leak fail. A section of the ordinary type of variable leak is shown herewith. It consists of a threaded rod with spring plunger A for varying the pressure, alternate layers of metal discs and resistance material B, the ebonite container C insulating A from the base and second terminal D.

To renew the leak, first remove D and shake out the contents. Soak the pellets in indian ink and stand them aside to dry. When dry, reassemble by dropping in first one of the brass discs (it having been previously cleaned with a file or emery-cloth), then alternately a pellet and disc. B. D.

## Flexible Connections

**A** NEAT method of making flexible connections for such components as coil-holders is illustrated in the sketch. Small strips of copper or brass foil are used for



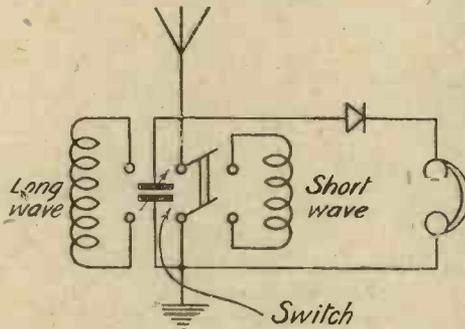
Neat Connections for Coil Holders.

connecting the sockets to the terminals, washers being interposed between the heads of the binding screws and the foil to effect a good electrical connection. The copper strip is much less liable to fracture than is ordinary flexible wire, and a neater job is the result. Variometers and similar components may be fitted with these connections. C.

## A Change-over Switch

**A** NUMBER of crystal sets incorporate some change-over device for coils, so that either Daventry or the local station may be received. The methods employed for altering the wavelength band of the receiver are many and ingenious, but undoubtedly the most efficient is that in which the long- and short-wave coils are quite separate, and are brought into circuit by means of a double-pole double-throw-over switch.

The wiring diagram of such a device is shown below. The aerial tuning condenser is placed across the two centre terminals



Wiring of Switching Device.

of the switch, so that it can be placed in parallel with either coil. The two coils should be spaced well apart, or capacity effects will diminish the strength of signals on the short waves. No provision is made for a series condenser, as this would be useless on long waves. R. N. B.

## Loud-speaker Hint

**L** OUD-SPEAKERS made soon after **AMATEUR WIRELESS** first published detailed instructions on the subject (that is to say, nearly eighteen months ago) may be beginning to look shabby or rubbed at the edges of the pleats. A fresh coat of gold paint may remedy this, but if it does not, it is a simple matter to turn the paper.

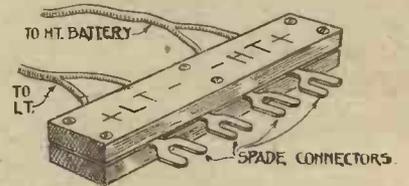
Removing the paper from the frame, run the edges through the fingers so as to flatten them a little, and put the paper back in the frame back to front. Two diaphragms turned in this way have proved perfectly satisfactory. H. P.

## Battery Connections

**A** CHEAP slip-on connection for H.T. and L.T. batteries which eliminates any risk of "shorting" is illustrated in the accompanying sketch. The connector also

obviates the possibility of the H.T. being connected across the filament.

The four spade tags which connect to the terminals are simply clamped between two strips of ebonite, which can be marked with panel transfers. Countersink-head screws are used for clamping the strips. Small grooves should be filed in the ebonite in order to carry the connecting wires. C. L.

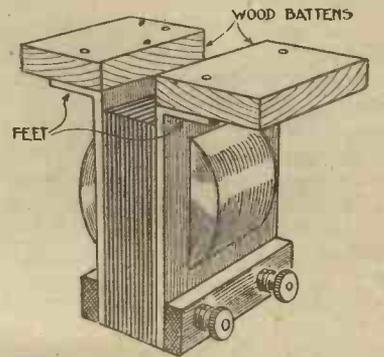


A Connection Device for Batteries.

## Mounting L.F. Transformers

**I**T happens not infrequently that one wishes to substitute for the transformer already installed in the set one of different make. In nearly every case it will be found that fresh holes have to be drilled for the fixing screws, thus spoiling the appearance of the panel below which the transformer is mounted.

Here is a simple tip which enables transformers of any make or size to be mounted in the receiving set without it being necessary to drill fresh holes for the fixing screws. To the "feet" of each of the transformers fix small wooden battens by means of 4 B.A. screws with countersink heads. Or, if preferred, each transformer

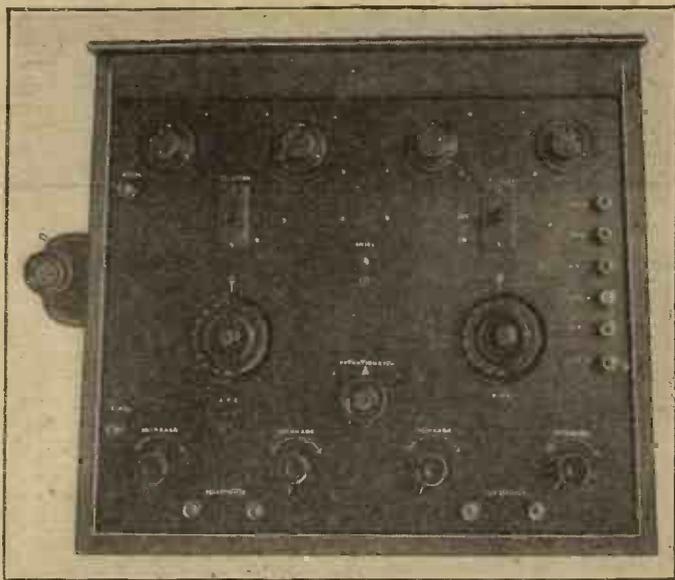


Method of Mounting Transformers.

may be provided with a small stand of 1/2-in. wood. To mount the transformer below the panel, use wood instead of metal screws and drive them into the stand. To substitute one transformer for another, remove the wood screws, take out the transformer that is to be replaced, put the new one in position and drive the screws into its wood base. J. R.

# A FOUR-VALVE RECEIVER FOR FAMILY USE

POWERFUL :: SIMPLE IN OPERATION :: SEL



The Complete Receiver.

THE receiver described in this article, although possessing four valves, is so designed that it can be easily handled and will give good reproduction on a loud-speaker. It will deliver a large volume of sound when used for either the local or the high-power station, and also it is reasonably selective so that the local station can be cut out and the more distant stations received either on the loud-speaker or the phones, according to conditions.

A further desirable point is cheapness of construction, though appearance has not been neglected.

The actual receiver shown in the photographs was tested twelve miles from 2 L O on an aerial about 30 ft. high. Most of the B.B.C. main stations came in on the loud-speaker, as did also Petit Parisien, Radio-Paris, Toulouse, Madrid, Barcelona,

Oslo, Königswusterhausen, and a number of other Continental stations. All these stations are too loud to be comfortable on the phones, and a number of other stations,

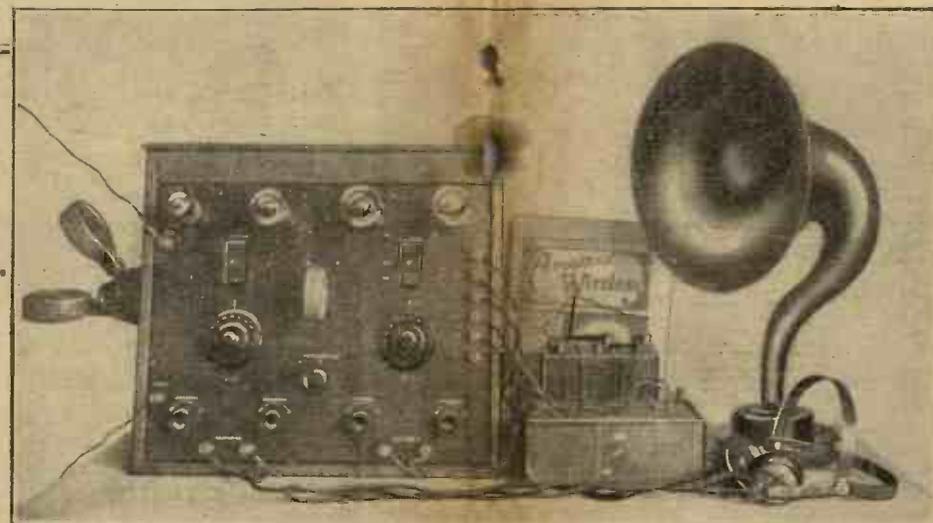
mostly Continental, can be received at excellent phone strength.

For tuning the more distant stations the potentiometer works exceptionally well, it often being possible to cut out an unwanted station by its adjustment. It is necessary that a good-quality potentiometer be used, and the adjustment should be fine and easy. The potentiometer in the writer's receiver was made by Siemens and is a particularly high-class component.

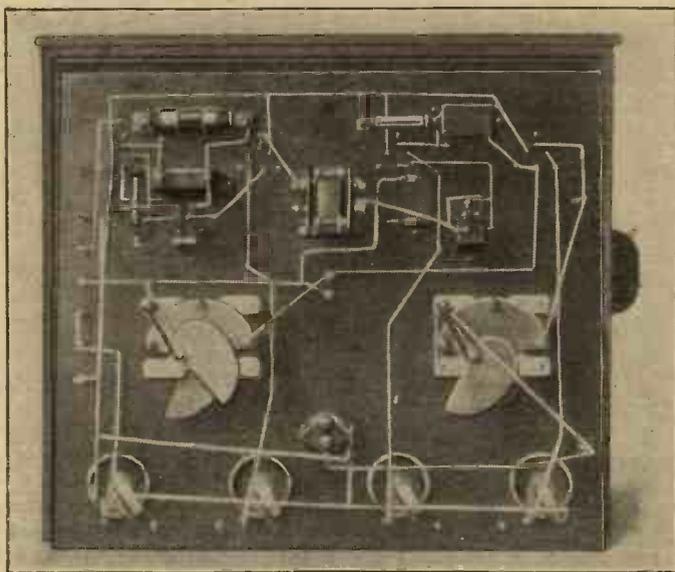
As will be noticed from the circuit diagram, only one intervalve transformer is used, the last valve being coupled by the resistance-capacity method. Terminals are arranged so that either high- or low-resistance telephones or loud-speaker may be used. With low-resistance phones the terminals marked "loud-speaker" are used and here the phones are connected across a step-down transformer as usual. For

high-resistance phones the terminals marked "telephones" are used. Connections to this pair of terminals are so arranged that the winding of the transformer acts as a choke coil. A 2-microfarad condenser is connected in series with the phones to prevent the steady plate current from flowing through them. This arrangement ensures safe operation with good tonal quality whether high- or low-resistance telephones are employed.

The tuned-anode method of coupling has been chosen for the high-frequency valve,



The Receiver with Batteries and Loud-speaker.



View of Back of Panel.

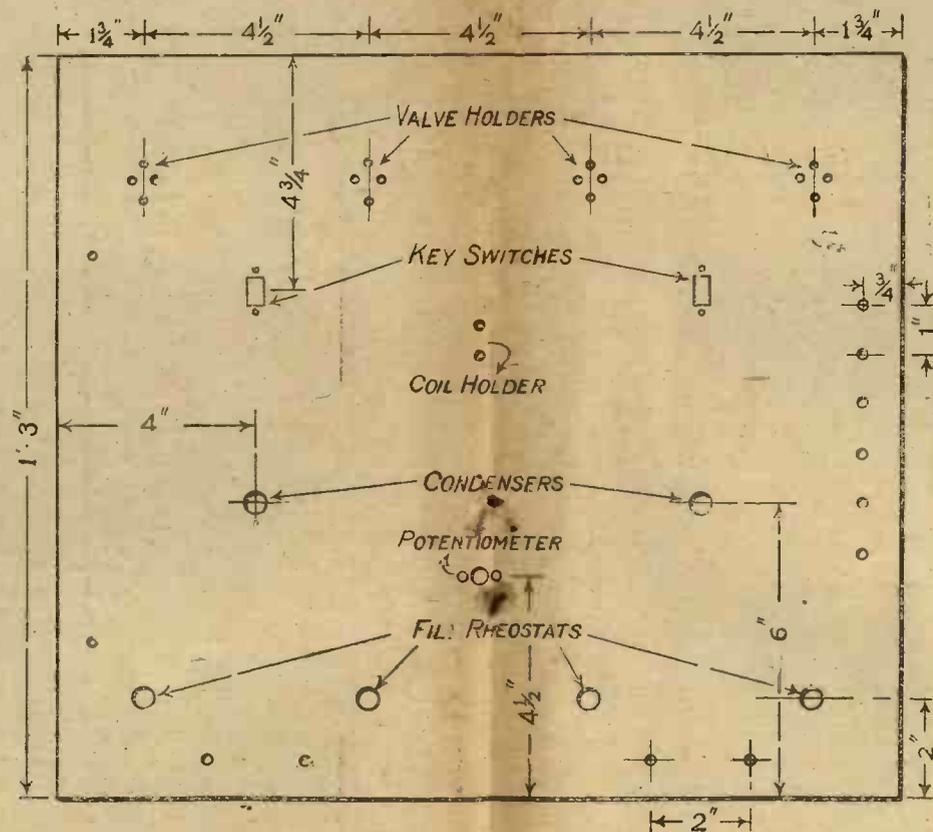
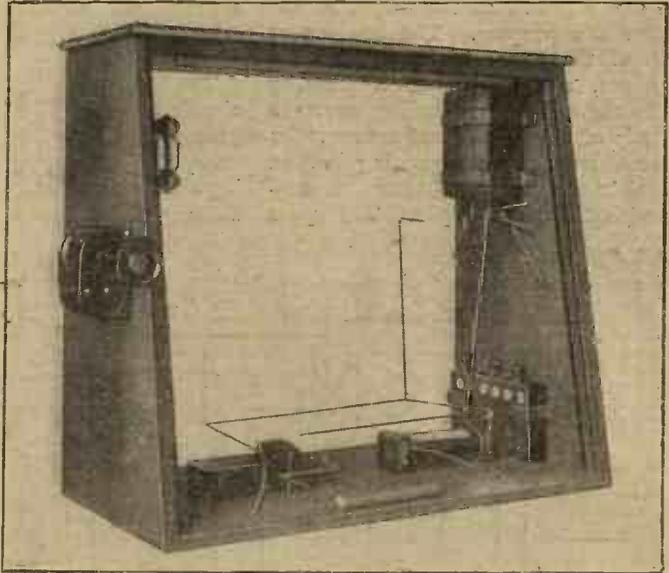


Fig. 1.—Drilling Diagram of Panel.

# VER

## ECTIVE



Interior View of Set in Course of Construction.

since this gives about the best results without complicated tuning and also lends itself admirably to adaptation for all wavelengths. The particular arrangement of the components on the panel renders the receiver quite stable, so that no fears of unstable working due to an unneutralised H.F. valve need be entertained. This, of course, is mainly due to the fact that only one H.F. valve is employed, and would not apply to a receiver having more than one H.F. stage.

Single-circuit tuning is employed with a direct-coupled reaction coil. It is very necessary that a vernier coil holder be used, and in this regard the Lotus coil holder fitted in the writer's set has given every satisfaction.

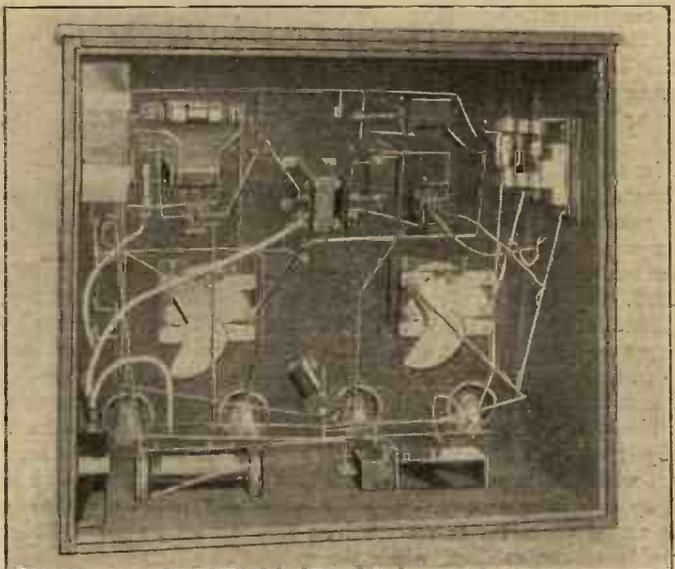
A Siemens vacuum-type lightning protector is fitted inside the receiver to protect it from possible damage due to high potential charges or surges in the aerial. An earthing switch should, of course, be used to earth the aerial when not in use.

The following is a complete list of the components required, together with the names of the manufacturers who supplied the items for the original receiver, though it should be noted that other high-class components will answer.

Ebonite panel, 15 in. by 17 in. by  $\frac{1}{4}$  in.; cabinet with sloping front, 6 in. deep at top, 9 in. deep at bottom; one Lotus two-coil holder (Garnett Whiteley and Co., Ltd.); four valve holders; two D.P. change-over key switches (Siemens); one fixed coil holder (Woolwich Radió Supplies); one variable condenser, .0005 microfarad, (Ormond), low-loss square-

law, with vernier; one variable condenser, .0003 microfarad, with vernier; four filament rheostats (Peerless); one potentiometer (Siemens); one L.F. intervalve transformer, ratio 5-1 (Siemens); one 80,000-ohm anode resistance (Dubilier); one grid leak, 3 megohms, with clips (Dubilier); one grid leak, 5 megohms, with clips (Dubilier); one fixed condenser, .25 microfarad (Fuller); four fixed condensers, 2 microfarads (Mansbridge); one fixed condenser, .0003 microfarad (Dubilier); one fixed condenser, .001 microfarad (Dubilier); one fixed condenser, .002 microfarad (Dubilier); one aerial protector, vacuum type (Siemens); one 9-volt grid-bias battery with three plugs (Siemens); twelve terminals.

The photographs show the general design of the cabinet, which, incidentally, had not been polished when these were taken.



Back View of Receiver in Case.

A beading is arranged around the edge to clamp the panel in position, so that no screws are required at the edges of the panel for this purpose. The beading at the top of the panel is wider than the other edges, and this gives a pleasing finish to the set. The beading covers a wider strip of the ebonite and accounts for the four valve holders appearing low on the panel in the drilling diagram as compared with the photographs. The spare

in the usual manner and is connected to circuit by means of flexible leads. The arrangement of the components in the cabinet is clearly shown in one of the photographs.

The wiring can be carried out from the circuit diagram Fig. 2, and for this purpose square tinned-copper wire should be used, all joints being soldered. The wiring on the panel and in the cabinet should be carried out separately and afterwards

face of the panel. The potentiometer is fitted immediately beneath this coil, and is found to give admirable control of self-oscillation.

The reaction coil should be plugged into the moving socket of the two-coil holder, while the aerial coil should be placed into the fixed socket of the two-coil holder. Tuning is accomplished by rotating the tuning condensers more or less simultaneously. The first two filament rheostats provide an excellent control of self-oscillation and should not be forgotten when tuning, especially in the case of distant stations. A little experimenting with the controls will make the whole matter quite clear and no difficulty should be experienced.

Results will be found extremely gratifying both as regards tonal quality and range, and the receiver will be found eminently suitable for those who have not the skill usually necessary for operating a multi-valve receiver. S. J. M.

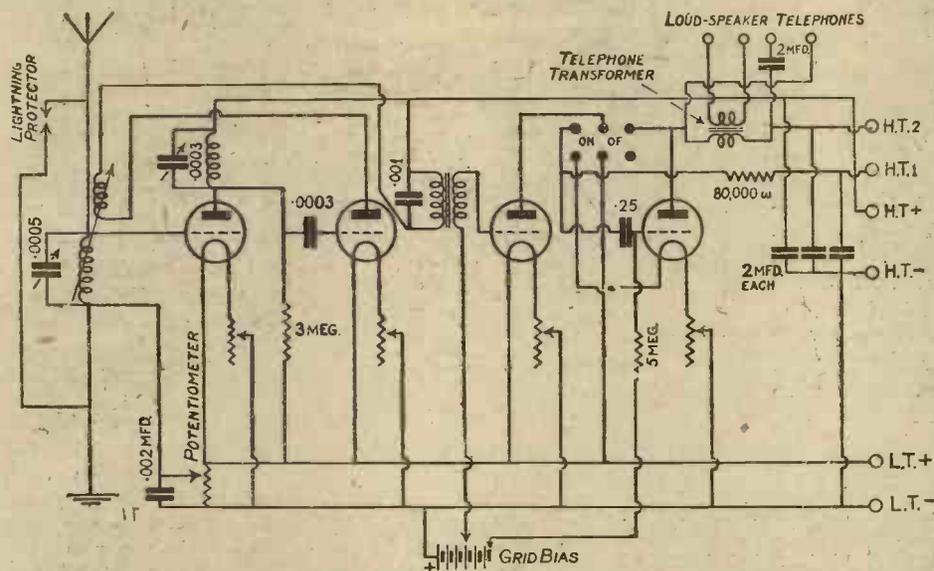


Fig. 2.—The Circuit Diagram.

width of ebonite is useful at the back for wiring, etc., as will be seen from the photographs of the rear of the panel.

### Drilling the Panel

The drilling of the panel should be taken in hand first of all, and Fig. 1 should make this a simple matter. Only the main drilling centres have been shown, since with different makes of components different drilling dimensions will be necessary, only the centres remaining constant. All the components with the exception of the four 2-microfarad condensers, telephone transformer, aerial protector, grid-bias battery, .002-microfarad condenser and two-coil holder are fixed to the panel. The components can be clearly seen in the photograph of the rear of the panel. After the panel has been drilled it can be rubbed down in the usual manner and then suitably engraved or marked with transfers.

The remaining components are mounted on the woodwork of the cabinet. Three of the 2-microfarad condensers are used for H.T. by-pass condensers and are clamped together on the side of the cabinet by means of two brass straps. The telephone transformer and remaining 2-microfarad condenser are fixed to the bottom of the cabinet, the latter being held in position by the .0002-microfarad fixed condenser, which in turn is fixed to the base-board by two long screws.

The aerial protector is mounted on the other side of the cabinet, while the grid-bias battery is clamped beneath the H.T. condensers by means of brass clamps. The coil holder is mounted outside the cabinet

connected together when the panel is put in place.

### Testing

When the wiring is completed, valves, H.T. battery and L.T. battery, phones, etc., should be connected up ready for a preliminary test. With regard to the valves, the writer used a Cossor "red top" for H.F. and R5V valves for both detector and the first stage of L.F. The last stage of L.F. should be a small power valve, and it was found that a B.T.H. B4 gave about the best results. Dull-emitter valves can, of course, be used for the first three, but in any case the filament rheostats should be suitable for the type of valve adopted. The values of H.T. used also depend upon the valve, but the writer uses 40 volts on H.T. +, 100 volts on H.T. + 1 and 150 volts on H.T. 2, with grid bias of  $4\frac{1}{2}$  volts on the first and 9 volts on the second stage of L.F. amplification.

### Operation

A short note on the operation of this set will not be out of place, although the working is particularly simple. The key switch on the left-hand side of the panel reverses the direction of the reaction coil and is found to be very useful at times, especially when receiving the more distant stations. One stage of L.F. can be cut out by means of the similar type switch on the right-hand side of the panel. The left-hand condenser is the aerial-tuning condenser, while that on the right tunes the anode coil, which, by the way, is plugged into the coil socket on the

### "A SIMPLE HARTLEY RECEIVER—20-200 METRES" (continued from page 417)

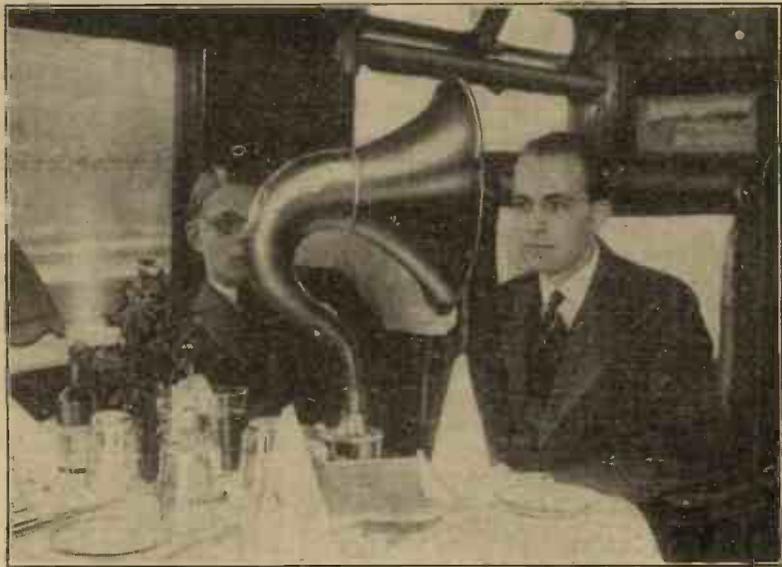
knob of the reaction condenser. In such a case the effect of putting the reaction condenser in the negative (earth) lead may be tried. The circuit will then be as shown in Fig. 5.

When using capacity reaction trouble is often experienced from small short-circuits taking place across the reaction condenser owing to small pieces of dust getting between the plates. This gives rise to bad noises, and is to be avoided at all costs. The best way of getting over the trouble is to prevent the direct H.T. energy coming full on the variable condenser. This can be done by putting a fixed condenser in series with the variable condenser on either side of it, but preferably on the plate side. A glance at Fig. 5 will show that this has been done in this arrangement. The fixed condenser, C<sub>3</sub> in the lead from the plate to the top of the coil, is actually in series with the variable reaction condenser C<sub>2</sub> in the negative lead. This being so, it is obvious that a variable condenser of .0002 microfarad maximum capacity will no longer have that effective value in the circuit, as the value of the two capacities in series is the sum of their reciprocals. Therefore, the variable condenser should now be of .0005 microfarad maximum capacity, and the fixed blocking condenser should be of the same value.

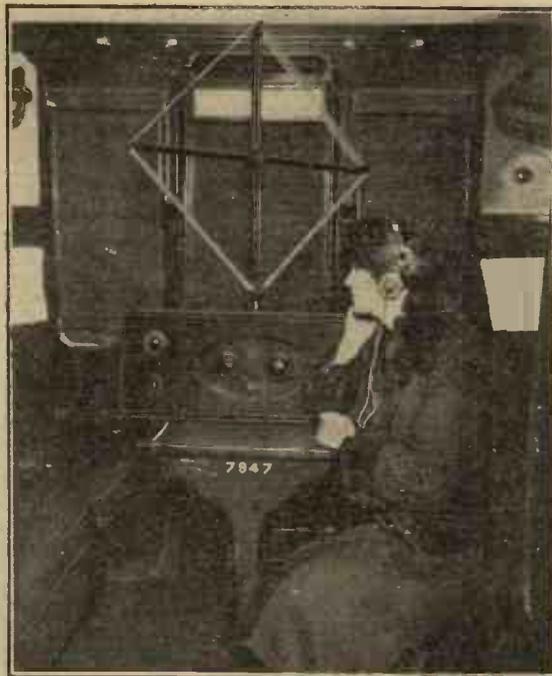
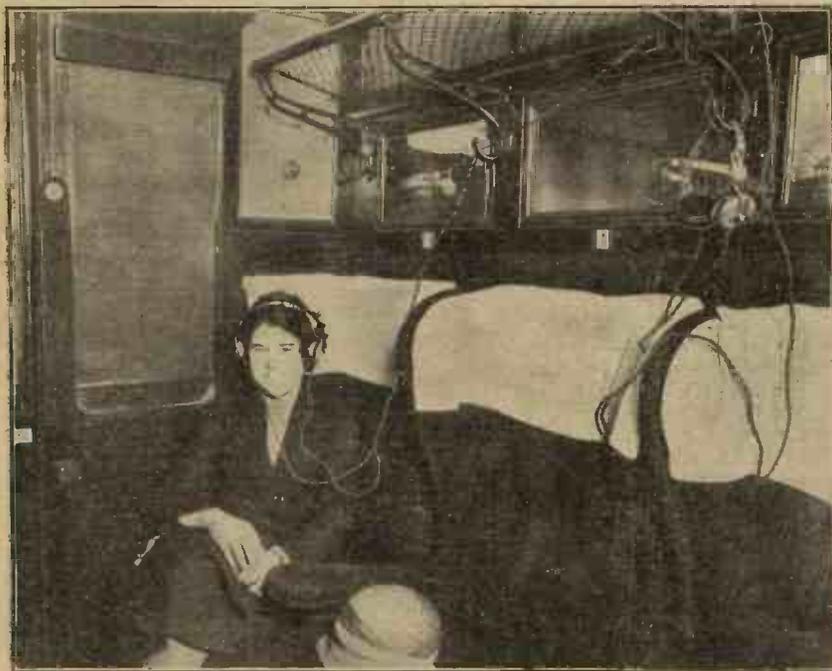
The set as described above would have to be completely re-designed for this arrangement, otherwise many of the leads would be unduly long. 5 Y.M.

Another birthday programme is announced for March 21. On this date a special programme commemorative of J. S. Bach will be given from London. It is hoped to secure several artistes who have specialised in the famous composer's works.

## MODERN TRAVEL—A PROBABLE INNOVATION



Two Pictures of an Experiment on the Cornish Express. Music from Six Counties was Heard.



An Excellent Method of Relieving the Monotony of a Journey.

### IMPROVING THE COIL HOLDER

THE novice who fixes a socket and plug to his panel for the aerial-tuning coil may find that if the latter is plugged in sufficiently tightly the valves on the set are jarred when it is pulled out. The following simple device ensures excellent contact between the coil and its connections even if it is allowed an easy fit.

A length of flex about 3 in. long is soldered to each end of the coil windings, and a small spade tag attached to the free

end. Two terminals are inserted in the panel beside the socket and plug respectively and wired to them.

It takes only a moment to secure the tags firmly to the terminals, and this trouble is well repaid by decreased capacity effects, sharpened tuning, and the absence of microphonic noises. G. S.

York Corporation have decided not to grant permission for the fixing of wireless aeri-als over main streets, except in cases where it is impracticable for them to be fixed in other positions.

### PROTECTING THE PANEL

MANY components of the one-hole fixing variety are fitted with round milled nuts which do not provide a grip for pliers. The tool is very apt to slip and scratch the panel.

A simple method of overcoming the difficulty is as follows. A strip of cardboard has a hole cut in it, and when using the pliers the cardboard protector is held over the nut, thus effectively preventing an accidental scratch. R.



ALL the private sitting-rooms in the main south block of the Hotel Cecil, London, are being installed with wireless, and as soon as possible the whole of the rooms will be similarly equipped.

A broadcasting station has been opened by a small group of wireless amateurs in the Grand Duchy of Luxemburg. The call-sign is LOAA, and musical transmissions are made twice weekly on a wavelength of 1,200 metres.

In future all Sunday concerts from Bournemouth will be broadcast from the new Central Hall at Southampton.

The B.B.C. has received from a correspondent a log of British stations received during a voyage from Liverpool to South America. The reception of Daventry is recorded throughout the whole trip as far as the coast of Brazil and subsequently up the Amazon as far as Manaus, over 1,000 miles inland.

A broadcasting station was opened recently at Kosice (Hungary). The power is 2½ kilowatts, and concerts are broadcast nightly between 18.00 and 20.00 G.M.T. on a wavelength of 2,020 metres.

On St. Patrick's Day (March 17) the speeches to be given at the banquet of the Union of the Four Provinces of Ireland Club, held at the Hotel Cecil, will be relayed to 2LO and Daventry. The String Band of the Irish Guards will contribute a programme of music, and toasts will be proposed by the Rt. Hon. Stanley Baldwin and by Cardinal Bourne, Cardinal Archbishop of Westminster. Later in the evening 5XX will relay a portion of the programme broadcast by the Dublin station.

The Band of H.M. Grenadier Guards will perform at the 2LO studio on Sunday afternoon, March 14. In the evening the programme will be provided by De Groot and the Piccadilly Orchestra.

The last Act of Verdi's *Rigoletto* will be relayed to all stations from the Alhambra, Bradford, on Monday, March 15. This will be followed by the relay from the Grand Hotel, Eastbourne, of Albert Sandler and his orchestra.

Miss Maud McCarthy will give a recital

of Indian music at the London studio on Monday, March 15. She accompanies herself on the vina, a peculiar and valuable eastern instrument.

By a system of wired wireless, an attempt is being made to relay the Vienna concerts to the Buda-Pesth broadcasting station. A new station will shortly be opened at Zagreb.

The Vienna high-power station has altered its wavelength to 528.5 metres.

### If this Catches the Eye

of the new reader, we shall have the opportunity of telling him why we are presenting the SPECIAL SUPPLEMENT with this week's issue.

Firstly we want to tell our readers all about "Britain's Most Popular Two-valver," as revealed by the votes in the recent competition.

It is a simple set and our Constructional Staff have found it to give quite good results. The booklet and coloured plate provide every possible detail.

Will the new reader bear in mind that we are offering him a very special service. We have what we believe to be the finest Wireless Information Bureau connected with any periodical. It gives a remarkable and a very prompt service to its readers and no charge whatever is made for the information supplied.

Week by week we keep our readers informed of wireless developments, and week by week we give them much to ponder over and much to do.

Will the new reader and casual reader accept our very pointed advice. Please see that AMATEUR WIRELESS is delivered to you each week. Do not depend on buying an odd copy here and there, but make it easier for the publishers and for the distributing trade to meet your needs by telling them beforehand that you want your copy of AMATEUR WIRELESS every week without fail. Perhaps you will care to avail yourself of the ORDER FORM below.

### FILL IN THIS ORDER FORM NOW

To ..... (Newsagent)

Please supply me every week, until further notice, with "AMATEUR WIRELESS," published by Cassell's.

(Signed) .....

(Address) .....

**ORDER  
FORM**

It is proposed to increase the energy of the Zurich broadcasting station to 5 kilowatts in the immediate future.

Since the inauguration of the Stranice broadcasting station in Czecho-Slovakia the number of listeners has increased con-

siderably, and it is thought that the figure of 50,000 will be exceeded at the beginning of April.

The high-power station of Königswusterhausen now relays dance music broadcast by 5XX at the end of the ordinary Berlin programme.

A new broadcasting station is shortly to be opened at Basle (Switzerland). Tests will be effected during the next few days on wavelengths varying between 900 and 1,300 metres.

A broadcasting station, erected under the auspices of the Military School at Asuncion, Paraguay, has been completed and tests are now being made.

There are now nine transmitters working on nine different wavelengths from the G.E.C. research station at Schenectady.

More than five million American homes are equipped with receivers, and there are over 600 broadcasting stations in the country.

On Good Friday Londoners will have a special programme, beginning with Evensong from Canterbury Cathedral. This will be followed by a concert of chamber music, an organ recital, and an address by the Rev. Hugh B. Chapman, of the Savoy Chapel, and orchestral and vocal music.

It is hoped that the relay of the sounds of a boxing match will take place on the evening of March 29.

Negotiations have been opened between wireless amateurs of the Dutch East Indies and the broadcasting authorities in Holland with a view to the establishment of a station in the Indies. The Dutch Government is willing to grant a ten-years' licence to a private company on the condition that the broadcasting station is of sufficient power to give an efficient service to the entire Dutch Archipelago.

A company has been formed at Amsterdam for the equipment of concert halls in order that, for a small entrance fee, listeners may hear the broadcast transmissions.

Some interesting experiments with direction-finding apparatus are being carried out by the Canadian Marconi Co. on the steamer *Glencagles*, which has been fitted with special D.F. apparatus.

There is to be another broadcast from York Minster on the last Sunday in March, when part of Bach's St. Matthew

Passion Music will be transmitted through Daventry.

A forthcoming feature of the programmes will be a series of special Sunday afternoon transmissions from the London station of scenes from popular Shake-

spearian plays. "The Heroines of Shakespeare" will form the theme of the series.

An extract from Vaughan Williams' *Hugh the Drover* is to be relayed on March 22, when it is to be performed by the British National Opera Co.

American listeners are at present registering an emphatic protest against announcers using nicknames.

On its latest Bremen to New York voyage the North German Lloyd liner *Berlin*, in conjunction with the Nauen and the Norddeich and Bremerhaven coastal stations, carried out interesting experiments on wavelengths varying from 52 to 68 metres. The German stations utilised a power of approximately 500 watts, and two-way communication on the short waves was found possible at all times of the day and night until the liner's arrival at New York. On the higher wavelengths messages sent by the *Berlin* did not reach their destination.

Land-lines connect the Schenectady broadcasting station with many other cities in the U.S.A., and through its affiliation with WJZ (Boundbrook) it is able to tap the programmes given out by that station, as well as those of WRC (Washington), WFLB (Syracuse, N.Y.), WTAM (Cleveland, Ohio) and WMAK (Lockport, N.Y.).

The broadcasting stations of Canada have formed a new organisation known as the Canadian Association of Broadcasters, which includes the ten transmitters run by the Canadian National Railways, as well as most of those in the possession of private firms and newspapers.

From June 5 to August 1 a theatre exhibition will be held at Magdeburg. It is proposed to show the various developments of the dramatic art and also to demonstrate the different methods by which performances from places of amusement can be relayed to broadcasting stations for re-transmission.

"A Model Railway Controlled by Wireless" is the title of an article appearing in the current issue of "The Amateur Mechanic and Work" (3d.), and deals with the construction of the necessary track. The locomotive and the electrical connections will be described in future articles. Other articles appearing in the same number are: "An Antique Flower-bowl Stand," "What 1926 Will See in Photography," "Photographic and Fretwork Firescreens," "Bookbinding for the Amateur," "Repairing Bowden Cables," "A Parallel Sliding Two-way Coil Holder for Wireless," "A Simple Wireless Wave-trap," "Toy Furniture from Waste Tins: The Bedroom Suite," "Cupboards Made from Cheap Wood," "Magnets: Natural, Temporary and Artificial," "Decorating a North-east Bedroom," "Making a Flag-The Union Jack," "Uses for Discarded Motor Inner-tubes."

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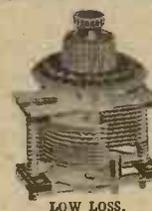
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EBONITE VARIOMETERS.—Ball Rotor, 4/6. Standard, 3/11. Duplex for 5XX and B.B.C., 7/6. Tapped Variable Coupler, 9/0.000 metres, the instrument, 8/11. Marconi series-parallel, 16/-; Edison Bell, 14/-. MOUNTED COILS: STAR.—25, 1/3; 35, 1/6; 50, 1/9; 75, 2/-; 100, 2/3; 150, 2/6; 175, 2/6; 200, 3/-; 300, 3/6. GRAM (Patent 206233), air-spaced, mounted, 20, 1/6; 35, 1/8; 50, 1/8; 75, 1/11; 100, 1/3; 150, 2/8; 200, 2/11; 250, 3/6; 300, 3/6; 400, 3/6. IGRANO (Honeycomb)—25, 3s. 4/3; 50, 4/8; 75, 4/10; 100, 6/3; 150, 7/-; 200, 8/-; 250, 8/6; 300, 9/-; 400, 10/-; 500, 10/6; 600, 11/-; 750, 12/6; 1,250, 15/6; 1,500, 17/6. LISSEN.—25, 3s. 4/10; 50, 5/-; 60, 7s. 5/4; 100, 8/6; 150, 7/-; 200, 8/5. LISSEN X, 50, 6/-; 60, 6/4; 75, 6/5; 100, 9/-; FINSTON.—25, 1/8; 50, 1/9; 75, 2/-; 100, 2/8; 150, 2/9; 200, 3/8; 250, 3/8; 300, 4/-.

VALVE HOLDERS.—BENJAMIN, 2/9; Lotus, 2/3; Apex, 1/6; Excelator, 1/8; Sterling Non Ponz, 4/3; Burndept, 5/-; Magnum, 5/-; 2/6; Bowyer-Lowe, 3/6; Athol, 1/3; H.T.C., 1/6; 1/9; Aeromicon, 1/3; Bestwood, 1/9. FIXED CONDENSERS.—Dubilier .0001, 2, 3, 4, 5, each 2/6. .001, 2, 3, 4, 5, 6, each 3/-. Grid Leak, 2/6. Edison Bell, .001, .0001, 2, 3, 4, 5, 1/-; .002, 3, 4, 5, 6, 1/8. .003 and grid leak, 2/-. (Post 2d.) Thelma 1/6 and 2/- each. Dorwood .0003 with grid leak clip, 2/6. McMichael with clips, .0001 to .0005, 2/6 each; .001 to .006, 3/- each.

VARIABLE CONDENSERS.—Polar Standard, 10/6. Junior, 5/6 each. Bowyer-Lowe Popular, 10/6. Igranite, 24/-, 21/-, Collinson's Low Loss, 21/-, 20/-. Utility, 5/6. 12/6. Vernier, 2/6 extra. Utility Low Loss, stocked .0003 and .0005. J.B. (Jackson Bros.), Square Law, .001, 9/6; .0005, 8/-; .0003, 7/-; with vernier, 4/- each extra. Geared .0005, 15/-; .0003, 13/-; Low Loss 10/6, 3/-; Ormond new geared friction drive, .0005, 15/-; .0003, 13/6. Low Loss, .0005, 8/-; .0003, 7/6; with vernier 1/6 each extra. Ebonite ends same price. Newey 4 point, 15/-, 17/6. FILAMENT RHEOSTATS.—Ormond 6 or 30 ohms, 2/6. Finston, 6 ohms, 2/3; 30 ohms, 2/6. Wates' Microstat, 2/6. Lissen Wire, 7 or 35 ohms, 4/-. Do. Potentiometer, 4/6. Burndept, 4/6 to 7/6. McMichael, 4/6 to 7/6. Peerless 6 or 30 ohms, 2/6. Peerless Dual, 3/6.

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## PROGRAMMES AND POLICY

ALTHOUGH the findings of the commission on broadcasting have been made known; many months will pass before effect can be given to the scheme for radiation by "regions" and not by density of population. To listeners the most important change impending is the establishment of different wavelengths, for the various sections into which broadcast programmes must fall. The latter innovation will have a profound effect on the standard and merit of programmes.

Such knowledge of coming changes provides an element of hopefulness, yet something should be done to bridge the gap and give more vitality to programmes.

### A Definite Plan

Looking back on the past, there would seem to be a need for a more definite plan to be pursued in the various divisions into which the programmes fall.

One might take the case of orchestral transmissions. There are the excellent Hallé performances, coming as they do once a fortnight, but the credit for these belongs to the originators. To the B.B.C. the credit due is for purchase only. Taking the whole year throughout, there would

seem to be no definite course mapped out—no systematic booking of leading conductors whose genius should fit into a well thought out musical policy. Now and then the names of leading conductors appear in the programmes, but one feels that the reason of the presence is to enliven matters somewhat.

### Resources

When the power and resources of British broadcasting are pondered on it becomes a source of surprise as to why the orchestral and concert plans are not drawn up from autumn to autumn. It cannot be said that the past winter has been brilliant with wireless musical productions. True, there have been many excellent transmissions, but there has been an undoubted lack of continuous plan. Rather it could be said that an opportunist policy has been pursued. The musical listener would like to possess the knowledge that before his closed eyes would slowly pass the genius of the musical world—its conductors, its singers, its instrumentalists. These artists are not tied up like the stars of the theatrical world, but can be booked were some fixed plan

pursued by the musical authorities of the B.B.C.

### A Detached Atmosphere

One of the drawbacks of wireless is the detached atmosphere in which it must exist due to its general appeal and multitudinous restrictions. Its transmissions are not grafted on to our everyday life, and when one eccentric step is made there immediately arises an outcry from that section of listeners who disagree with the slight deviation. The reader can imagine the outcry were some virile dramatic policy allowed to take the place of the cautious fare at present served out.

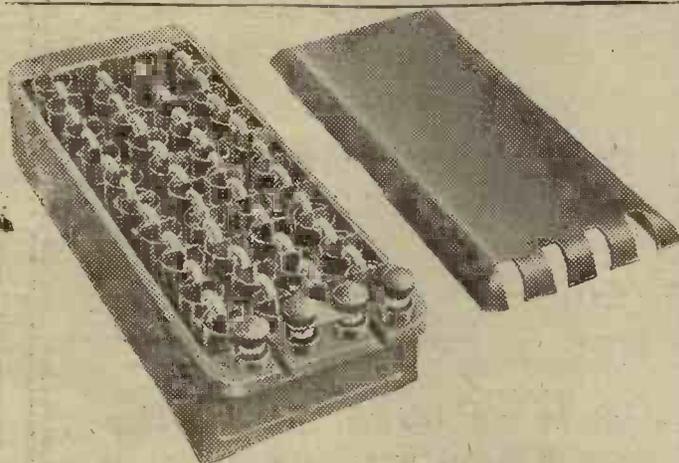
### A Temporary Compromise

As the present wireless programmes have to suit all tastes, it would seem that frequently one or two sections of listeners have to shut down for a whole night unless they are prepared to wait until the late hours, perchance, provide what they require.

There are many fortunate people who are not dependent on wireless for their daily amusement. This group of listeners can afford to pick and choose, but usage has

(Concluded on next page)

## DRY BATTERY TROUBLES ELIMINATED



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80 Volts.

1 amp. hour capacity.

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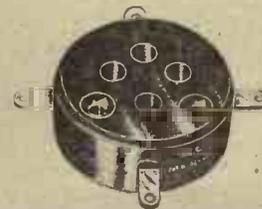
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"PROGRAMMES AND POLICY" (continued from preceding page)

formed habits, and to many a blank wireless evening brings keen disappointment.

Could not a policy of subdivision be pursued? If it is intended to radiate chamber music, then let this occupy three quarters of an hour, and during this time put forth the best of its kind. The next division could be given over to musical or straight drama, while variety or song and dance music could complete the two hours. Such divisions may be too small, but the examples are sufficient for illustration.

There have been of late stolid evenings of two hours' duration, and the tired business brain has been unable to cope with more than half an hour of concentration. Such programmes are a recreation to many, particularly to the rural listener. With only one wavelength it is essential to provide daily fare to suit all groups of listeners. It is useless to say that the set should be switched off when something is not to one's liking; also the amount of the licence does not enter in the matter. The point is, one cannot afford anything else, and wireless entertainment has become a part of one's life, so that it is essential for a policy of subdivision to be introduced.

Such a proposal limits the scope of high-brow music, but exceptions can occur. As long as there exists but one outlet—that is, one wavelength—it is essential to concentrate on producing a triple bill in every programme—a difficult task—yet its successful attainment would reap its merited reward. Let us have good music, good drama, good variety groups.

**Reshuffle the Timings**

A step towards this more generous method of amusing listeners would be to advance the time at which the news is read by half an hour, to be followed by the usual talk, unless that item were dispensed with. One hesitates to consider the discontinuance of this evening talk, because it is an admirable time to hear what others think.

The growing fashion of singing dance songs increases the scope of the period after the news bulletin. At present many hard-working people are obliged to miss these happy, care-free melodies simply because they must go to bed, but were they to start punctually at ten o'clock this group of people could steal a half-hour of entertainment for which concentration is unnecessary.

Picture a hard-working man and wife: he from a wretched office, she an unpaid domestic servant. Then why not give them those rhythmic tunes—those ukelele lullabies, and so create around them an atmosphere of hope—of belief that the joys of life are still within reach. They listen—they dream, and as the clock strikes 10.30 they have yet lived again some moments of a long-past romance.

ROBERT GLENDING.

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Service Advertising



## WIRELESS IN THE QUEEN'S HOSPITAL, BIRMINGHAM

course, give ample volume for headphone reception of the local station.

### Crystal Receivers

All the beds were wired for headphones, but it was only deemed necessary to supply headphones for 75 per cent. of the beds

OF the very many hospital wireless installations which have now been carried out, one of the most interesting is undoubtedly that recently completed at the Queen's Hospital, Birmingham. Generally, in installations of this kind, large valve sets are employed and the control is centralised.

### Phone Reception

In designing the Queen's Hospital installation it was felt that, since loud-speaker reception was not required, it would be simpler and better in every way to employ crystal receivers, which, of

owing to the fact that a percentage of the patients would be too ill to listen and that therefore a proportion of the phones would be useless. The present installation comprises thirty-two B.T.H. Bijou crystal receivers and one hundred and fifty pairs of B.T.H. headphones. In most cases six pairs of phones are connected to each crystal receiver. The outward leads from each receiver are run to six beds. Close to each bed an ordinary lamp-holder is fixed. The headphones are fitted with adaptors, so that when a patient wishes to listen it is only necessary for the adaptor to be placed in the lamp-holder.

### First Experiments

Experiments were first made with inside aerials in all wards, but ultimately a special form of cage aerial was constructed. This consists of two hoops, about 4 ft. in diameter by 2 ft. deep, supported by stays. About 100 ft. of galvanised-iron wire are wound round the hoops. In all thirty of these cage aërials are used.

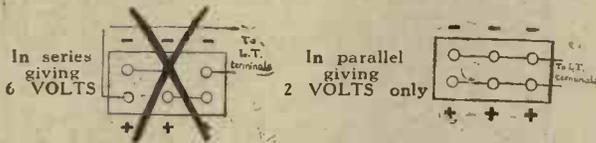
### Simple and Effective

From the point of view of simplicity of control and good reception, the Queen's Hospital installation is eminently satisfactory.

The cost of the installation was borne by the *Birmingham Gazette* Hospital Wireless Fund, subscribed to by readers of the *Birmingham Gazette*. The aerials and internal wiring were installed by Cooke and Whitfield Wireless, Ltd., while, as already mentioned, the receiving sets and phones were supplied by the British Thomson-Houston Co., Ltd.

## A BRIGHT IDEA in dull emitters

Accumulator charging is the bugbear of Wireless reception. Diminish it by using Lustrolux low consumption valves. Try the economical combination of 2v. .06 H.F. and 2v. .06 L.F. together with 2v. .34 Power Valve. Run your set with a consumption of .46 amps. for 3 valves.



If you have a four- or six-volt accumulator, parallel it up instead of using it in series and use the Lustrolux valve combination; you will be surprised at the life of each charge and, above all, at the quality of the reception. Compare our prices and send for our catalogue.

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Agents wanted everywhere. Show-cards and literature supplied.

**LUSTROLUX LTD.**  
West Bollington, Nr. Macclesfield.

## A New "Amateur Wireless" Handbook

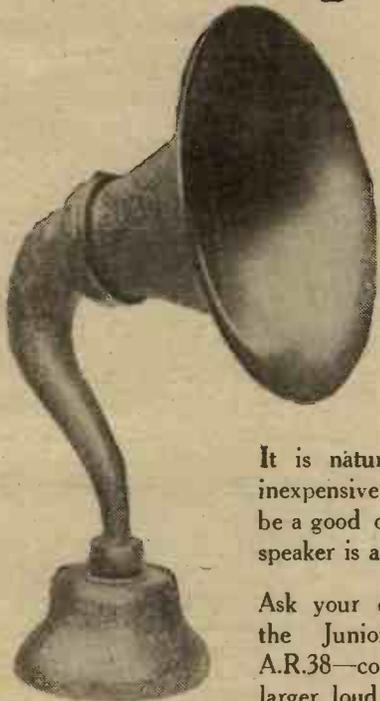
## A Wireless Man's Workshop J. HARTLEY REYNOLDS

The author, a practical home constructor and a well-known wireless expert, possesses the happy knack of imparting knowledge in simple, easily understood sentences. There is an amount of general wireless information throughout the book which all readers will appreciate.

2/6 net.

CASSELL'S, LONDON, E.C.4.

# SENIOR *performance* JUNIOR *price*



SWAN-NECK Model  
A.R. 38, price 38/-.  
Other models at 58/-. 84/-.  
and 95/-.

It is natural to assume that an inexpensive loud speaker cannot be a good one—but not if the loud speaker is an AMPLION.

Ask your dealer to let you hear the Junior Swan-Neck model A.R.38—compare it with other and larger loud speakers costing much more. It may not come out best against them all, but it will hold its own easily with many of twice the size and double the price.



Obtainable from AMPLION STOCKISTS, Radio Dealers or Stores.

Demonstrations gladly given during business hours at the AMPLION Showrooms:—

25-26, Savile Row, London, W.1.      10, Whitworth Street West, Manchester.  
79-82, High Street, Clapham, S.W.4      101, St. Vincent Street, Glasgow.

## There is no substitute for a genuine AMPLION

Announcement of Alfred Graham & Co. (E. A. Graham), Crofton Park, London, S.E.4.

# FELLOWS WIRELESS



## FELLOWS COILS

The Fellows Coils have justly earned the reputation of being amongst the most efficient on the market. Besides having particularly low self capacity and low losses, they are effectively encased in crystalate and will, therefore, stand even rough handling without fear of damaging the windings.

They are made in a complete range to cover all ordinary wavelengths as below:

Coil No.	Wavelength		Price
B 1	250 —	400	3/-
B 2	320 —	545	3/-
B 3	370 —	660	3/-
B 4	560 —	930	3/-
75	600 —	1,100	3/6
100	870 —	1,500	4/3
150	1,340 —	2,520	4/6
200	1,800 —	3,350	4/9
300	2,460 —	4,200	5/-
400	4,000 —	5,750	5/6
500	5,500 —	10,000	6/-

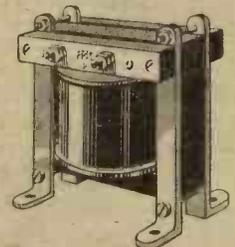
The wavelength test was made on a standard P.M.G. Aerial with a 0.00075 mfd. condenser in the aerial circuit. When ordering please enclose 3d. postage for each coil.

Write for Free Illustrated  
Catalogue post free

## THE FELLOWS "SUPER" TRANSFORMER

The name Fellows has stood for pre-eminence in the making of magnetos and transformers for over 20 years, and to-day there is no better transformer on the market than the Fellows "Super" at any price.

Low self capacity, complete absence of distortion, made of the highest grade materials, this transformer represents the finest value for money that the Wireless industry has to offer. Send for one to-day and you will be amazed at the results.



Price 15/6

Postage 6d.

All our apparatus is fully guaranteed and is sent on SEVEN DAYS' APPROVAL against cash. Remember that our policy of selling to you direct enables us to save you 6/8 in the £1 and still maintain the high quality for which we have always been famous.



## BUY BY POST AND SAVE MONEY

THE FELLOWS MAGNETO Co., Ltd.  
CUMBERLAND AVENUE, N.W.10

Branches:

LONDON: 20 Store St., Tottenham Ct. Rd., W.C.1. Museum 9200

CARDIFF: Dominions Arcade, Queen Street.

NOTTINGHAM: 30 Bridlesmith Gate

E.P.S. 223

# HIGH-TENSION SUPPLY FROM A.C. MAINS

*The third and concluding article on an efficient system*

## Testing the Switchboard

TO a length of 35/40's well-insulated electric-light twin flex connect an adaptor, or a two-pin plug, according to whether the current is going to be taken from an electric-lamp holder or a wall socket. With the electric-light switch "off," connect one end of the flex to one of the input terminals and in series with the other wire, and in the other terminal insert a piece of fine fuse wire, which conveniently may be a single strand obtained from the flex. Now put both the main switch of the board and the switch controlling the adaptor or plug to the "on" position, and if the fuse holds good, then the input connections. Subject to the rotary switch contacts making actual contact, then the input side is quite in order. This test should only occupy a few seconds, as it is harmful to the transformer windings for the current to be on with no load, as a considerable strain would be put on the windings.

The ends of the lighting flex should now be fitted with two spade terminals, preferably of the insulated shank type. With the switches again at the "off" position,

insert the valves into their holders and connect up once more to the supply point; but before switching on, see that the filament resistances are at their minimum, that is, that nearly all the resistance is in circuit. When the switch is now put on, the valve filaments should light, either two or four, according to the position of the valve switch. Should the filaments not light, switch off immediately, and carefully examine the whole of the filament circuits, especially the valve legs. *Do not search for faults with the main switch "on."*

## Operation

If the filaments, as they should do, light up, then the low-voltage secondary connections are in order, and the voltmeter may now be switched on, when it will be found that the voltage will rise or fall according to the adjustments of the filament resistances, and, assuming that bright-emitter valves are being used instead of the small power valves, as advocated, there will be quite a different reading when only two valves are in use.

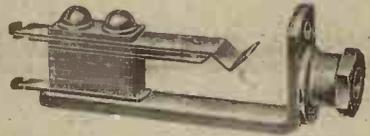
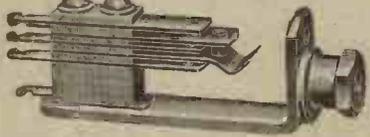
The switchboard and the components being designed to give a current output of approximately 15 milliamperes, it is important to realise that the correct voltage reading is that which is taken when there is no load on. If a voltmeter of other than the resistance specified be used, do not be surprised if it renders but a reading of 10 volts or just moves from the zero point. On the other hand, if the specified voltmeter does not by chance register, the fault no doubt will be due to the grid and plate legs not making proper contact in the valve holder, or, alternatively, it may be traced to a faulty condenser in either the positions of C1 or C2.

There is no need to imagine that the negative lead is dangerous, although it is certainly connected to the high-voltage winding, as this is actually taken from the electrical centre, which, of course, is at zero potentially, and is perfectly safe when connected to earth, either direct or through the common negative. The voltmeter is now registering, and the main switch turned off, while the output terminals are

*(Concluded on page 432)*

# EDISON BELL RADIO

"THERE IS NOTHING BETTER THAN THE BEST"—WE SUPPLY YOU WITH THE BEST  
— NOTE PRICES —

 <p>S.O. No. 1. Single Open. PRICE 1/8</p>	 <p>S.C. No. 2. Single Closed. PRICE 2/2</p>	 <p>D.C. No. 3. Double Closed. PRICE 2/9</p>
 <p>S.F. No. 4. Single Filament. PRICE 2/6</p>	 <p>D.F. No. 5. Double Filament. PRICE 3/4 JACKS and PLUG</p>	 <p>I Pair Plug. PRICE 2/9</p>

*Ask your dealer for catalogues or write direct to:—*

**J. E. HOUGH, Ltd., Edison Bell Works, LONDON, S.E.15  
AND HUNTINGDON**

**TESTED 500 VOLTS  
FLAT TYPE**



## INSIST ON EDISON BELL CONDENSERS

THEY ARE BRITISH MADE AND GUARANTEED BY A NAME WITH 30 YEARS REPUTATION BEHIND IT

**TESTED 500 VOLTS  
UPRIGHT TYPE**





*The  
Shanty-man*

flourished in the palmy days of the sailing ship, when the handling of capstan, windlass or sails depended on the lusty arm of the seaman. His duty it was to sing the shanty which kept the hands heaving or hauling in time, while the latter took up the refrain, and the great ships were warped to their berths or headed for the open sea to the strains of 'Away, Rio,' 'Reuben Ranzo,' 'Shenandoah,' 'The Hog-eye Man,' and many another of these curious and attractive airs. Alas! the stately Indiaman and the graceful clipper ship have vanished from the sea, and the Shanty-man sings no more.

20 for 11d.  
10 for 5½d.



Reg. No. 154011

Player's  
WHITE LABEL  
NAVY CUT CIGARETTES

P.W. 39

"HIGH-TENSION SUPPLY FROM A.C. MAINS"  
(continued from page 430)  
connected to their respective positions on the receiving instrument.

With the switchboard outers now taking the place of the dry batteries, the main switch may be turned on.

After carefully following these tests, the board should be disconnected and screwed to the wall (which should be perfectly dry); to ensure free circulation of air behind the panel, it is advisable that the woodwork be spaced by inserting a reel insulator between the frame and the wall.

This article does not represent the last word in rectifying devices to permit the alternating-current mains being used instead of dry batteries, but it has been found to be very satisfactory. However, if the alternating-current hum is prominent, an extra condenser, or condensers paralleled to either C1 or C2, will usually be found to prevent it.

If a larger output than 15 milliamperes is required, it is only necessary that a larger transformer be used instead of the H.2 type, as mentioned under the list of components: A. W. Knight, Ltd., of 180, Tower Bridge Road, S.E., who are the makers of the Kaynite devices, have in hand transformers giving 30 and 50 milliamperes; for power amplifier work other patterns, from 75 to 200 milliamperes, are available.

In order to secure the full output of the larger transformers, larger types of power valve must be used. A. W. K.

WIRELESS IN PARLIAMENT



From Our Own Correspondent.

MR. DAY asked the Postmaster-General, whether his attention had been drawn to the speech broadcast by the President of the Board of Trade when inaugurating the British shopping week at Birmingham, which speech was of a contentious political nature; and whether such speech was reviewed or censored by the British Broadcasting Co. before broadcasting.

Sir W. Mitchell-Thomson said he understood that the speech was broadcast by the British Broadcasting Co. from their London studio. In accordance with the usual practice a draft was submitted in advance to the company. The company did not consider that it contained anything to which objection could be taken, and they agreed to the broadcasting of the speech as a matter of general national interest. He was surprised to learn that any section of political opinion would desire to controvert the proposition enunciated by the President, namely, that increased purchases of British goods, wherever circumstances permitted this to be done, stimulated British industry and assisted in relieving unemployment.

CHIEF EVENTS OF THE WEEK

SUNDAY, MARCH 14

London	9.15	De Groot and the Piccadilly Orchestra.
Birmingham	3.30	Mozart and Handel Programme.
Cardiff	3.30	The Cory Silver Band.
Manchester	3.30	The Story of Peer Gynt.

MONDAY

London	8.0	Variety Programme.
Daventry	8.0	A Programme of the Sea.
Bournemouth	8.0	An Instrumental Evening.
Glasgow	8.20	A Popular Programme.
Manchester	8.0	Request Programme.
Newcastle	8.0	Pianoforte Recital by Percival Garratt.

TUESDAY

London	8.0	The Kutcher String Quartet.
Aberdeen	8.0	The Seasons in Music and Verse.
Birmingham	8.0	Musical Comedy.
Cardiff	8.0	Fashions in Fun.
Sheffield	8.0	The Dannemora Steel Works Band.

WEDNESDAY

London	10.30	Irish Emigrant Scene.
Aberdeen	8.0	Irish Programme.
Birmingham	8.0	Some Irish Music.
Belfast	8.0	Carrillon from Armagh Cathedral.
Hull	8.0	Erin Go Eragh.
Newcastle	8.0	St. Patrick's Day Programme.
Nottingham	8.0	Mirth and Melody.

THURSDAY

London	6.0	The London Radio Dance Band.
Birmingham	8.0	The Dream of Gerontius (Elgar).
Manchester	8.0	A Ladies' Evening.

FRIDAY

London	9.30	The Shakespeare-Rutterford Trio.
Birmingham	8.40	The Shakespear Mystery.
Cardiff	8.0	A Musical Prelude.
Manchester	8.0	Lancashire Talent Series.
Newcastle	8.0	Syncopated Music and Humour.

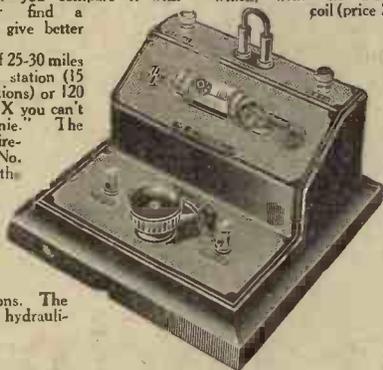
SATURDAY

London	8.0	For Love of the Flag.
Bournemouth	8.0	Popular Programme.
Glasgow	9.0	Second Edition of Listening Time.
Manchester	8.0	Popular Concert.
Newcastle	8.0	Popular Arias and Ballads.

How loud it is!

That's what everyone says when they first listen-in with a "Brownie Wireless" receiver. And it doesn't matter how long you have one—how often you use it—what other crystal receiver you compare it with—you'll never find a crystal set to give better results.

At a distance of 25-30 miles from the local station (15 miles relay stations) or 120 miles from 5XX you can't hear "Brownie." The "Brownie Wireless" Model No. 2 embodies all the features of the Standard "Brownie" Receiver. It is capable of resisting extreme climatic conditions. The outer casing is hydraulically



moulded under a pressure of 60 tons, forming a pleasing and substantially designed piece of apparatus. The receiver has a natural wave-length up to 600 metres and a standard plug and socket coil attachment is provided, which, with the aid of a special coil (price 2/9 extra) makes the set adaptable to 5XX. Complete, including the famous D.L.5 Crystal and Palladium Catwhisker.

PRICE  
10/6  
COMPLETE

"BROWNIE WIRELESS" MODEL No. 2

The Standard "Brownie." Just as good as ever, 7/6  
but now complete with ebonite base ... 2/-  
5XX Loading Coil for the Standard ... 2/-

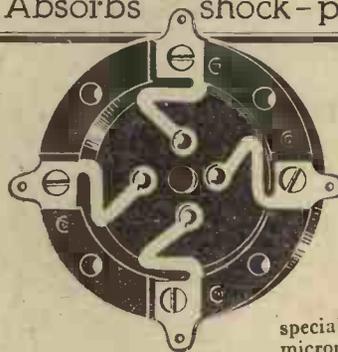
THE BROWNIE WIRELESS Co. (of Great Britain) Ltd.

(Incorporating the J. W. B. Wireless Co.),

310a-312a, Euston Road, London, N.W.1

'Phone: Museum 3747

Absorbs shock—protects the valves



You know it's good because of the name "LOTUS"

Don't have your valves spoilt by shock. The Lotus Valve Holder has been specially designed to counteract the microphonic elements that are so injurious to the delicate valve filaments.

The unique and original springs of the Lotus Valve Holder absorb any shock and eliminate all microphonic noises. Protect YOUR valves by fitting the Lotus Holder.



From all Reliable Radio Dealers.

GARNETT, WHITELEY & Co., Ltd.,  
Broadgreen Road, Liverpool.

Makers of the famous LOTUS Coil Holder

2/3

With Terminals 2/6



## "It's the Valves that make the difference"

"Don't claim to be much of an expert, old boy, but I'll tell you this: you can pay 50 guineas for a nickel-plated low-loss super-super set, and if you aren't using the right valves you aren't getting half the pleasure out of wireless. It's like looking at the lights o' London when there's a fog on, or being in charming company when you've got the earache.



"Now MY set isn't much to look at; *junk*, you'd call it. But I have three NEUTRON Valves, and I'll back it against the best. Get everything that's going, and my loud-speaker reproduction is as clear as a bell.

"Red Spot Neutron for H.F. and Detector; Green Spot for L.F. And they're as good as any

BRIGHT Valves—and that's saying a lot when you're speaking of Dull-Emitters."

# NEUTRON VALVE

H.F.—Red Spot. L.F. Green Spot.  
In both 4-volt and 2-volt types.

Sold by Radio dealers everywhere. In case of difficulty send P.O. 12/6 for sample valve, post free. Address "Valve Dept. A," Neutron

Distributors, Sentinel House, London, W.C.1.

British made and guaranteed by Neutron, Ltd.

## •06 for 12'6



## MATCHED TONE HEADPHONES

IF you're fond of sitting up in the wee sma' hours to stretch a hand across the world, Matched Tone are extremely able confederates. With radio you span continents and with Matched Tone it becomes easier, "comfier" and much more efficacious. Distant signals stand out clearly; Matched Tone grope in the ether with unflinching accuracy. The specially matched receivers make them super-sensitive and tone perfect. You are logging a new call-sign every day with Matched Tone.

20/-

Table-Talker	Brandola	Audio Transformer
30/-	90/-	17/6

# Brandes

Brandes Limited, 296, Regent Street, W.1

From any good Dealer



NOTE.—In the following list of transmissions these abbreviations are observed: con. for concert; lec. for lecture; orch. for orchestral concert; irr. for irregular; m. for metres; and sig. for signal.

**GREAT BRITAIN**

The times given are according to Greenwich Mean Time.

**London** (2LO), 364 m. 1-2 p.m., con. (Tues., Thurs., Fri.); 3.15-3.45, transmission to schools; 3.30-5.30, con. (Sun.); 4-5 p.m., con.; 5.15-5.55, children; 6 p.m., light music; 7-8 p.m., time sig., news, music, talk; 8.10-10 p.m., music; 9.0 news (Sun.); 10.0-10.30 p.m., time sig., news, talk; 9.30-10 p.m., special feature (Mon., Wed., Fri.). Tues. and Thurs. the Savoy Bands are relayed until 11.30 p.m., and on Sat. until midnight.

**Aberdeen** (2BD), 495 m. **Belfast** (2BE), 440 m. **Birmingham** (5IT), 479 m. **Bournemouth** (6BM), 386 m. **Cardiff** (5WA), 353 m. **Glasgow** (5SC), 422 m. **Manchester** (2ZY), 378 m. **Newcastle** (5NO), 404 m. Much the same as London times.

**Bradford** (2LS), 308 m. **Dundee** (2DE), 331 m. **Edinburgh** (2EH), 324.5 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 321.5 m. **Liverpool** (6LV), 311 m. **Nottingham** (5NG), 323.5 m. **Plymouth** (5PY), 338 m. **Sheffield** (6FL), 301 m. **Stoke-on-Trent** (6ST), 304 m. **Swansea** (5SX), 482 m. **Daventry** (25 kw.), high-power station, 1,600 m. Special weather report 10.30 a.m. and 10.25 p.m. (weekdays), 9.10 p.m. (Sun.); 11.0 a.m., light music (exc. Sat. and Sun.); relays 2LO

from 4 p.m. onwards, own con. on Mon. Dance music daily (exc. Sun.) till midnight; on first Friday in each month until 2 a.m.

**IRISH FREE STATE.**

**Dublin** (2RN), 390 m. Daily (exc. Sun.), 7.30 p.m.

**CONTINENT**

The Times are according to the Continental system; for example, 16.30 is 4.30 p.m., and 08.00 is 8 a.m. G.M.T.

**AUSTRIA.**

**Vienna** (Radio Wien), 590 m. and 530 m. (temp.) (10 kw.). 10.00, con. (almost daily); 14.30 con.; 18.25, news, weather, time sig., con., lec., news; 19.00, con.; 21.00, dance (Wed., Sat.).

**Graz**, 399 m. (1 kw.). Relay from Vienna. Also own con. (Tues., Wed., Fri.), 19.10.

**BELGIUM.**

**Brussels**, 262 m. (1½ kw.). 17.00, orch. (Tues., Thurs., Sat. only), news; 20.00, lec., con., news (opera, Mon. and Wed.).

**CZECHO-SLOVAKIA.**

**Prague**, 368 m. (5 kw.). Con., 19.00-22.00, daily.

**Brunn** (OKB), 521 m. (2.4 kw.). 09.00, con., news (Sun.); 18.00, lec., con. or dance (daily).

**DENMARK.**

**Copenhagen** (Radioraadet), 347.5 m. (2 kw.). Sundays: 14.30, lec.; 16.30, children; 19.00, play; 20.15, news, con.; 20.5, news, Esperanto (Mon.), silent night. Weekdays (Tues., Fri., Sat.): 19.00, lec., con., news, con.; 20.30, dance (Sat.).

**Ryvang**, 1,160 m. (1 kw.). Sundays: 08.00, sacred service; 16.30-20.30, same as Copenhagen; 19.00 (Wed., Thurs.), lec., con., news, orch.

**Hjoerring**, 1,250 m. (1.5 kw.)\*  
**Odense**, 950 m. (200 w.)\*  
**Sorø**, 1,150 m. (1½ kw.). Also occasionally relays 5XX from 22.00 G.M.T.  
\* Relay Copenhagen.

**FINLAND.**

**Helsingfors** (Skyddskar), 522 m. (500 w.). 17.30-20.00, con. (Tues.; Thurs., Sat.).

**Helsingfors**, 318 m. Con. 17.00 (Tues., Thurs., Sat., Sun.).

\***Tamafors**, 360 m.  
\***Jyvaskyla**, 561 m. (200 w.).  
\***Uleaborg**, 233 m. (200 w.).  
\* Relay Helsingfors.

**FRANCE.**

**Eiffel Tower**, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 11.00, markets (exc. Sun. and Mon.); 11.20, time sig., weather; 15.00, 16.45, Stock Ex. (exc. Sun. and Mon.); 18.00, talk, con., news; 19.00 and 23.10, weather; 20.10, con. (2,740 m.) (daily).

**Radio-Paris** (CFR), 1,750 m. (about 3 kw.). Sundays: 12.45, con., news; 16.30, Stock Ex., con.; 20.15, news, con. or dance. Weekdays: 12.30, con., markets, weather, news; 16.30, markets, con. (irr.); 20.15, news, con. or dance. *Le Matin* gala con. every Sat., 20.30.

**L'Ecole Sup. des Postes et Télégraphes** (PTT), Paris, 458 m. (800 w.). 14.00 or 15.00, studio con. or outside relay; 20.30, lec. (almost daily); 21.00, con. (daily).

"**Let Petit Parisien**," 315 m. (500 w.). 21.15, con. (Tues., Thurs., Sat., Sun.).

**Radio-Toulouse**, 430 m. (2 kw.). 12.30, con., time sig. (daily); 17.30, news (exc. Sun.); 20.45, con.; 21.25, dance (daily).

**Radio-Lyon**, 280 m. (2 kw.). 20.15, con. (daily).

**Radio Agen**, 318 m. (250 w.). 12.40, weather, Stock Ex.; 20.00, weather, Stock Ex.; 20.30, con. (Fri.)

\***Lyon-la-Doua**, 480 m. Own con., 20.00 (Mon., Wed., Sat.).

\***Marseilles**, 351 m. (500 w.).  
\***Toulouse** (PTT), 280 m. (500 w.).  
\***Bordeaux**, 410 m.

\* Relays of PTT Paris.  
(Continued on page 436)

# These are the accumulators

which have been giving ABSOLUTE SATISFACTION to their users throughout the whole world.

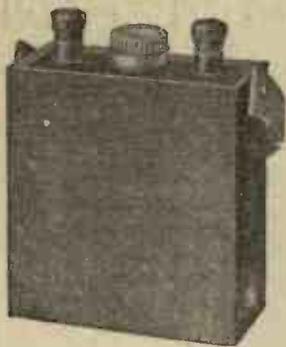


Illustration of BD (2 Volt) Unit in "Dagenite" container, which is absolutely impervious to acid; will not crack nor leak, and is practically unbreakable. Fitted with carrying strap 1/- extra.

**TYPE BD (2 VOLT) UNITS**

Type and size	Actual capacity in ampere hours	PRICE:		
		Complete unit without crate		
		£	s.	d.
BD 5-R	32		14	0
BD 7-R	48		19	0
BD 9-R	64	1	3	6
BD 11-R	80	1	6	6
BD 13-R	96	1	10	0

**TYPE DE (2 VOLT) UNITS**

Type and size	Actual capacity in ampere hours	PRICE		
		£	s.	d.
DE 5	24		17	6
DE 7	36	1	1	0
DE 9	48	1	4	6

**TYPE GF UNITS**

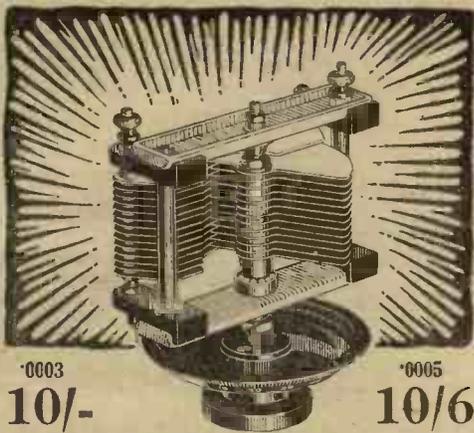
Voltage	Type and size	Actual capacity in ampere hours	Price complete in crate		
			£	s.	d.
2	GFC 5	40	1	12	6
2	GFC 7	60	1	18	0
2	GFC 9	80	2	4	9

Illustration of GFC (6 Volt) with the coloured "Floats" that give visual warning when recharging is necessary.



## PETO & RADFORD

Manufacturers of Accumulators for all Wireless Requirements; (Proprietors: PRICHETT & GOLD & E.P.S. COMPANY, LIMITED, 50 Grosvenor Gardens, Victoria, LONDON, S.W.1 Telephone: Victoria 3667 (5 lines). Telegrams: "Storage, Sowest, London.")



0003 10/- 0005 10/6

**CHOSEN BY A.W.  
FOR BRITAIN'S MOST POPULAR  
3 VALVE RECEIVER**

When "Amateur Wireless" designers built their demonstration model (illustrated in the supplement to "Amateur Wireless," dated Feb. 27), of Britain's most popular 3 valve set they used Bowyer-Lowe Popular Condensers. They wanted the lowest losses, a big wavelength range and precision tuning. This ball bearing, compensated Square Law Condenser gave the results they sought. Use it in your sets. Order from your dealer or direct from Bowyer-Lowe Co., Ltd., Letchworth.

**The Bowyer-Lowe  
POPULAR  
Low Loss Condenser**

To get pure EBONITE, ask for



It is made from finest rubber and sulphur and is guaranteed free from surface leakage.

REGISTERED TRADE MARK

**QUALITY  
EBONITE**

It proves its quality in every test. Its polish will also please you—ask to see it.

**RODS, TUBES, SHEETS, PANELS, MOULDINGS**

Ask your Dealer for "BECOL"

THE BRITISH EBONITE CO., Ltd., HANWELL, LONDON, W.7



**PANELS & CONDENSERS**

ARE

**GUARANTEED**

Then WHY be CONTENT with?  
INFERIOR SUBSTITUTES?

Ask your Dealer, or write to us direct,

PARAGON RUBBER MANUFACTURING CO. LTD.,  
SCULCOATES, HULL.



*"Going to make a set?"  
Don't forget to use*

**GLAZITE**  
BRITISH MADE REGD.

COLOURED CONNECTING WIRE"

**Red, Yellow,  
Blue and Black**

**10 foot  
COILS**

Be sure to  
see the  
LEW seal

Per 1 1/2 Coil

**2 foot  
LENGTHS**

Four assorted  
colours in  
an envelope

Per 1 1/2 Pkt.

Obtainable from all dealers

Write for interesting descriptive leaflet

**The LONDON ELECTRIC WIRE CO.  
and SMITHS LTD.**

(Makers of Electric Wire for over forty years)

Playhouse Yard, Golden Lane, London, E.C.1

This mark



guarantees quality

JUDD

# A Good Job—

The Etherplus+ Brass-vaned Condenser really merits that description.

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'0005 ... 11/-

'001 ... 14/-

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case.



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FOR ALL  
WIRELESS  
ACCUMULATORS

3s.



The "Testrite" is the hydrometer you need if you want to keep your wireless accumulator in good condition.

It tells at a glance if battery is fully charged, half-charged or discharged.

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Ask "A.W." for  
List of Technical Books

"BROADCAST TELEPHONY" (cont. from page 434)  
Montpellier, 186 m. (1 kw.). Relays Radio Toulouse.  
Angers (Radio Anjou), 250 m. (500 w.). Daily: 20.30, news, lec., con.

### GERMANY.

Berlin, on both 505 and 576 m. (4 kw.). 08.00, sacred con. (Sun.); 10.00, con. and tests; 11.55, time sig., news, weather; 14.00, edu-hour (Sun.), markets, time sig.; 16.00, orch.; 19.30, con., weather, news, time sig., dance music until 23.00 (nightly). Relayed on 1,300 m. by Königswusterhausen and Stettin (241 m.).

Königswusterhausen (LP), 1,300 m. (8 kw.). 10.30-11.50, relays Berlin (Sun.); 14.00, lec. (daily); 17.30, relay of Berlin (Vox Haus) con. (daily); 2,525 m. (5 kw.), Wolff's Buro Press Service: 05.45-19.10; 2,880 m.: Telegraphen Union: 07.30-18.45, news. 4,000 m. (10 kw.): 06.00-20.00, news.

Breslau, 418 m. (4 kw.). 11.00, con. (daily); Divine service (Sun.); 11.55, time sig. (Sun.), weather, Stock Ex., news; 15.00, children (Sun.); 16.00, con.; 18.00, lec.; 19.30, con., weather, time sig., news; 20.45, dance (Sun., Thurs.). Relay: Gleiwitz, 251 m.

Frankfurt-on-Main, 470 m. (1½ kw.). 07.00, sacred con. (Sun.); 10.55, time sig., news; 11.55, Nauen time sig.; 15.00, con. (Sun.); 15.30, con.; 17.00, markets, lec.; 19.00, lec., con., weather, dance. Relay: Cassel, 273.5 m.

Hamburg, 392.5 m. (4 kw.). Relayed by Bremen (279 m.), Hanover (297 m.), Kiel (230 m.). Sundays: 06.25, time sig., weather, news, lec.; 08.15, sacred con.; 12.15, con.; 17.00, con.; 18.15, sports, weather, con. or opera, dance. Weekdays: 05.55, time sig., weather; 06.00 and 06.30, news, weather; 11.55, Nauen time sig., news; 13.00, weather, con.; 15.15 and 17.00, con.; 18.00, lec.; 18.55, weather, con.; 21.00, dance (daily, exc. Tues.).

Königsberg, 463 m. (1 kw.). 08.00, sacred con. (Sun.); 11.55, time sig., weather, news; 15.30, con.; 16.00, con. (Sun.); 18.30, lec.; 19.00, con. or opera, weather, news, dance (irr.).

Leipzig, 452 m. (700 w.). Relayed by Dresden (294 m.). 07.30, sacred con. (Sun.); 10.00, educ. hour (Sun.); 11.00, con. (daily); 11.55, Nauen time sig., news; 15.30, con., children (Wed.); 19.15, con. or opera, weather, news, cabaret or dance (not daily).

Munich, 485 m. (3 kw.). Relayed by Nuremberg (340 m.). 10.30, lec., con. (Sun.); 13.00, time sig., news, weather; 15.00, orch. (Sun.); 15.30, con. (weekdays); 17.30, con. (weekdays); 18.15, lec.; 18.30, con. (Sun.); 19.30, con.

Münster, 410 m. (2½ kw.). Relayed by Elberfeld (259 m.); Dortmund (283 m.). 10.45, Radio talk, Divine Serv.; 11.00, news (Sun.); 11.30, news (weekdays); 11.55, Nauen time sig.; 14.30, news, time sig.; 15.00, con.; 16.00, children (Sat.); 18.40, news, weather, time sig., lec., con.

Norddeich (KAV), 1,800 m. 23.00, weather and news.

Stuttgart, 446 m. (1½ kw.). 10.30, con. (Sun.); 15.30, con. (weekdays); 16.00, con. (Sun.); 17.30, time sig., news, lec., con. (daily); 20.15, time sig., late con. or cabaret.

### HOLLAND.

Amsterdam (PCFF), 1,955 m. (1 kw.). Daily: 07.15-16.10 (exc. Mon. and Sat., when 1.10-11.10), news, Stock Ex.

Hilversum (HDO), 1,050 m. (2½ kw.). 09.40, sacred service (Sun.); 19.50, con.; 21.40, news, etc. Will shortly test on 25 kw.

### HUNGARY.

Buda-Pesth (Csepel), 546 m. (2 kw.). 08.00, news; 11.00 and 14.00, weather, news; 16.00, dance music; 19.00, con. or opera, dance.

### ICELAND.

Reykjavik, 430 m. (500 w.). Testing.

### ITALY.

Rome (IRO), 425 m. (2½ kw.). 09.30, sacred con.; 12.15, official communiqué; 16.00, children; 16.30, relay of orch. from Hotel di Russia; 16.55, news, Stock Ex., Jazz band; 19.30, news, weather, con.; 21.15, late news, Jazz band.

Milan, 320 m. (2 kw.). 19.00-24.00, con.

### JUGO-SLAVIA.

Belgrade (Rakovitz) (HFF), 1,650 m. (2 kw.). 16.00, news (daily), con. Tues., Thurs., Sat.).

### LETTLAND.

Riga, 475 m. (2 kw.). Con. daily, 20.00-21.00.

### NORWAY.

Oslo, 382 m. (1.2 kw.). 10.00, Divine service (Sun.), Stock Ex. (weekdays); 12.15, markets; 18.15, news, time, lec., con.; 21.00, time, weather, news, dance relayed from Hotel Bristol, Oslo.

Aalesund, 515 m.

Bergen, 358 m. (1½ kw.). Testing.

### POLAND.

Warsaw, 380 m. (700 w.). Daily: con., 17.00-19.00.

### RUSSIA.

Moscow (RDW), 1,450 m. (12 kw.). Week-days: 12.30 and 17.55, news and con. (Popoff Station), 1,010 m. (2 kw.). 10.00, 11.00, lec.; 13.00, 19.00, con. (Tues., Thurs., Fri.).

Radio Peredacha, 410 m. (6 kw.). Trades Union Council Station, 450 m. (2 kw.). 18.00, con. (Mon., Wed.). 11.00 m.: 21.00, con.

Leningrad, 940 m. (2 kw.). Weekdays: 15.00, con. Nijni Novgorod, 1,400 m. (1.2 kw.). 20.30, con.

### SPAIN.

Madrid (EAJ6), 392 m. (1½ kw.). Daily: con. (times vary daily). Closes at 00.10 on Sun., Wed., Sat.

Madrid (EAJ7), 373 m. (4½ kw.). Con.: 17.30-01.00 (almost daily).

Madrid (EAJ4), 340 m. (1 kw.). 16.00, con. Barcelona (EAJ1), 325 m. (1½ kw.). News, lec., con., 17.00-21.00 (Sun.), 18.00-23.00 (daily).

Barcelona (Radio Catalana) (EAJ13), 460 m. (4½ kw.). 19.00-24.00, con., weather, news.

Bilbao (EAJ9), 315 m. (1 kw.). 19.00, news, weather, con. Close down 21.00 or 22.00.

Bilbao (Radio Vizcaya) (EAJ11), 415 m. (2 kw.). Daily: 22.00-24.00, con. (daily).

Cadiz (EAJ3), 360 m. (550 w.). 19.00-21.00, con., news. Tests daily (Mon., Tues., Wed., Sat.), 24.00.

Cartagena (EAJ15), 335 m. Daily: 19.00-22.00, con.

Seville (EAJ5), 357 m. (1½ w.). 21.00, con., news, weather. Close down 23.00.

Seville (EAJ17), 300 m. Daily: 19.00-22.00, con.

San Sebastian (EAJ8), 343 m. (500 w.). Daily: 17.00-19.00, 21.00-23.00.

Salamanca (EAJ22), 355 m. (500 w.). 21.00, con. daily.

Saragossa, about 325 m. Testing.

### SWEDEN.

Stockholm (SASA), 428 m. (1 kw.). 10.00, sacred service (Sun.); 11.30, weather; 13.00, con. (Sun.); 16.00, children (Sun.); 17.00, sacred service; 18.00, lec.; 20.15, news, con., weather. Dance (Wed., Sat.).

Relays.—Boden (SASE), 1,200 m.; Eskilstuna, 250 m.; Falun (SMZK), 370 m.; Gothenburg (SASB), 288 m.; Gefle, 325 m.; Joenköeping (SMZD), 265 m.; Karlsborg, 1,250 m.; Karlstadt (SMXC), 221 m.; Linköeping, 467 m.; Malmö SASC), 270 m.; Norrköeping (SMVV), 260 m.; Örebro, 218 m.; Sundsvall (SASD), 545 m.; Trollhättan (SMXQ), 322 m.; Varborg, 340 m.

### SWITZERLAND.

Lausanne (HM2), 850 m. Testing on 348.5 m. (1½ kw.) (temp.). 19.00, lec., con. (daily).

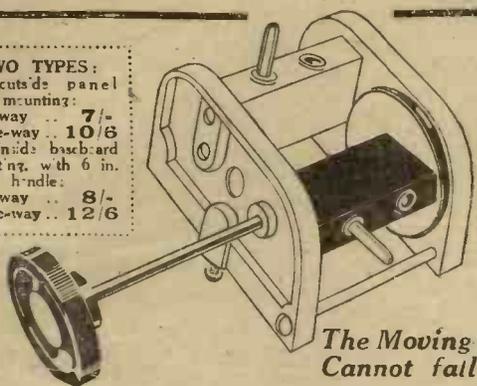
Zurich (Höngg), 515 m. (500 w.). 10.00, con. (Sun.); 11.00, weather; 11.55, Nauen time sig., weather, news, Stock Ex.; 12.30, piano soli; 16.00, con. (exc. Sun.); 17.15, children, women; 18.00, news, weather; 19.15, lec., con., dance (Fri.).

Geneva (HB1), 760 m. (2 kw.). 19.15, con. (daily).

Berne, 435 m. 09.30, organ music (except Sat.); 15.00, 19.30, con.

Basle, 900-1,300 m. Testing.

**TWO TYPES:**  
For outside panel mounting:  
Two-way ... 7/-  
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For inside baseboard mounting, with 6 in. handle:  
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Fit in any position, with any weight of coil—you'll be satisfied with the results.

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Makers of the New LOTUS BUOYANCY VALVE HOLDER

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SIMPLIFIES  
SOLDERING

Not until you have soldered your set with FLUXITE will you discover the secret of faultless reception. For FLUXITE soldered joints always provide perfect contact; they never come undone. Soldering the FLUXITE way is so simple—a minute's practice and you are an expert.

Ask your Ironmonger or Hardware Dealer to show you the neat little

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it is perfectly simple to use, and will last for years in constant use. It contains a special "small-space" Soldering Iron with non-heating metal handle, a Pocket Blow-lamp, FLUXITE, Solder, etc., and full Instructions. Price 7/6. Write to us should you be unable to obtain it.

PRICE  
7/6



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All Hardware and Ironmongery Stores sell FLUXITE in tins, price 8d., 1/4, and 2/8.

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## Figures to Remember



## The Town Crier

Old Times are changed—old manners gone, leaving just the remembrance of perfect service and faithfulness. With quickened feelings of real pleasure you can recollect the service Six Sixty Valves have rendered you—nay more, you will always remember the figures 660 as the mark of PERFECTION OF QUALITY.



S.S.3 L.F.  
(Green Disc).

Voltage - 3 volts.  
Consumption '06 amp.

PRICE 16/6

Ask your Dealer for Leaflet S.S.1.7 for full particulars of complete range

This is true for every valve in our new range. You say you want a valve suitable for a small or medium-sized Loudspeaker, and which will cost very little to run. You can't do better than get the S.S.3 L.F. (green disc). The filament consumption of this valve is only '06 amps.—a remarkable saving not only on Bright Valves but even on the average Dull Emitter on the market to-day. Bear this in mind and effect the maximum economy whilst at the same time ensuring perfect quality of tone. Two good dry cells will operate these valves with entire satisfaction, but a 4-volt accumulator—in conjunction with a 30-ohm filament rheostat—may be used with equal success and economy.

If you want a Power Valve—you have the S.S.7 to fall back on. This wonderful D.E. is absolutely non-microphonic, has a current consumption of only '1 amps. and is capable of handling output sufficient to work the largest Loudspeaker without distortion.

For long Life, good Service, perfect Tone, insist on—SIX SIXTY VALVES.



**BETTER BY SIX TIMES SIXTY**  
The Electron Co., Ltd., Triumph House, 189, Regent St., London, W.1. 4



**Polar Wireless**

SIR,—The following may be of interest to those of your readers who are short-wave enthusiasts.

Shortly an attempt is to be made by the Detroit Wilkins Expedition to fly across the North Pole. A land station is being built at Point Barro, in Alaska, and will keep in communication with the aeroplane on wavelengths of 17.3, 34.6 and 77.2 metres. The call-signs used by land station and aeroplane are KFZG and KFZH respectively.

The transmitter and receiver used at Point Barro will be those used on the U.S. warship *Seattle*, which, using the call-sign NRR L, was received so well in England last summer.

The aeroplane is using similar apparatus, so both should be easily received in England.

Mr. H. F. Mason, a former department editor of the American magazine *Q.S.T.*, is taking the equipment by rail for about 2,000 miles, and beyond that a tractor will be used to haul it over another 2,000 miles of snow. A 1,000-volt generator, driven by

a small gas engine, will be used. The land station will keep in communication with a station at Madison, Wisconsin, U.S.A. Mr. J. L. Reinartz will be at the Madison station.—F. C. S. (Harrow).

**Another Short-wave Station**

SIR,—Readers may be interested to know that another low-wave morse station is making tests. This is Bremerhaven, on the German coast, on 53 metres. He sends slowly ZWT (each word twice) usually, asking for a post card if signals are received. I last heard him on Sunday between 9 and 10 p.m.

I was using one valve with Franco coils (15-80 metres), which I find very satisfactory, with Igranic .0005 condenser across secondary. He came in at good strength (about R6 or 7). The valve was an Ediswan 2-volt dull-emitter over two years old, and a single-wire aerial 30 ft. high was used.—W. H. S. (Wandsworth).

**"A Curious Effect"**

SIR,—I have been waiting for a long time for THERMION to deal with what he calls "a curious effect" in No. 192, as I have experienced this complete blotting-out effect for some time, particularly about 3.30 p.m. and 8.30 p.m. on Sundays.

Before these times I am always able to pick up most of the Continental stations,

but immediately 2LO switches on his carrier wave (which, by the by, comes on with an audible "pip") silence rules, and there is nothing further to be done but wait for 2LO broadcast.

This blotting-out may account in some way for the poor reception of American stations ever since the number of European stations has been considerably increased.—J. F. (London, W.).

**Permanent H.T. Battery**

SIR,—In reference to the query by J. T. (Otley), I should like to say that I made up the permanent H.T. and found it very satisfactory; in fact I shall not go back to dry batteries again or any other H.T., as this is so little trouble. Several friends seeing how successful I was decided to make it up, and two or three had trouble with it owing to the fact that they allowed too much sal-ammoniac solution for each cell. The best plan is to immerse the carbon rod and the top of the sac in hot paraffin-wax before making up, as if even the top of the sac is damp unpleasant noises and cracklings will be present.—NUIDAS (New Cross).

**Care of Accumulators**

SIR,—The following tip may be useful to your readers.

It is usually difficult to find out whether  
(Concluded on page 440)

**The FAMOUS GENERAL RADIOPHONES**

**YOURS** for

Latest Standard Model General Radiophones (made by the well-known General Radio Company, Ltd.), super-sensitive and highly efficient. Receivers matched in tone. Magnets of highly expensive Cobalt Steel. Diaphragms triple tested. Accurately designed sound chamber gives natural tone. Beautifully comfortable, highly finished. Weight 7 ounces. Fully guaranteed. Sent on receipt of 6d. deposit. If satisfied, you send 2/6 more on receipt, balance 3/- monthly until only 2/1- is paid. Price full cash with order or within 7 days, £1.

**6d DEPOSIT**

**SIMPSON'S (Brighton, Ltd.)**  
146a, 14, Queen's Road, BRIGHTON.

Place a **GRAMOPHONE ATTACHMENT** on the D.1 Model of the

**'ALLWOODORN'**

And you have the best at the lowest price. 23" Oak horn-Aluminium casting-iron base 62/6. If with 2,000 ohms speaker 21/- extra; if with Amplion speaker 42/- extra. Other sizes in stock, send for list.

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2a, Ronalds Road, Holloway Road, Highbury, N.5  
Colwyn Bay—get them at 2 Erw Wen Rd.  
Hours: 9 till 6.30, Sat. 2 o'clock.

ADVERTISEMENT INSTRUCTIONS for "Amateur Wireless" are accepted up to first post on Thurs day morning for following week's issue, providing space is available.

**PREPAID ADVERTISEMENTS.**

Advertisements under this head are charged **FOURPENCE PER WORD**, minimum charge **FOUR SHILLINGS.**

**DEPOSIT SYSTEM.**

As the Publishers cannot accept responsibility for the bona fides of Advertisers in this publication they have introduced a system of deposit which it is recommended should be adopted by readers when dealing with persons with whom they are unacquainted. It is here explained.

Intending purchasers should forward to the Publishers the amount of the purchase money of the article advertised. This will be acknowledged to both the Depositor and the Vendor, whose names and addresses must necessarily be given. The Deposit is retained until advice is received of the completion of the purchase, or of the article having been returned to and accepted by the Vendor. In addition to the amount of the Deposit, a Fee of 6d. for sums of £1 and under, and 1s. for amounts in excess of £1, to cover postage, etc., must be remitted at the same time. In cases of persons not resident within the United Kingdom, double fees are charged.

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Why pay 14/- for Dull Emitter Valves? Special 14 days' offer of the wonderful Triotron Dull Emitter Valves. 2 amp. 2 volts 5/8; 0.6 amp. 4 volts 6/8; Power Valve 10/8. POST FREE. Cash refunded if not satisfied. H. E. NICHOLLS, 29, TRINITY SQUARE, LONDON, E.C.3.

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(As described in "A.W." Jan. 30th, 1926). Our frames, etc., are ideal for this loudspeaker. It is easily made at home. Send stamp for particulars.

**GOODMAN'S.** (See advert. on p. 439)

**EBONITE BUSHES**

FOR MOUNTING ON WOOD. PERFECT INSULATION.

Two required for each hole.

NUMBER	1	2	3	4	5
Size of hole	4BA.	2BA.	1/4"	5/16"	7/8"
Price each:	1d.	1d.	1d.	2d.	1d.

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Standard Works, Forest Hill, London, S.E.23

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and Buy H.T. Supply Unit.

Complete with Flex and Adapter to plug in ordinary lamp holder, running cost 1d. per week. Money back guarantee. Complete with full instructions. 30/-. Postage 1/-.  
**CONTINENTAL SUPPLIES**  
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**RADIONS Ltd., Bollington, Nr. MACCLESFIELD, Ches.**  
Largest valve-repairing firm in the world. List Free.

**SANS PAREIL**

ASHTON Perfect Aerial Spreader  
Fit any Pole.  
Any length.  
PRICE 12/1- PAIR  
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**IF YOU CAN'T SELL IT Elsewhere**  
SELL IT THROUGH  
**The BAZAAR**  
54, DRURY LANE, LONDON, W.C.2.



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Did you ask for CLAYTON or did you simply say "—and Ebonite"? There is a world of difference. Clayton Ebonite is guaranteed in quality and efficiency. It is the most "workable" ebonite known—you never find it chipping when you drill it and it never splits. You can get Clayton either with a matt or polished surface.

If you have any difficulty in obtaining supplies, a postcard to us will bring the name of your nearest stockist by return. It is worth the trouble.

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**CLAYTON RUBBER CO. Ltd.**

DEPT. E7.

Progress Works, Croft Street, Clayton, MANCHESTER.



**"A.W." PAPER DIAPHRAGM LOUDSPEAKER**

The BROWN A at 22/6, or BROWN A2 at 15/- are far the best reed units for this purpose. 3-in. Length Rod to screw in Reed with nut to lock, 7d. Ditto 6-in. for cone-shaped Loudspeaker, 1/- Adjustable Centre Bushes and dome, 2/3 (does away with the unsatisfactory cork and makes a neat and easy job). Paper, 39 1/2 by 6, 1/6. 39 1/2 by 7, 1/9. Also Gilded, (untarnishable), 2/3, 2/8, and 3/- respectively. Not parchment substitute. 12-in. Frames, Gilded, Plated or Bronzed, give a very finished appearance, 5 6 per pair. Brass Back Stays to fit earpiece to frame. These obviate drilling your cap. 2/- per set of 3. Gilded, Plated or Bronzed, 2 9 per set. Highly polished Aluminium Caps, to fit Brown A or old A2 Earpieces, 2/6. The LISSEOLA at 13/6, Reed, 1/- can be used with our specialities. Stamp for particulars and diagram.

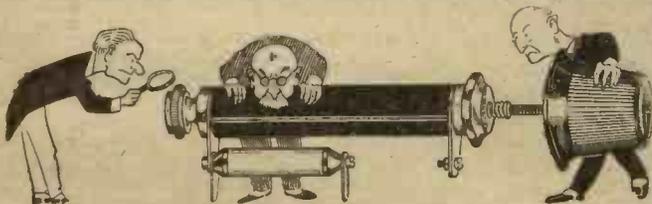
GOODMANS. 68, FARRINCION ST., E.C.4, and at 42a, Myddleton St. E.C.1.

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**How to Make and Manage Them**

Working instructions are given on the building of a number of highly efficient crystal sets with which particularly loud signals have been obtained. Also the making of an attachment for simple connexion to any existing wireless set is described with full details, being well illustrated ... 2/6 net.

Cassell's

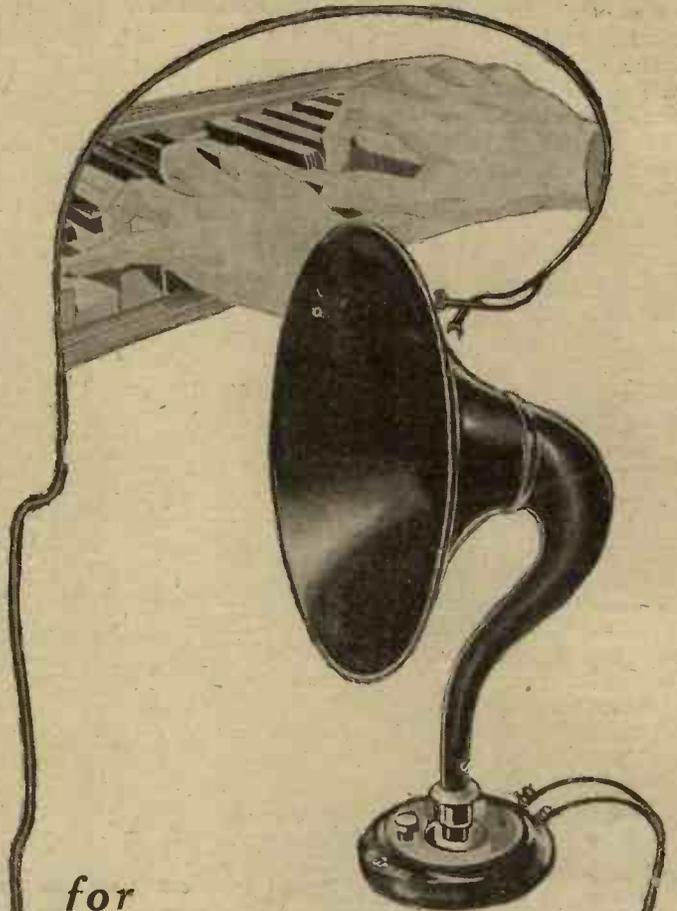


**Bretwood Grid Leaks**

Price bear inspection and stand constant use. They are guaranteed to give efficient performance for a period of three years. Price  
**3/- GRID LEAK OR ANODE RESISTANCE 3/-**  
 (Price with Condenser, as illustrated 4/-). Postage on either 3d.

BRETWOOD Ltd. 12-18, London Mews, Maple St. London, W.1.

H.F.22



for beautiful reproduction

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The secret of this tone-perfection lies in the painstaking craftsmanship lavished on every Super Tone we make—it's made by a firm with a generation's experience in telephone manufacture. Try one to-day at your dealers! 18" high in gunmetal, gracefully shaped and mounted on a polished wood base. **63/-**

A worthy smaller edition is the Junior Super Tone—for small and medium-sized rooms. Superb in tone and amazing in volume for a small speaker. 15 1/2" high, 9" flare. Complete with 5' lead ... **32/6**

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**Ericsson**  
 SUPER-TONE LOUDSPEAKERS

CORRESPONDENCE

the electrolyte in high-tension accumulators is at the correct level, as the interiors of the cells are not visible. To remedy this I find that a circular piece of stout sheet rubber about 1/2 in. in diameter, pierced in the centre and pushed over the nozzle of a fountain-pen filler, makes an excellent gauge. After the ring is set to the correct level one has only to insert the nozzle until the rubber touches the vent hole and release the bulb, and any surplus electrolyte will be drawn into the filler. If air only is drawn up it is apparent that the level is too low.—H. M. E. (Canterbury).

Other Correspondence Summarised

COL. E. C. JENNINGS (Gelli-Dep, Kidwelly, S. Wales) would be glad to hear from any transmitters on 180-200 metres with a view to arranging tests.

**L.E.S. Coil Holders.** The address of the manufacturers of the L.E.S. coil holder was, on p. 343 of No. 195, stated incorrectly. The correct address of the London Electric Stores, Ltd., is 9, St. Martin's Street, Leicester Square, W.C.2. We much regret any inconvenience that may have been caused.

THE ASHTON AERIAL

FOR those who have not the space to erect the more conventional type of aerial, an efficient substitute will be found in the Perfect aerial, obtainable from Ashton's Wireless Depot, of 8 and 10, Bull's Head Yard, Market Place, Manchester. This aerial consists of two polygonal frames placed above each other, the planes being horizontal. The aerial wire is wound in zig-zag fashion from an insulator fixed on the circumference of one frame to an insulator fixed on the other, the end of the "cage" so formed being brought down in the ordinary way to the lead-in tube.



Golders Green and Hendon Radio Society

Hon. Sec.—LT.-COM. H. A. SCARLETT, 357A, Finchley Road, N.W.3.

A DEBATE on "Superhetrodyne v. Neutrodyne" took place on February 18, when Mr. A. J. Bremner, B.Sc., opened the proceedings. At the conclusion of the debate both types of receiver were demonstrated, and a number of stations were picked up.

Proposed New Section of the International Amateur Radio Union.

An attempt is being made to form a new section of the above in Southern Ireland, and all interested are requested to communicate with Messrs. D. Fisher and D. Burton Burton Bradshaw at 115, Anglesea Road, Ballsbridge, Dublin.

Manchester Radio Scientific Society

Hon. Sec.—MR. G. C. MURPHY, Meadow View, The Cliff, Hr. Broughton, Manchester. On February 5 a lecture was given by Mr. J. Baggs entitled "A Talk on General Radio Theory and

Practice," and in the course of it the lecturer dealt at some length with the performance and efficiency to be obtained from crystal sets and the relative advantages of grid-leak and anode rectification. He also discussed the theory of low-frequency amplification, and concluded by showing graphs of loud-speaker performances and their effects on good reproduction.

On February 10 a lecture entitled "Difficulties of Broadcasting From My Point of View" was given by Mr. Bird, chief engineer of the Manchester B.B.C. station 2 Z Y. Mr. Bird gave details of circuits employed in Broadcasting, and the way in which the broadcasting wavelength was controlled by a master valve. He explained the effect of modulation and how, with certain types of singing and music, it is necessary to reduce the modulation of certain portions so that the distortion may not occur through overloading the transmitter. Numerous questions were replied to by the lecturer.

Groydon Wireless Society

Hon. Sec.—MR. H. T. P. GEE, 51-52, Chancery Lane, W.C.1.

On February 8 members spent an interesting evening in continuing the demonstration on the plotting of valve characteristic curves. A short-wave set is being built and will be kept at 128, George Street for the use of members, and those who are skilled in Morse reading are asked to make use of the set on Monday evenings. Three new members were elected.

On February 15 Mr. A. W. Knight gave a lecture on "Alternating-current as H.T. Supply." He exhibited a neat and compact rectifier which he had made for use with alternating-current, and described by means of diagrammatic sketches the circuit and action of the valve and of the filtering sides of the lay-out.

On February 22 members held their fortnightly round-table conference. The building of a selective 4-valve set, the making of grid leaks and high-resistance rheostats, and the charging of H.T. accumulators were amongst the wireless subjects discussed.

SALE BY AUCTION WITHOUT RESERVE

550-556, OXFORD ST., W.

(Adjoining Marble Arch Station),

WEDNESDAY, MARCH 17th, at 11.30.

650 NEW FULLER SPARTA CAR STARTING and LIGHTING BATTERIES.

1,000 NEW FULLER BLOCK WIRELESS AND LIGHTING ACCUMULATORS, in ebonite cases. 1,000 NEW FULLER BLOCK WIRELESS AND LIGHTING ACCUMULATORS, in celluloid cases. Fuller Home Lighting Batteries, 50,000 ft. C.J. "SLIP TUBING CABLE, VALVE SETS, HEADPHONES, AERIALS, Etc., Switches, Fuse Wire, etc.

On view day previous and morning of sale. Catalogues from the auctioneers.

SEYMOUR, SEYMOUR & CO., as above; and HENRY J. SHAW, 85, Newington Causeway, London, S.E.1.

13, HIGH HOLBORN, LONDON, W.C.1.

SALE BY AUCTION WITHOUT RESERVE.

HENRY J. SHAW

is instructed to Sell by Auction on

THURSDAY, MARCH 18th and following day, at 11.30 each day.

THE STOCK OF A WIRELESS & ELECTRICAL GOODS MERCHANT, including:—200 Sterling Magnavox Loud Speakers, 1,000 Polar Universal Coil Holders.

30 New Marconi Amplifiers, 100 Polar Variable Condensers, 750 Magnavox Loud Speakers, 950 Crystal and One-Valve Receiving Sets, 8,000 New T.C.C. 5 Condensers.

100 New Twin Crystal Sets in leather-covered cabinets, 100 Junior Crystal Sets.

Marconi 1- and 2-Valve Sets. 100 Marconi hand-driven generators, 700 New Fallon Square Law Variable Condensers, 300 Various Laboratory Voltmeters.

Wheatstone Bridges. Megger-patt Testing Sets.

8 NEW PETROL ELECTRIC GENERATING SETS WITH STORAGE BATTERIES, 200 pairs 4,000-Ohms Heaphones, 200 Linesman's Galvos, 200 EDISWAN AND FULLER NEW 6-VOLT ACCUMULATORS, 1,000 Telephone plugs, 3,000 Cords, 100 Aerial Panels, 30 NEW 3-VALVE SETS.

Western Electric Power Amplifiers, Armoured Car Flex, High Tension Cable, G.P.O. Relays, Marconi Transformers, Electric Fans, Motor Generators, Marconi Heterodyne Wavemeters, Marconi S.W. Tuners, Cabinets, Cell Testing Voltmeters, Motors, Microphones, etc., etc.

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If you are not getting results you should, don't tinker with your set, try a "Nomast" Aerial and get them!

Obtainable through any reliable wireless dealer for 30/- complete, no extras to buy; or securely packed per passenger train anywhere in U.K. for 32/6, from Patentees and Makers—

THE "NOMAST" AERIAL CO.  
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THE SKINDERVIKEN CRYSTAL LOUD SPEAKER SYSTEM

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SCIENTIFIC APPARATUS & CHEMICALS

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FOR WET H.T. BATTERIES

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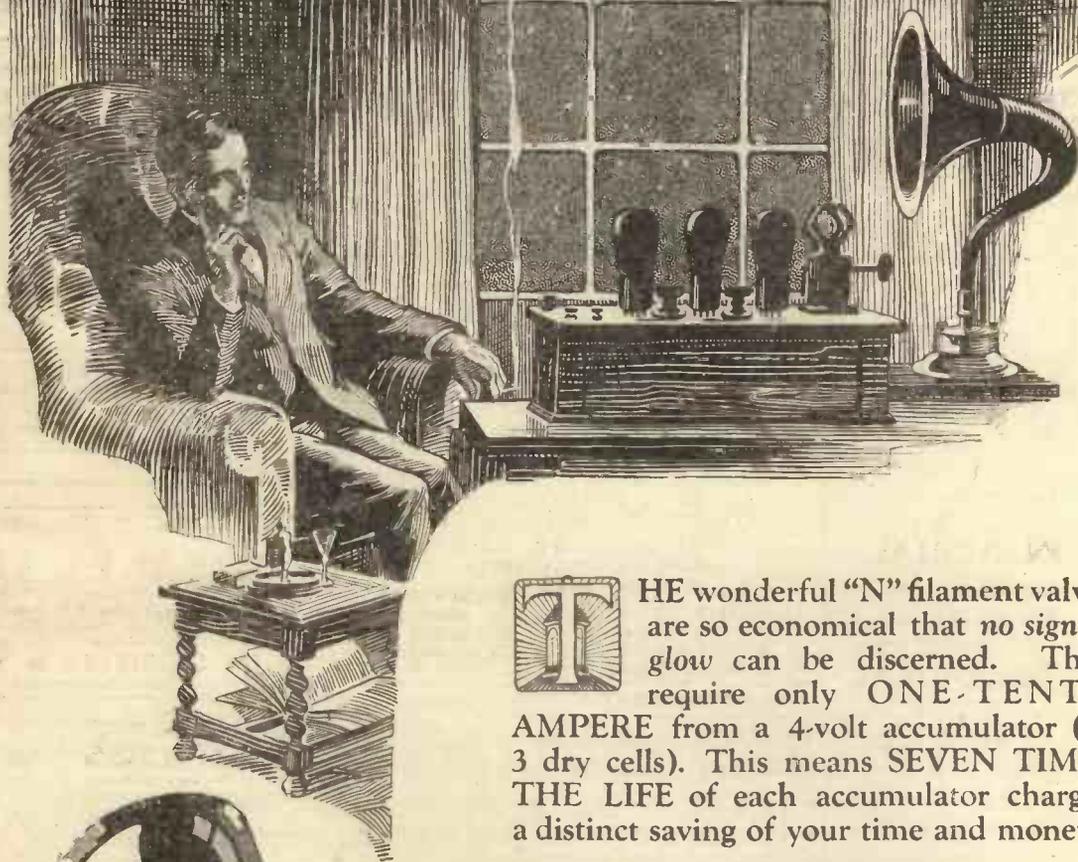
106, Midland Road, N.W.1.

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Museum 4209. Isaglasbot, Kinross, London.

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*Too economical even to glow*



THE wonderful "N" filament valves are so economical that no sign of glow can be discerned. They require only ONE-TENTH AMPERE from a 4-volt accumulator (or 3 dry cells). This means SEVEN TIMES THE LIFE of each accumulator charge; a distinct saving of your time and money.

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The general purpose Valve, suitable for every circuit. Gives clear strong signals free from microphonic disturbance.

**ASK FOR THE P.M.4 - - 22/6**

A power valve for majestic Loud Speaker volume. The finest Loud Speaker Valve ever produced.

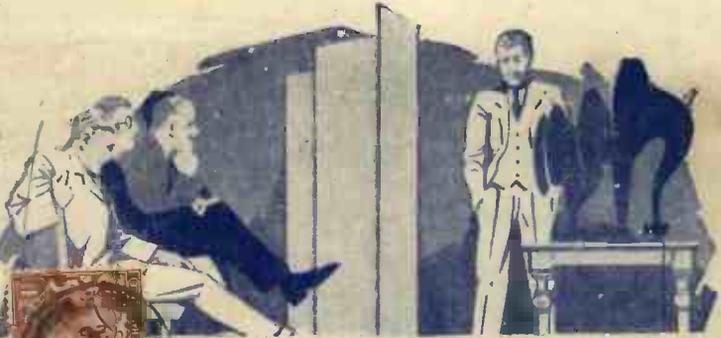
GET THEM FROM YOUR RADIO DEALER



These Valves only require the same H.T. current as for equivalent types.

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# CONVINCING TEST

—now build your own loud speaker

When we first offered the public a full-powered loud speaking unit for 13/6 people were frankly incredulous. "No doubt it's excellent value for the money," they said, "but you can't expect it to equal an instrument costing several pounds."

So we invited four entirely disinterested judges to sit behind a screen while we carried out a simple test. We put on a well-known and expensive loud speaker and carefully noted the quality and volume of reproduction. The horn was removed from it and attached to the "Lissenola" and the result again carefully noted. This was repeated with half-a-dozen popular makes of loud speakers. *It was found impossible to say which gave the better result—the original loud speaker bases or the "Lissenola."*

The result of our test has, of course, been confirmed since by thousands of "Lissenola" converts—for the sales of the "Lissenola" have broken all records in the wireless trade.

Briefly, the "Lissenola" is the essential loud speaking base that only needs the addition of a horn to yield results equal to an instrument many times the price. And for a few pence you can make a really efficient horn yourself from the very simple directions and full-sized exact patterns given with every instrument. The "Lissenola" can also be attached to the tone arm of any gramophone, turning the gramophone into a radio loud speaker.

There is also the Lissen Reed (1/- extra) which adapts the Lissenola to take a cone or any other diaphragm working on the reed principle.



We challenge comparison. Before buying go to your dealer and make the same test yourself.

The "Lissenola" is obtainable from all Wireless Dealers throughout the country—or in case of difficulty by sending remittance direct to the makers.

Price 13/6. Post Free.

## BUY THE LISSENOLA

and build your own Loud Speaker

Lissen Limited, 16-20, Friars Lane, Richmond, Surrey

Phone: Richmond 2285 (4 lines).

Grams: "Lissenium, Phone, London."

L. 30

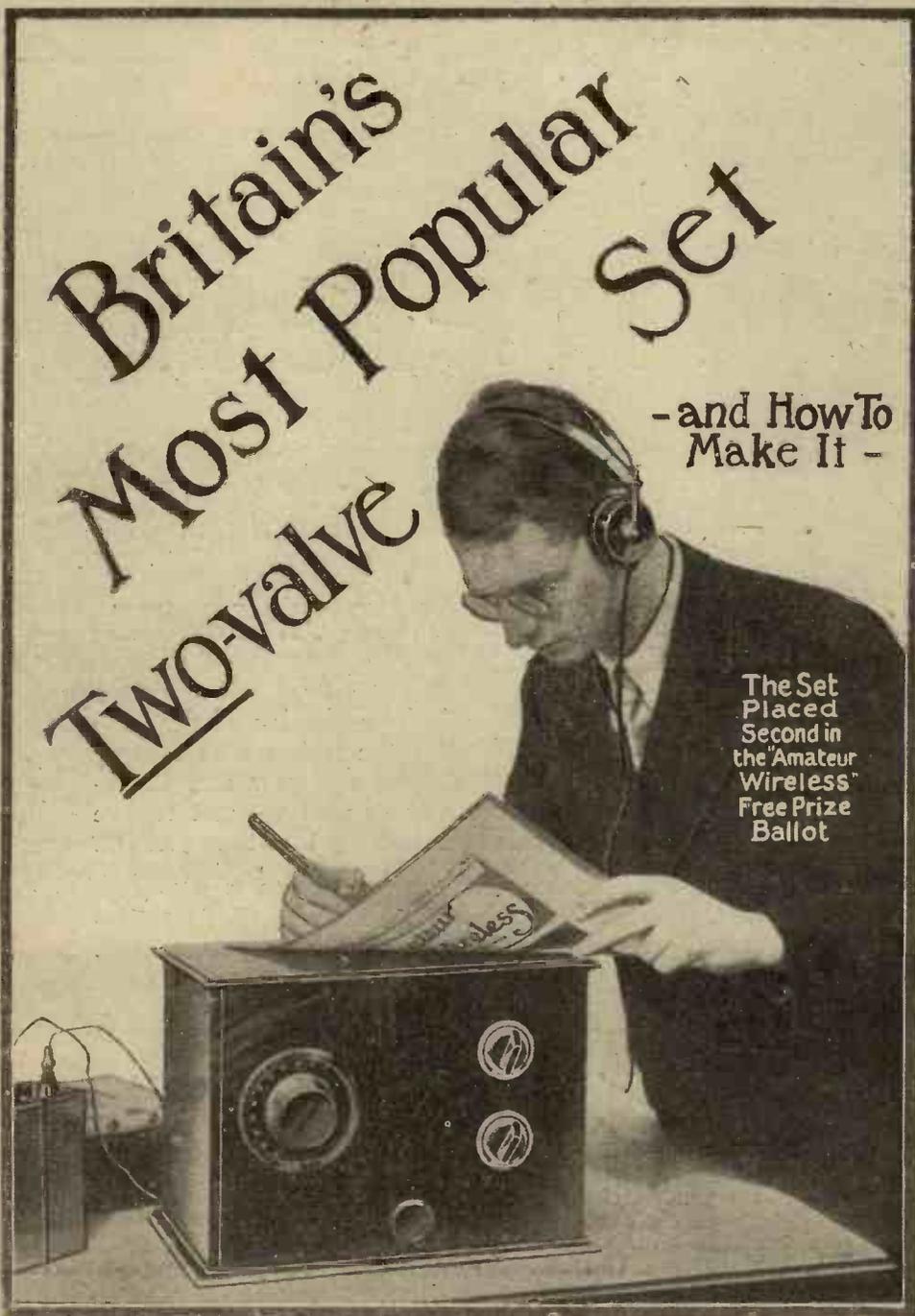
This Booklet Presented Free with "Amateur Wireless," No. 197, March 13, 1926

An additional gift is a Wiring Diagram (in colours) of the set described in this booklet

# Britain's Most Popular Two-valve Set

- and How To  
Make It -

The Set  
Placed  
Second in  
the "Amateur  
Wireless"  
Free Prize  
Ballot



# BRITAIN'S MOST POPULAR TWO-VALVE SET

Wiring Diagram and Easy Construction Guide.

SCALE: EXACTLY THREE-QUARTERS.

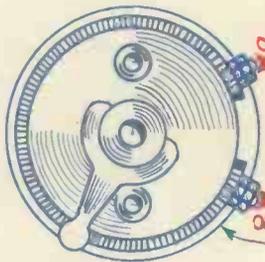
## THE PROPER WAY TO USE THIS DIAGRAM

The constructor may choose the particular method of using this wiring diagram and constructional guide:—

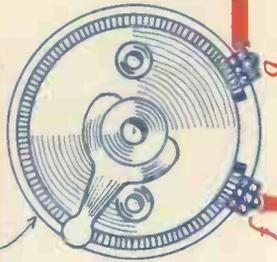
(a) You may simply follow the wiring lines, red lines indicating the filament-lighting circuits; and black lines the H.T. or plate circuits; and black lines the grid circuits. A black circle at the intersection of two wires indicates that the two are soldered together. At all other intersections there is no connection between the two wires.

(b) You can ignore the lines of the wiring, if you like, and work entirely by means of the red letters shown at the various terminals. You just connect all like letters together with one wire or with as few wires as possible, thus all the a's together, all the b's together and so on, and you should do so in alphabetical order, the a's first. By this method you cannot go wrong if you are careful.

(c) You will find, if you have gained a little experience, that the ideal method is to combine (a) and (b).

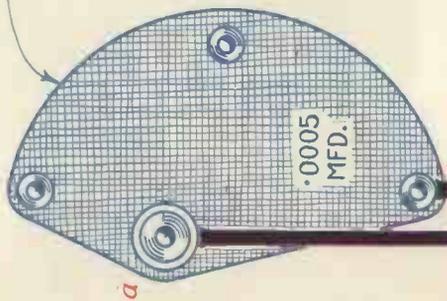


RHEOSTATS



For information on construction see **BOOKLET**—the other **FREE GIFT** presented with the March 13 "Amateur Wireless."

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12" X 9"

BASE BOARD  
12" X 7" X 1/2"

GRID LEAK  
&  
CONDENSER

COIL HOLDER

TRANSFORMER

VALVE HOLDER

FIXED  
CONDENSERS

.001 MFD.

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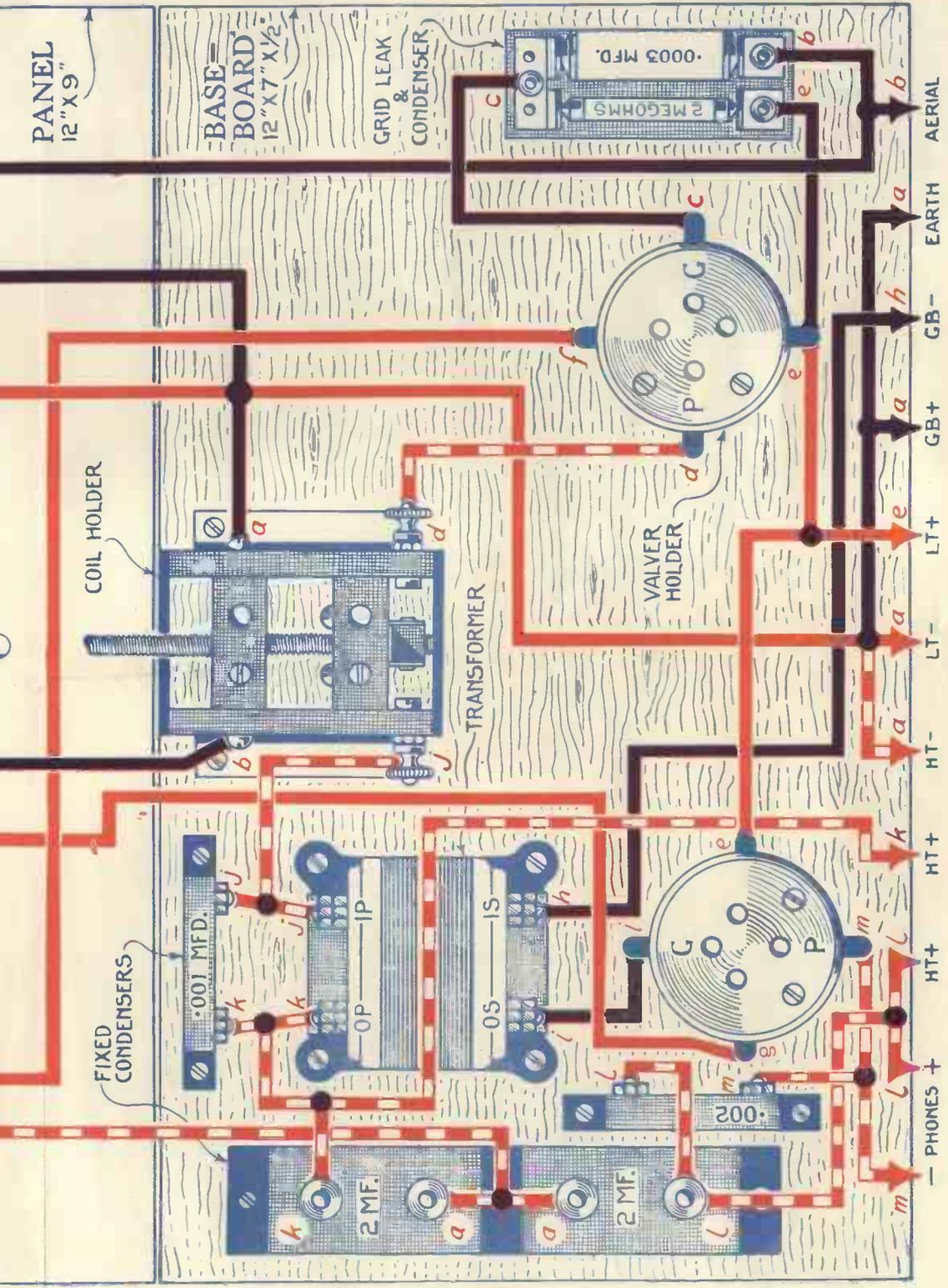
2 MF.

2 MF.

.002

.0003 MFD.

2 MEGOHMS



2  
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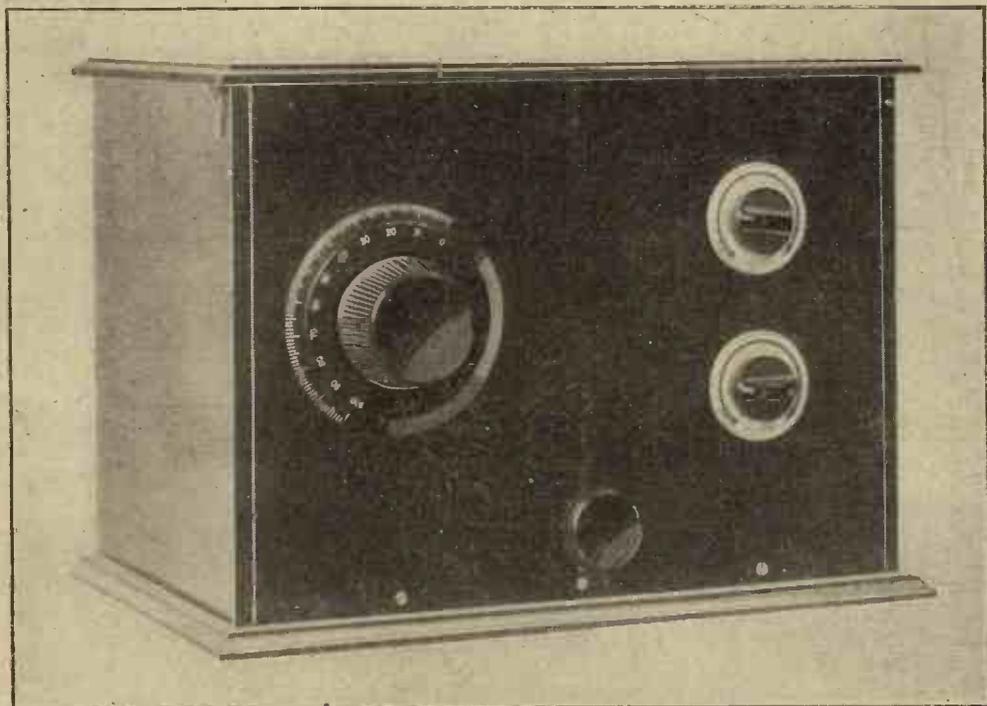
**CASSELL'S, Publishers, LONDON, E.C.4**

## BRITAIN'S MOST POPULAR TWO-VALVE SET

As Revealed by the "Amateur Wireless" Free Prize Ballot

**I**N the "A.W." Prize Ballot (which appeared in the Xmas number of *AMATEUR WIRELESS*) the circuit placed *second* was a straight two-valver, having a detector valve followed by a low-fre-

quency amplifier, transformer-coupled. which gained the first place was a straight three-valver, and was described in a booklet issued a fortnight ago with "A.W." No. 195 under the title of "Britain's Most Popular Three-valver."



Britain's Most Popular Two-valve Set—compact and efficient.

quency amplifier, transformer-coupled. A list of ten circuits was given, including five three-valve and five two-valve circuits, out of which six were to be chosen and placed in what was considered to be their order of popularity. The circuit

This curious result that out of ten well-known circuits—including, as already stated, several possessing three valves—a plain two-valver should be given second place, proves that, so far, no two-valve circuit has been evolved which, in the

hands of the average man, will give better results than the well-known straight two-valve circuit illustrated by Fig. 1. Even a three-valve reflex which, theoretically, does the work of five valves, was ignored.

There are, of course, many reasons why such a circuit is popular. In the first place the cost of a receiver built with this arrangement is not very high. Secondly, it is simple to make and simple to

operate. For very short waves—such as, say, 20 to 40 metres—the coils should be specially wound on low-loss principles; but for all ordinary purposes, the ordinary plug-in coil is quite satisfactory.

In the set which was specially constructed by the Technical Staff of AMATEUR WIRELESS, a glance at the circuit diagram will show that the simplest and most

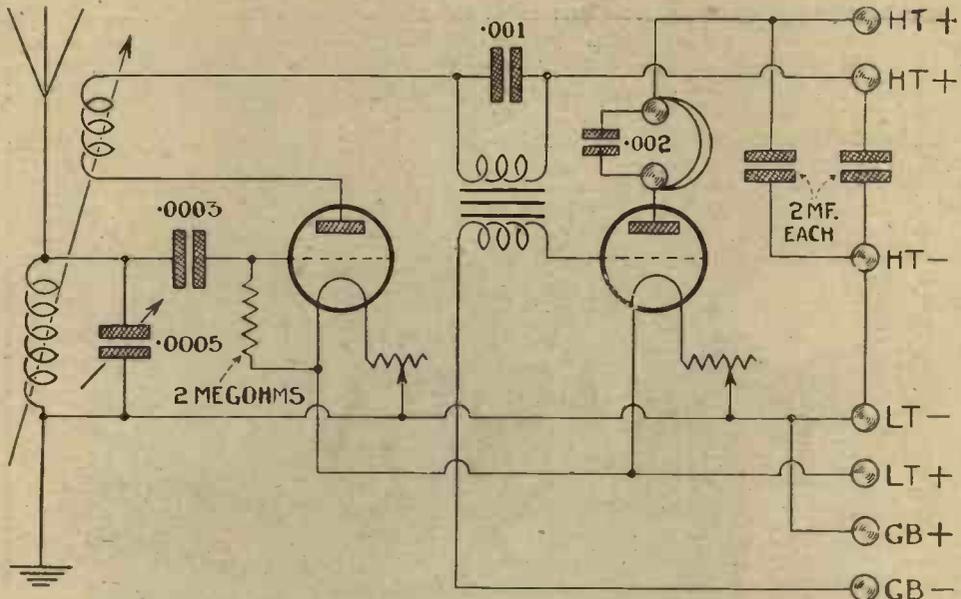


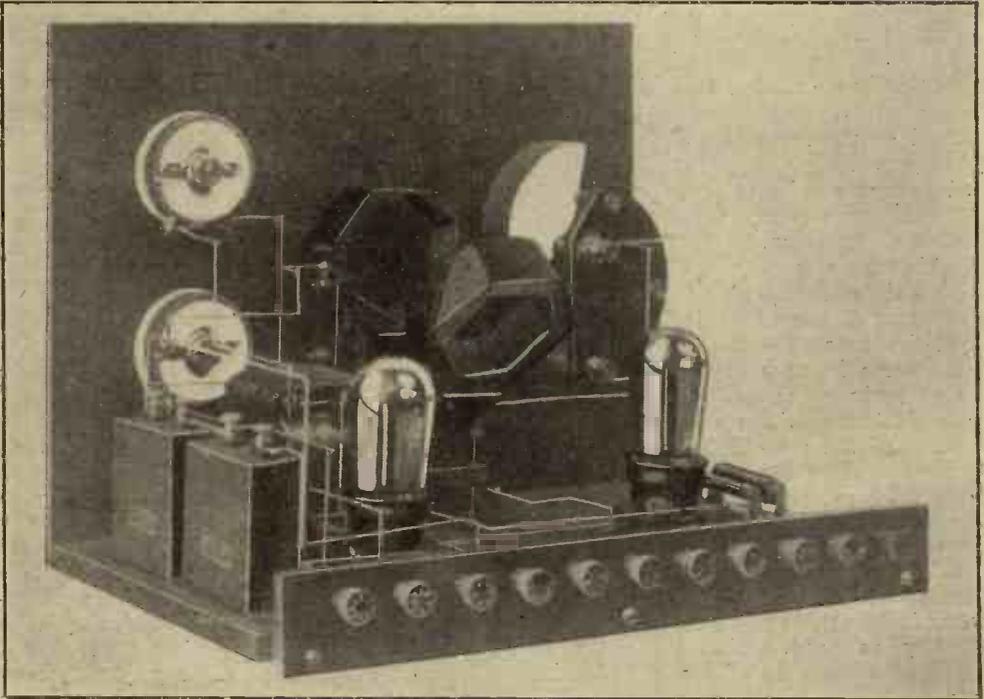
Fig. 1.—This is the circuit diagram of the set, at once simple and efficient. It is the best all-round two-valve circuit for loud-speaker work from the local station.

operate, and, finally, it is capable of giving loud-speaker results from a local station up to a distance of fifteen miles. Sometimes this distance, of course, is much shorter, and sometimes even greater, depending on circumstances which as yet have not been satisfactorily explained. Using phones, however, the range of reception is unlimited. Evidence is not lacking of the reception of many American stations on two valves. By the use of plug-in coils the whole wavelength range used in wireless transmissions may be covered; and it is well known that the straight two-valve circuit is one of the best, if not the most efficient, for short-

popular form of tuner is used, in which a coil inserted in series with the aerial and earth is "tuned" by a variable condenser, the incoming signals being passed to the grid of the detector valve through the grid condenser. Now, although this is the simplest form of tuner, and the most efficient from the point of view of signal strength, its chief disadvantage is its comparatively low degree of selectivity—as compared with the three-coil method of tuning. This latter method, although capable of giving excellent results in the hands of an expert, introduces complications in tuning which the novice is apt to find bewildering. Not only are there two

distinct circuits to tune, but there is also the degree of coupling between primary and secondary circuits to adjust until the necessary amount of selectivity is obtained, consistent with the maximum signal strength. This adjustment is by no means easy, and the average man is advised to stick to the single-circuit tuner until he has gained sufficient experi-

should not be too great, or the valve will start to oscillate at a frequency which will approximate to that of the station that is being received. Other listeners for several miles round the oscillator will hear a squeal. This is the result of the oscillating valve transmitting oscillations which heterodyne those of the transmitting station, producing an audible note the



Back-of-panel view, showing the compact arrangement of the components which are few in number.

ence to warrant the altering of his receiver to the double-circuit tuning system.

Reaction, essential to the efficient working of any receiver, is obtained by coupling a coil connected in the plate circuit of the detector valve to the aerial coil in the grid-circuit of the valve. In this manner the incoming signals are amplified by the property peculiar to the valve, and are fed back again to the grid circuit, thus giving the incoming signals a tremendous boosting effect. As most of our readers know, the amount of reaction

frequency of which is equal to the difference of the frequencies of the transmitting station and the oscillating valve.

Apart from this interference caused to other listeners, the reception of undistorted telephony with the valve in or even near an oscillating condition is impossible. All, or most of this, will already be familiar to many of our readers, but we do not apologise for its reception, for it may catch the eye of many offenders who are unaware of the annoyance they are causing to others.

## Necessary Components

Returning to the discussion on the circuit diagram: After the rectified signals have passed through the reaction coil they traverse the primary winding of the low-frequency transformer, producing in the secondary winding impulses similar in form but greater in voltage, due to the step-up ratio of the transformer windings. The second valve amplifies these impulses and passes them through the telephone windings, where they actuate the diaphragm.

That is a short description of how the set actually works, and attention will now be given to the actual construction of the receiver. For this purpose a list of the components required is given. Beside each component a list of manufacturers' names will be seen, the first name in each case being the manufacturer (or agent) of the component used in the original receiver. From time to time, however, we have used the components of other manufacturers, and have found them equally as good. This gives the constructor a selection of makes which have our guarantee of efficiency.

Ebonite panel, 12 in. by 9 in. (American Hard Rubber Co.; or Paragon, Trelleborg, British Ebonite Co., Ltd., Clayton).

Terminal strip,  $11\frac{7}{8}$  in. by  $1\frac{1}{2}$  in.

Baseboard, 12 in. by 7 in. by  $\frac{1}{2}$  in. thick.

L.F. transformer, medium ratio (B.T.H.; or Radio Instruments, Igranic, Eureka, Lissen, Ferranti AF3, Marconi Ideal, Energo).

Two filament rheostats (Igranic-Pacent; or Lissen, Ediswan).

Variable condenser, .0005 microfarad (Ormond; or R.I., G.E.C., Dubilier, Igranic, A.J.S., Sterling, Raymond).

Two-way coil holder (Henderson; or G.E.C., Lissen).

Grid condenser, .0003 microfarad and 2-megohm grid leak (Yesley; or Dubilier, Mullard).

.001-microfarad fixed condenser (Paragon; or Dubilier).

.002-microfarad fixed condenser (Paragon or Dubilier).

Two 2-microfarad fixed condensers (Dubilier or T.C.C.).

Two baseboard-mounting valve holders (H.T.C. or Benjamin, Lotus, Burndept).

Eleven terminals (Belling Lee).

4-in. condenser dial (Igranic).

Three pieces ebonite tube,  $\frac{3}{4}$  in. diameter and  $\frac{3}{4}$  in. long.

Cabinet (Unica Cabinet Co.).

### The Cabinet

First of all we may start with the cabinet, a dimensioned sketch of which is shown in Fig. 2. Some of our readers who are handy with carpenters' tools may possibly care to construct the cabinet for them-

selves, in which case a good job should be made of it, for nothing looks worse than a badly made cabinet. The majority, however, will prefer to obtain the cabinet ready made. A suitable one may be obtained from the Unica Cabinet Co., of 73 Camden Street, London, N.W.1. This cabinet is made in mahogany and is built in the ordinary manner, having an upright panel opening and a lid, hinged at the back, giving easy access to the components arranged on the baseboard at the back of the panel.

Along the top of the cabinet, just above the panel, a thin strip of wood is attached for the purpose of giving support to the panel along its top edge. A slot should be cut at the bottom of the back of the cabinet through which the terminal strip projects.

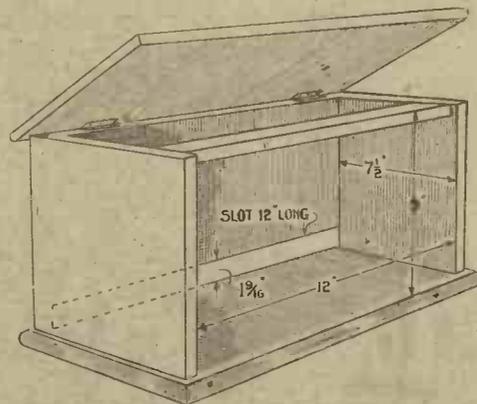


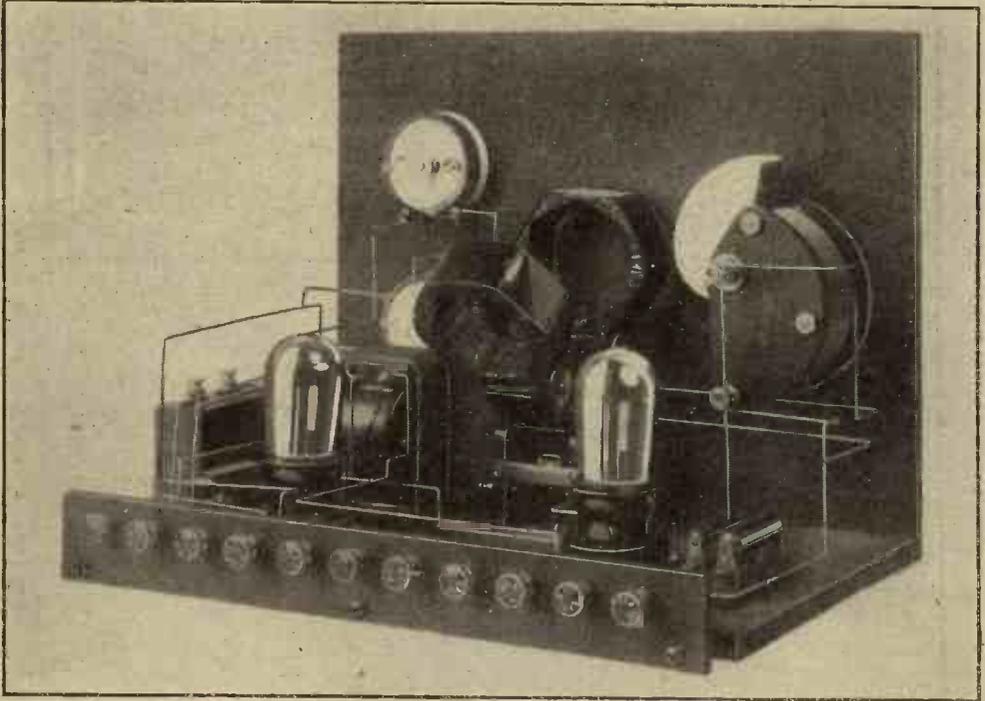
Fig. 2.—Sketch showing dimensions and constructional details of the cabinet.

## The Panel

The first step in the construction of the actual set is the preparation and drilling of the panel. The use of high-class ebonite cannot be too strongly emphasized. Many of the faulty receivers which have come under our notice have had the fault traced to poor ebonite introducing high-resistance leaks in the most unlikely places. In order that such a possibility may be eliminated, a branded variety of

the centre pages of this booklet, where a full-size drilling template of the panel will be found. No notice should be taken of the broken edges of the panel as shown on the template, which is shown thus for the reason that the two centre pages together are not quite large enough to show the complete panel. All the holes to be drilled, however, are indicated.

The method of using the template is as follows: Lay the panel on a flat surface



Another view of the back of the panel.

ebonite should be purchased, and all unbranded panels regarded with suspicion.

If the panel cannot be obtained cut to size from one of the firms indicated in the list of components, one having slightly larger dimensions must be obtained, from which it will be necessary to saw off the superfluous area. The edges must then be smoothed off with emery cloth.

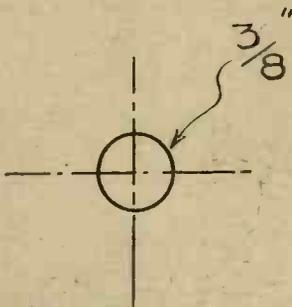
## The Drilling Template

Drilling may now be started, and for this purpose reference should be made to

with its outside face on top. Place the template on the panel in such a manner that the edges of the latter coincide with those shown in straight black lines on the template. With a sharp steel point mark through on to the panel the centres of all the holes to be drilled. The template may then be removed, and holes of the sizes shown on the template drilled through the panel at these marks.

When drilling the panel care should be taken that the drill is at right-angles to

# THE PANEL TEMPLATE

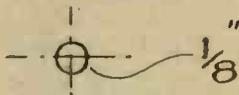


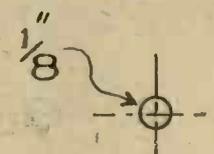
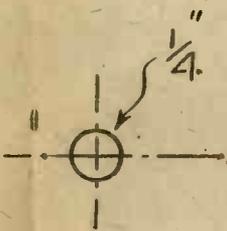
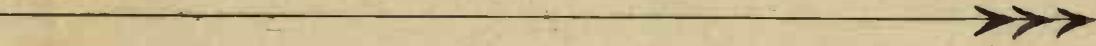
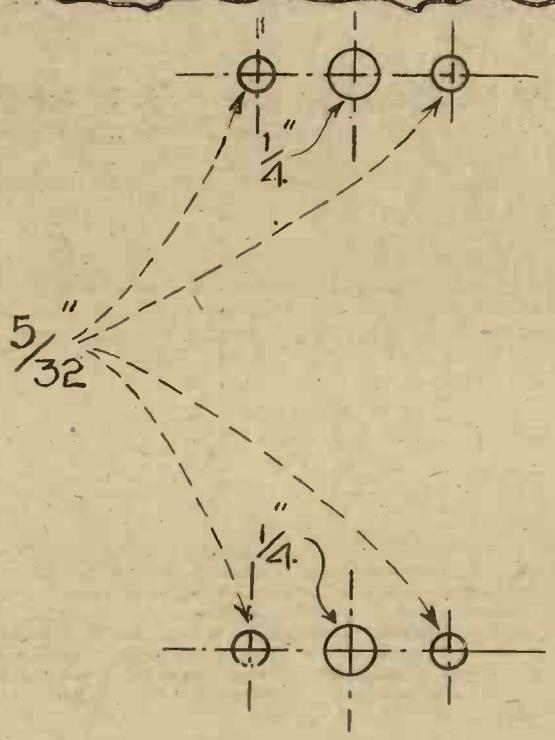
This is a full-size panel drilling template. It should be carefully removed from the booklet without being torn. Although the full outline of the panel is not shown, the centres and sizes of all the holes to be drilled are indicated and it is only necessary to lay the template on the panel so that the straight black lines drawn on the template, indicating the bottom and left-hand edge of the panel, coincide with the actual similar edges of the panel. The centres of all the holes are then marked through with a sharp steel point and the template removed. Holes of the sizes indicated on the template are drilled through the panel at these marks.

12"

9"

LOWER LEFT-HAND  
CORNER OF PANEL  
FRONT





the plane of the panel. As the total number of holes to be drilled is comparatively small, the time occupied in drilling should be very short. On the left of the panel the variable condenser is mounted, whilst the two filament rheostats are mounted on the right. At the bottom and in the centre of the panel projects the control knob of the two-way coil holder. These components should be mounted on the panel, and the whole put aside until the remainder of the components are mounted on the baseboard.

### The Baseboard

The baseboard consists of a piece of hard wood, such as teak, measuring 12 in. by 7 in. by  $\frac{1}{2}$  in. thick, the surface of which may be coated with shellac varnish

AMATEUR WIRELESS. The coloured wiring diagram plainly shows in plan the disposition of the components. A further idea may be obtained from the photographs.

It is essential that the moving coil inserted in the two-way coil holder should be able to move unhampered by the wiring of the set. No instrument, therefore, is mounted directly behind the coil holder, as will be clearly seen from the photographs and wiring diagram of the receiver. Directly behind the variable condenser the grid leak, grid condenser, and detector valve holder are mounted in the positions shown. Both leak and condenser are of the cylindrical cartridge type, and are held between brass clips. On the other side of the baseboard are

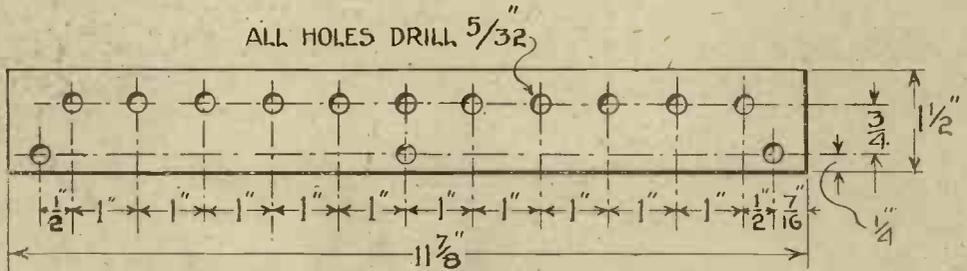


Fig. 3.—Dimensioned details of the terminal strip.

in order to improve the insulating and damp-resisting properties, as well as adding to its appearance. To the back edge of the baseboard the terminal strip is fixed by means of three  $1\frac{1}{2}$ -in. brass wood-screws, passing through the three ebonite distance-piece tubes. This strip carries all the eleven terminals, and should be drilled according to the drilling diagram shown in Fig 3. Looking at the back of the set, the terminals should be inserted in the strip in the following manner (reading from left to right): Phones -, Phones +, H.T. +, H.T. +, H.T. -, L.T. -, L.T. +, G.B. +, G.B. -, earth and aerial.

The positions of the components mounted on the baseboard are very important, and here is where use should be made of the coloured wiring diagram, also presented free with this issue of

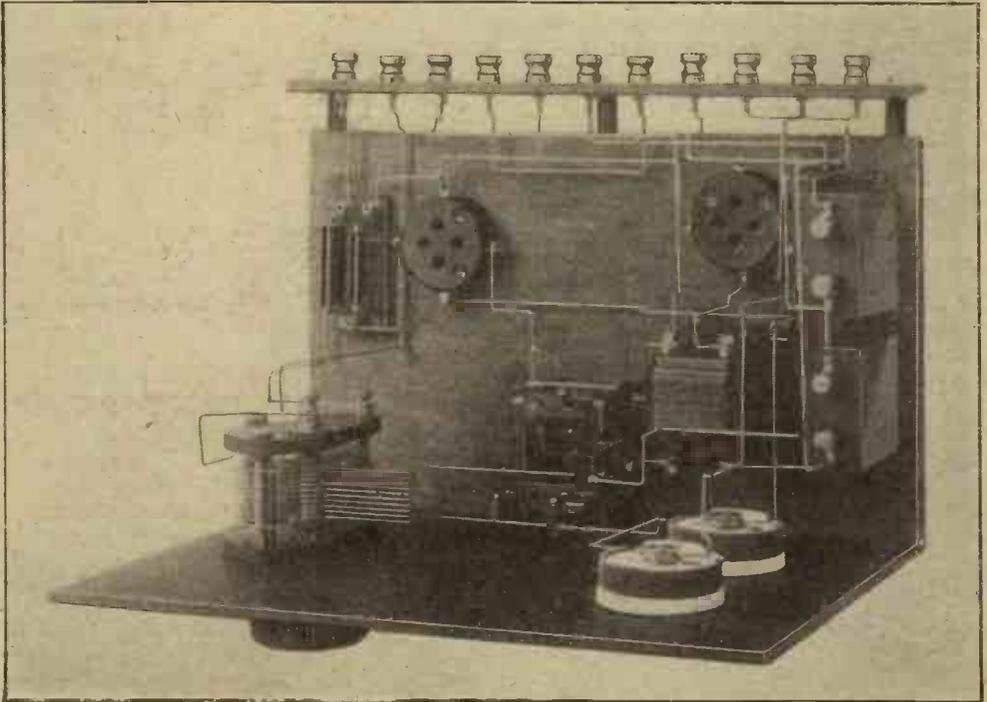
mounted the L.F. transformer and the two 2-microfarad fixed condensers, together with the second valve holder and the .002 fixed condenser across the phone terminals. The remaining .001-microfarad fixed condenser connected across the primary terminals of the transformer is not fixed to the baseboard, but is held in position by the thick wire used for wiring the set.

This completes the actual mounting of the components, and wiring may now be started. First of all, of course, it is necessary to fix the panel to the baseboard by three 1-in. brass round-headed wood screws. Panel bracket supports may be used if found necessary. In the coloured wiring diagram the grid, filament-lighting and plate circuits have been coloured in black, red, and red and white respectively. Also, on close examination

it will be seen that all the terminals, including those on the actual components, are marked with a small letter of the alphabet. Some, for instance, are marked *a*, and all these should be joined together *first*, with one wire, or as few wires as possible. Then all those marked *b* are connected together in a similar fashion: next all those marked *c*, and so on. In

Wherever possible, connections should be soldered, a joint of this type being far more efficient and lasting than a clamped joint. In the photographs the wiring is shown with each wire either parallel or perpendicular to the others. This method looks very neat, but the constructor need not worry himself unduly on this point.

It only remains to place the receiver in



This plan view of baseboard shows the accessibility of the components.

this manner the set may be wired up in the most convenient order.

If the coloured wiring diagram is frequently consulted during wiring operations there will be little likelihood of making mistakes. For those, however, who prefer to wire up from a circuit diagram, this will be found on page 4. The usual practice of keeping grid and plate wires well separated should be remembered. Connections to the reaction coil should be only temporary, for these connections may have to be reversed.

its cabinet and to conduct a preliminary test for short circuits, disconnections, etc. First of all place the valves in their sockets and turn the valves to the "full on" position, at the same time short-circuiting the L.T. and grid bias terminals with short pieces of wire. Place all the coils in their sockets, and connect the accumulator to the H.T. — and each of the H.T. + terminals in turn. If any short circuit exists between the plate and filament circuits, the fact will be demonstrated by the lighting-up of the valve

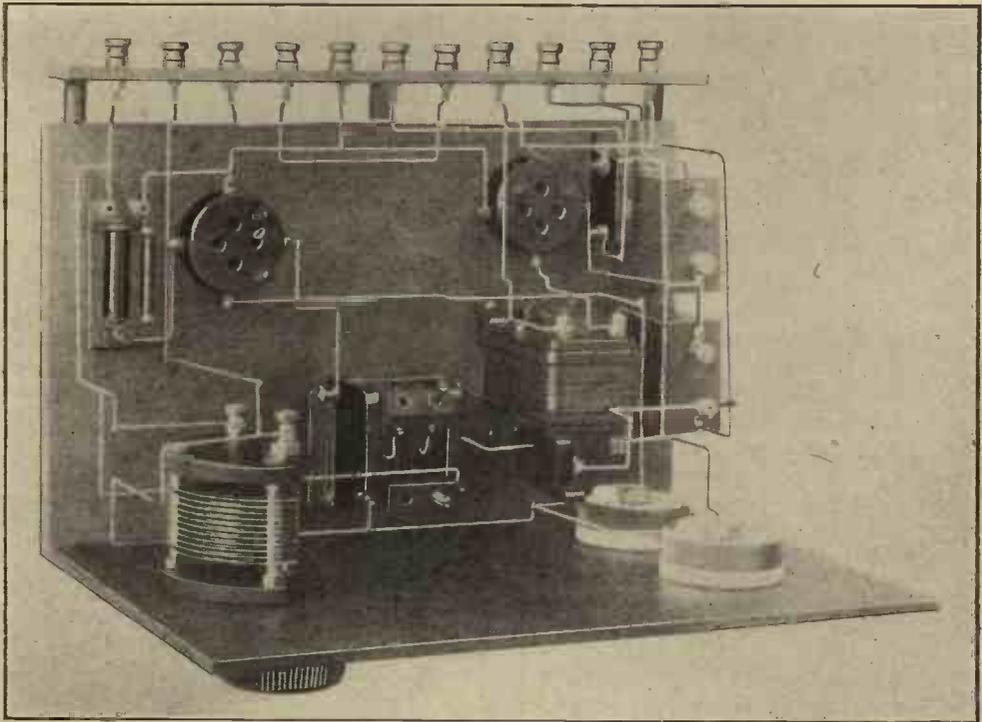
filaments. Should this occur, a search for the fault should be made and, when found, remedied.

### Valves

It is essential, of course, if good results are to be obtained, that valves of reputable make should be employed.

In this respect we can recommend

and place a No. 35 or 40 coil in the fixed holder of the two-way coil holder. In the moving holder a No. 60 is plugged. The filament rheostats should now be turned until the filaments of the valves reach a suitable brilliancy. With the coupling between the reaction and aerial coils fairly loose, search round for signals by slowly rotating the variable condenser



Another plan view, in which the simplicity of the wiring will be apparent.

the following: Marconi, Osram, Cossor, Ediswan, B.T.H., Mullard or Cleartron. Best results are obtained not by the use of general-purpose valves, but by employing a special valve for each stage. A good combination for 2-volt valves is the Ediswan ARDE H.F. for the detector position, and the Ediswan PV6 DE in the amplifying stage.

### Operation

Connect up the aerial, earth, batteries and phones to their respective terminals,

dial. If the set is inclined to oscillate, still further loosen the coupling.

When signals are received they may be further strengthened by slowly bringing the reaction coil nearer to the aerial coil. If no strengthening effect is noticed the wires connected to the reaction coil holder should be reversed. Once signals have been received, the voltages of all the batteries should be adjusted until best results are obtained. For longer wavelengths the aerial and reaction coils should be a No. 150 and 200 respectively.

## THE NEXT BEST TWO-VALVER

It is interesting to note that of the two-valve circuits in the "A. W." Free Prize Ballot, the one placed second in order of popularity was a reflex circuit, the first

There is no doubt but that the reflex receiver, when well designed, will give good results; but the constructor will find that to obtain the best results he will have to devote a fair amount of time to experiment.

In this circuit the high-frequency currents are fed to the grid circuit of the first (reflex) valve, by which they are amplified, and they are then passed to the detector to be rectified. They appear in the plate circuit of the detector valve in a rectified and amplified form, and are then handed back into

the grid circuit of the first valve to undergo amplification again, but now at their new (low) frequency.

The amplified L.F. impulses thus appear in the plate circuit of the first valve. Now the plate circuit of this valve must obviously be coupled to the grid circuit

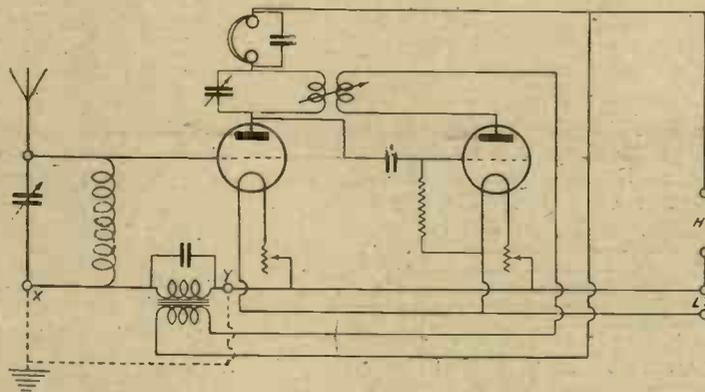


Fig. 1.—A Two-valve Reflex Circuit with Tuned Anode

valve acting as a high- and low-frequency amplifier, and the second valve as a detector. Although the straight-circuit gained the first place amongst the two-valvers, so many votes were cast for the reflex circuit that we considered it would be advisable to give one or two circuits.

The reflex circuit, with a crystal as a detector has lost most of its popularity, due to its inefficiency as compared with a valve in point of view of sensitivity and, more especially, its consistent operation when once adjusted. The "howling" proclivities of this type of circuit far surpass those of any "super," but once the set is mastered the valve detector is constant in operation, and herein lies its chief claim to usefulness. When a crystal detector is used, it often happens that the catwhisker has to be readjusted in the middle of an interesting item.

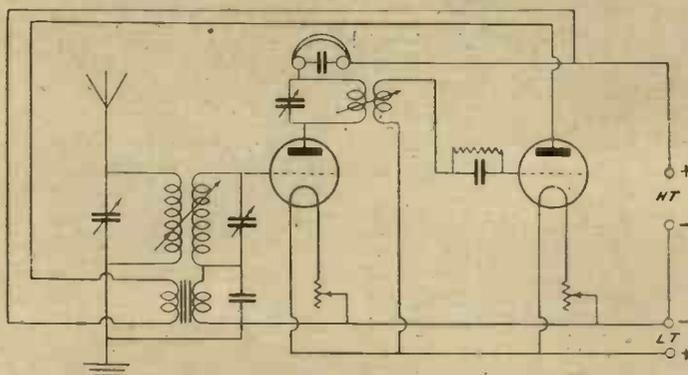


Fig. 2.—Two-valve Reflex Circuit with Transformer Coupling.

of the detector in order that the H.F. oscillations flowing in the first plate circuit may be passed on to the detector. If in addition to this H.F. coupling a sufficient L.F. coupling exists between the

first plate circuit and the detector grid circuit, the conditions for the maintenance of L.F. oscillations are satisfied and a steady howl is heard in the phones. It is therefore essential, for L.F. stability, that as small an L.F. coupling as possible should exist between the first plate circuit and the second grid circuit.

Fig. 1 shows a two-valve reflex circuit which has been widely advocated. Although it may sometimes give quite fair results, it is theoretically unsound, inasmuch as a low-frequency coupling of the well-known choke-capacity type exists between the two valves. The observant

also used between aerial and the first grid circuit, so that the batteries may be kept at earth potential and selectivity retained.

A circuit of this type is fairly free from L.F. oscillation, but, unfortunately, very liable to H.F. self-oscillation, and hence a separate reaction coil is not deemed necessary.

To the enthusiast the circuit shown in Fig. 3 is eminently suited. The coupling between the two valves is exactly the same as in Fig. 2. The grid circuit of the amplifying valve is, however, now directly coupled to the aerial, and the damping resulting from this arrangement greatly assists in stabilizing the set. The L.F. transformer secondary is connected in parallel with the tuned circuit and the batteries are always at earth potential. The small fixed condenser prevents the L.F. impulses passing through the tuning coil, while the H.F. choke (a coil of from 250 to 300 turns for broadcast wave-

lengths) prevents the H.F. currents leaking through the transformer. This circuit is very selective, owing to the loose coupling between the valves, and is considerably more powerful than the single-valve crystal reflex. No reaction coil is shown in Fig. 3, but one can be connected between the plate of the last valve and the L.F. transformer primary and coupled to the H.F. transformer secondary.

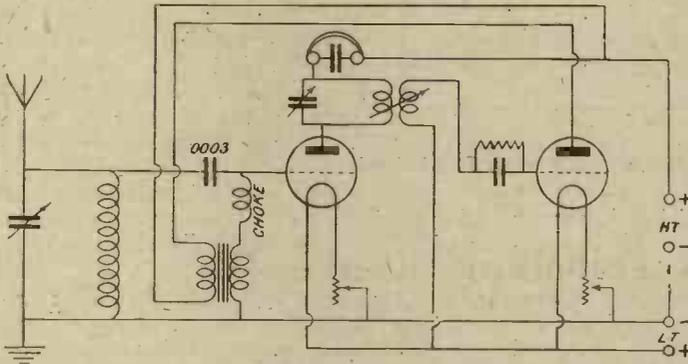


Fig. 3.—A Circuit with Amplifying Valve coupled direct to Aerial.

will notice that this circuit has another defect. Owing to the position of the transformer, the L.T. and H.T. batteries are at L.F. potential to earth, always an undesirable state of affairs. The practice of connecting the earth to point *y* instead of to point *x* is not to be recommended, as it destroys the selectivity of the set.

An arrangement favoured by many is shown by Fig. 2. Here the coupling between the two valves is by H.F. transformer and is as loose as possible. Either a variable coupling may be used consisting of two plug-in coils in a two-coil holder, and the two coils kept far apart, or the coupling may be a fixed one, in which case one winding is wound directly over the other, the primary winding consisting of a few turns only of thick wire. It will be noticed that loose-coupling is

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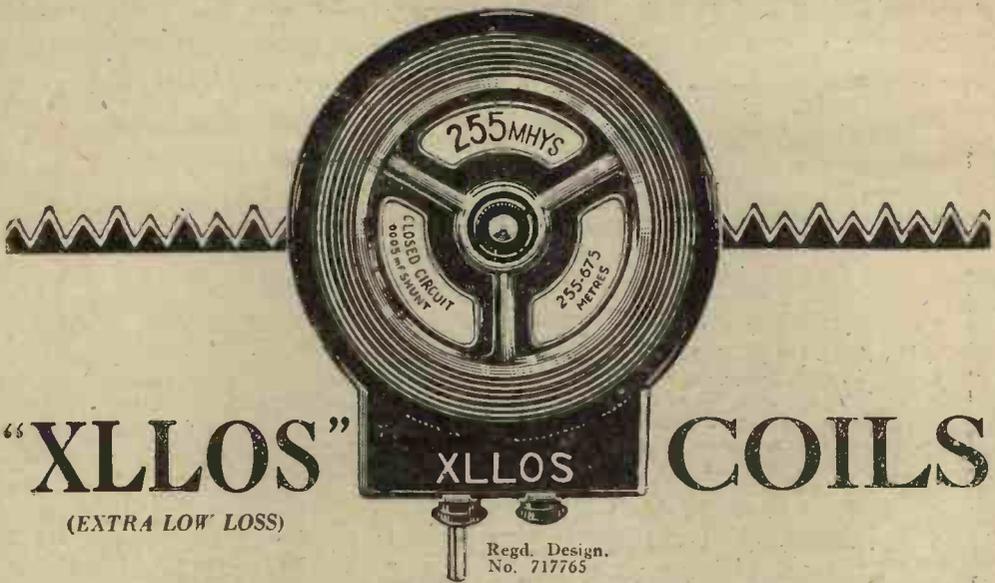
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