

HOW TO GET LOUD-SPEAKER PURITY

# Amateur Wireless

Every  
Thursday 3<sup>d</sup>

and  
Radiovision

Vol. XIV. No. 350

Saturday, February 23, 1929

**LOUD-  
SPEAKER  
BUILDING  
AT  
HOME**



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# Amateur Wireless and Radiovision

The Leading Radio Weekly for the Constructor, Listener and Experimenter

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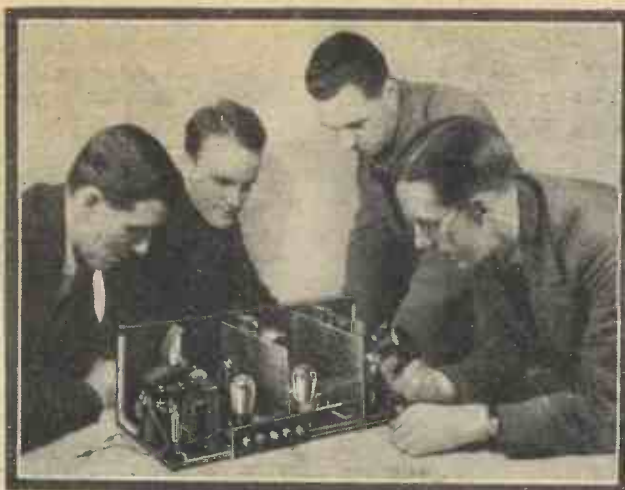
## On Cheese!—SOS—Conservative Loud-speaking!—An Expensive Request— Radioed Blueprint—Slippered Services—Papal Radio—Radio in Schools

**On Cheese!**—When it was first announced that housewifery talks should be given in the mornings from 5XX, there was quite a deal of "fluttering" in many homes where housewives objected to being taught by the B.B.C. Well, perhaps the following may be a surprise. On a recent Tuesday, a recipe for "some ways of cooking cheese" was given from 5XX and the lecturer announced that those who were not quite sure of the ingredients could obtain the recipe by post. Perhaps this was not without guile, for it would serve as an indication of the number of listeners to the morning broadcasts. Within three days no less than 5,889 inquiries were received!

**SOS**—The B.B.C. keeps very careful check on the personal SOS messages sent from all stations. Two things are rather striking. First, the large use to which the SOS service is put, and, second, the large proportion of successful results obtained. For example, during the whole of last year 765 people asked the B.B.C. to broadcast SOS messages. Of these 42.4 per cent. were successful.

**Conservative Loud-speaking!**—It seems, judging from an article published in last week's AMATEUR WIRELESS that politicians are making good use of radio. Now comes the news that a number of conservative candidates will use a special Marconi outfit. This consists of a "mike," a gramophone pick-up, and an amplifier, the juice for which latter is obtained from a rotary transformer working from a 12-volt car battery.

**An Expensive Request**—The Transatlantic radio telephone service is used for many quaint things, and advertisement is not the least important! Recently Samuel Goldwyn, the well-known Hollywood film impresario phoned across the Atlantic to a London film critic



A set well worth attention! It is the "All-Europe Four" to which our centre pages are devoted this week.

asking him not to miss the presentation of a certain new film!

**Radioed Blueprint**—During the same week as this film publicity stunt, however, very useful advantage was taken of the Transatlantic picture service. A blueprint diagram for a ship's rudder was sent from London to New York, where the rudder is to be made for the disabled British steamer *Silver Maple*. A saving of eight days was entailed by the radio-ing of the design.

**"Slippered Services"**—"I want to tell you quite definitely that lounging in an armchair and listening to a wireless service is not worship." In these words a Bournemouth D.D. condemns wireless services. Were it not for the fact that he afterwards confessed that wireless services could be "taken advantage of quite legitimately," one would suspect him of having never listened-in to some of the B.B.C.'s excellent Sunday services.

**Papal Radio**—In the new Papal State, which, it is understood, will be called the Vatican City, the Pope will have the right to maintain a railway station and aerodrome and last, but not least, a wireless station.

**Another Americanism!**—A real Americanism. How we seem to keep on falling over them in radio parlance! A U.S. radio contemporary, in advising readers to take out those inferior L.F. transformers, says "Perform that adenoid operation." Succint!

**Radio in Schools**—In order to keep up to scratch the wireless sets installed for educational purposes in schools, talks are occasionally given on set maintenance.

Teachers who want to hear what the B.B.C. has to say about the technical side should "book" 2.50 p.m. on March 14.

**Next Week**—For B.B.C. reception it is not usually necessary to have a set, the panel of which is covered with a multitude of tuning dials. Next week we are going to show how, in fact, every dial can be dispensed with! The novel two-valver which will be next week's feature carries on its panel simply a number of knobs, and in order to receive a station, it is necessary only to pull out the appropriate knob on the panel! This makes child's play of set operation.

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# A NEW PHOTO-ELECTRIC CELL

For Television and "Talkies"

AS photo-electric cells will be vitally important for television, and as they are already in use in connection with "talkies," it is gratifying to think that England now leads the field in producing commercial as distinct from laboratory-type photo-electric cells.

AN AMATEUR WIRELESS Special Correspondent has been in close touch with photo-cell experiments; so early as May, 1924, the G.E.C. research engineers at the Wembley laboratory were testing vacuum cells. Now commercial gas-filled photo-electric cells are to be had, and the red-sensitive cells (for the "burglar-alarms" much discussed in the daily press) have also passed out of the laboratory stage.

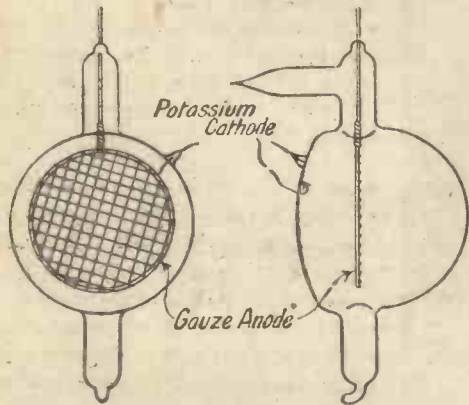


Diagram showing constructional features of photo-electric cell

Photo-cells have superseded selenium cells, of course, and their job is simply to transform light variations into current variations. Thus they are used at the transmitting end of television apparatus, and at the cinema end of talking film equipment, when the tone-variations on the film are changed into current and then into sound. The great advantage of the photo-electric cell over the selenium cell, is that selenium has a serious time lag of response.

All this is general knowledge, but much of the work conducted at the G.E.C. laboratories in developing commercial cells is not known to the public, and is now mentioned for the first time.

### Vacuum Cells

The early vacuum cells consisted simply of an evacuated glass bulb carrying a central electrode plate (the cathode) and having the interior coated with rubidium, potassium or sodium. A potential of about 90 volts is applied to the two electrodes, and a measuring instrument in series shows that a very minute current passes through the cell when light falls on to the bulb coating, owing to detaching of electrons from it and their passage to the cathode plate.

This is quite a simple arrangement, but several "snags" were discovered.

The vacuum cell is very insensitive. As a matter of fact, with the average cell, a 60-watt gas-filled lamp with the filament only a few inches away from the electrodes of the cell, produces a current of only  $10^{-3}$  amps., that is, 1/100,000,000 amp.! Cells vary, some being twice as sensitive as others: a rubidium coating is least sensitive, while sodium, though not always perfectly stable, gives the greatest emission. Moreover, sensitivity varies with the frequency of the light. Thus for lamps of equal candle-power, the response to a vacuum lamp is somewhat less than that to a gas-filled lamp.

Some of these disadvantages are not peculiar to vacuum photo-electric cells, and within a few months a very satisfactory vacuum cell was produced at Wembley which gave a more accurate proportionality between the amount of light given to the cell and the amount of current obtained from it. This type of cell is therefore very useful and accurate for photometric work.

### Gas-filled Cells

Gas-filled cells are, in some cases, nearly a hundred times as sensitive as vacuum cells, and it is therefore the gas type which is now on the market and is used for most purposes. This is the type shown by the photograph and the diagram. The reason why the gas-filled cell produces more current for the same light is that the passage of primary electrons (as set up in the vacuum cell by the action of the light) produces secondary electrons from the gas, and this means a bigger current. Also, the presence of the gas makes it possible to "sensitise" the cathode during manufacture.

The cathode is a sensitised potassium coating in the form of a kind of silvered cup on one side of the bulb, and the anode is a gauze disc supported centrally above the silvered cup. The bulb is filled with argon, a rare gas, to the low pressure of about .15 mm.

### Light-current Characteristics

A point about the gas-filled bulb is that the current obtained from the light variations depends on the permanent high voltage on both electrodes. A characteristic curve can be drawn showing this effect, and is given in an accompanying figure.

This graph shows along the horizontal axis the voltage applied to the cell, and on the vertical axis the current obtained from it. As a matter of fact the logarithm of the current is shown in order to make a con-



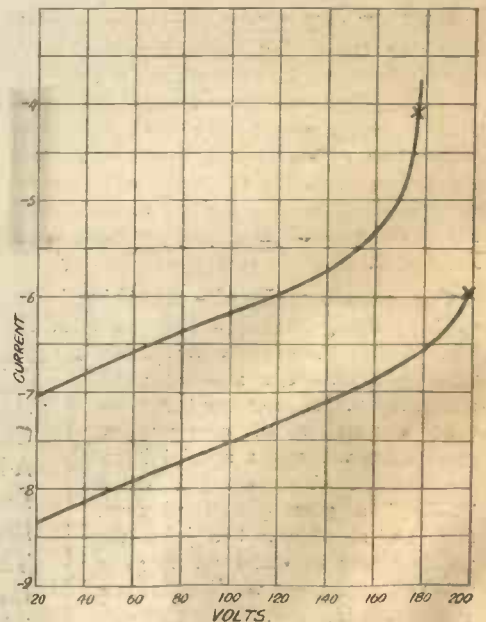
The G.E.C. photo-electric cell

venient-size diagram. The two curves are for two different values of light shining on the cell.

At about 180 volts the curve for the greater light value shoots straight up; this, in practice, means that the cell passes a large current, gives out a purple glow, and the current does not cease when the light is switched off. Thus this point on the curve shows first the greatest steady voltage which can be applied, and secondly the greatest current which can be obtained. The same effect is obtained with weaker illumination, as shown by the complete cessation of the lower curve.

### The Cell in Use

In practice, it is recommended that a resistance of about 10,000 ohms should



Graph showing voltage-current curves

always be in series with a gas-filled cell in order to protect the measuring instrument. For accurate measuring (apart from television or "talkie" work) the cell should be "warmed up" by applying a fairly high voltage to the cell for about ten seconds, which brings the cell into a steady state.





# Loud-speaker Building at Home

SINCE constructional details of the "Best Yet" cone loud-speaker were published in No. 318 of AMATEUR WIRELESS a number of enterprising firms have put on the market convenient and in some cases ingeniously designed unit-and-diaphragm supporting frames either in the form of "kits" or made up ready for the fitting of the cone driving unit.

The complete assembly or kits made by the firms mentioned below may satisfactorily take the place of the built-up wood chassis originally designed for the "Best Yet" cone, and when used in conjunction with the special 2-ft. square baffle originally specified, form a reasonably priced and easily assembled loud-speaker which will give excellent volume and quality of reproduction when working from the average two- or three-valve receiving set.

The various makes of kits or completely assembled chassis which have been found to give results in no way inferior to the

original built-up model are as follows:

### Squire

The Squire No. 97 cone kit consists of a three-stay aluminium casting together with cut-out "kraft" paper diaphragm, four "suedlin" segments for the flexible surround, cardboard ring for mounting the diaphragm and surround and a large plywood clamping washer which enables the cardboard ring holding the diaphragm and surround to be clamped to the front ring of the aluminium frame.

The unit support bracket is arranged to take either Blue Spot, Bullphone or Triotron cone driving units without alteration or drilling, but other makes of unit can be easily fitted.

### Goodman

The Goodman cone driving unit was one of the makes originally specified for the "Best Yet" cone speaker, so it is not surprising that Messrs. Goodman have come forward with a specially designed chassis assembly suitable for incorporation in the "Best Yet."

The casting used in the Goodman chassis is practically identical in strength to that supplied with this firm's well-known moving-coil loud-speaker.

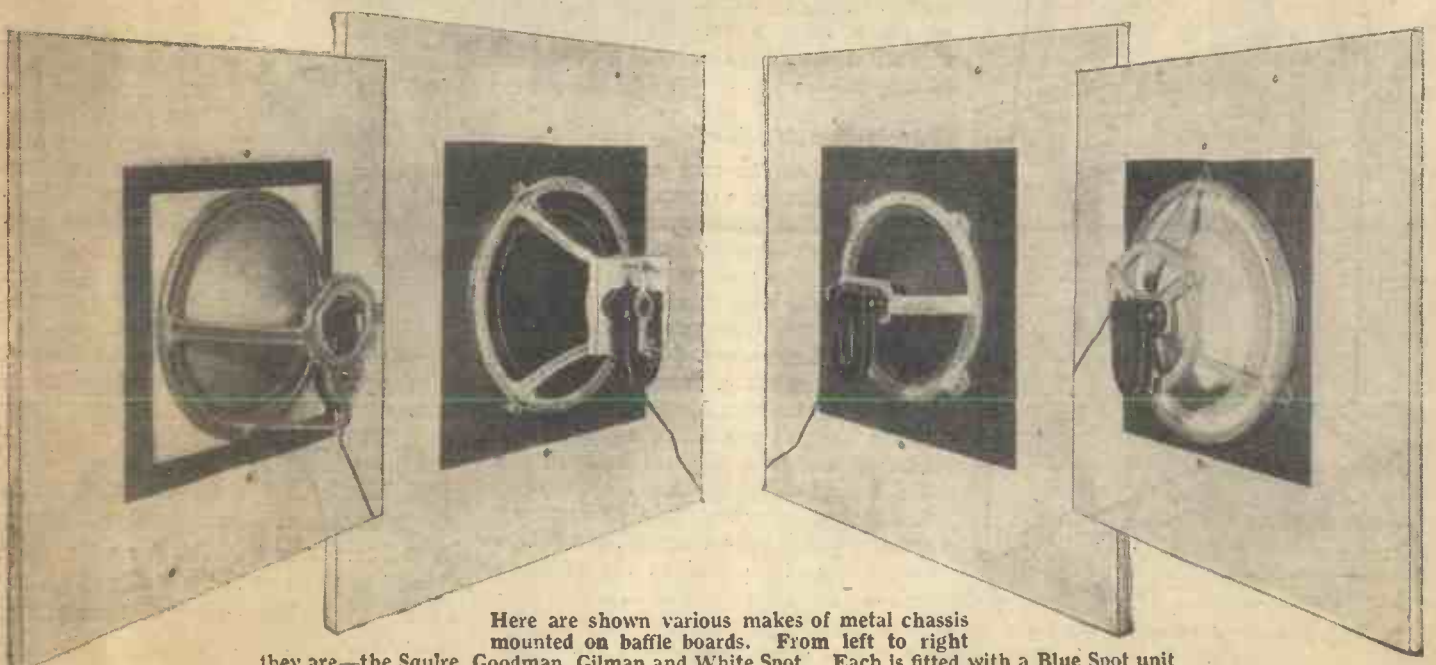
The diaphragm supplied as standard in the chassis is a one-piece seamless cone with blocked suspension; the whole being finished by a special doping process.

A special point about this assembly is that practically any make of driving unit can be fitted, as an adjustable clamping strip is provided as well as a plywood block to which some types of unit can easily be screwed.

### White Spot

The White Spot frame assembly consists of three die-cast aluminium castings comprising a three-stay body, a drilled ring for clamping the diaphragm surround to the body and a spider for holding the driving unit.

Drilled lugs are cast on the front ring for fixing the frame to the baffle board while the spider carrying the unit is adjustable, enabling the reed rod of the unit to be quickly centred in the apex hole of the diaphragm before final tightening up. This assembly is specially designed to take Blue Spot unit.



Here are shown various makes of metal chassis mounted on baffle boards. From left to right they are—the Squire, Goodman, Gilman and White Spot. Each is fitted with a Blue Spot unit



# "LOUD-SPEAKER BUILDING AT HOME" (Continued)

## Gilman

The framework of the Gilman standard floating cone assembly consists of a two-piece aluminium casting having two stays connecting the driving unit carrier to the diaphragm support ring, and a diaphragm surround clamping ring having four lugs for attachment of the chassis to the baffle board.

The diaphragm is suspended on a specially manufactured, pure rubber, surround.

Besides the standard assembly described above Messrs. Gilman manufacture a floating cone assembly incorporating a 14 3/4 in. diaphragm.

The main casting in this chassis has four stays in place of the two used in the standard model. Each model is specially designed for use with a Blue Spot driving unit.

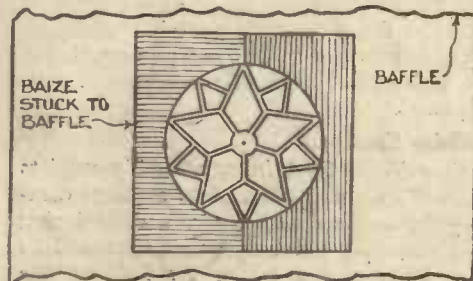


Fig. 1. Baize is fitted between chassis and baffle.

## Baffle Board

The baffle which was specially designed for the original "Best Yet" cone speaker and manufactured by Messrs. Carrington can be obtained from this firm in any

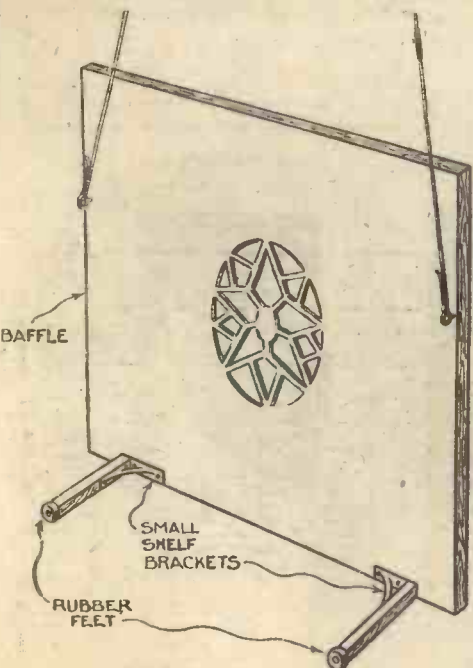
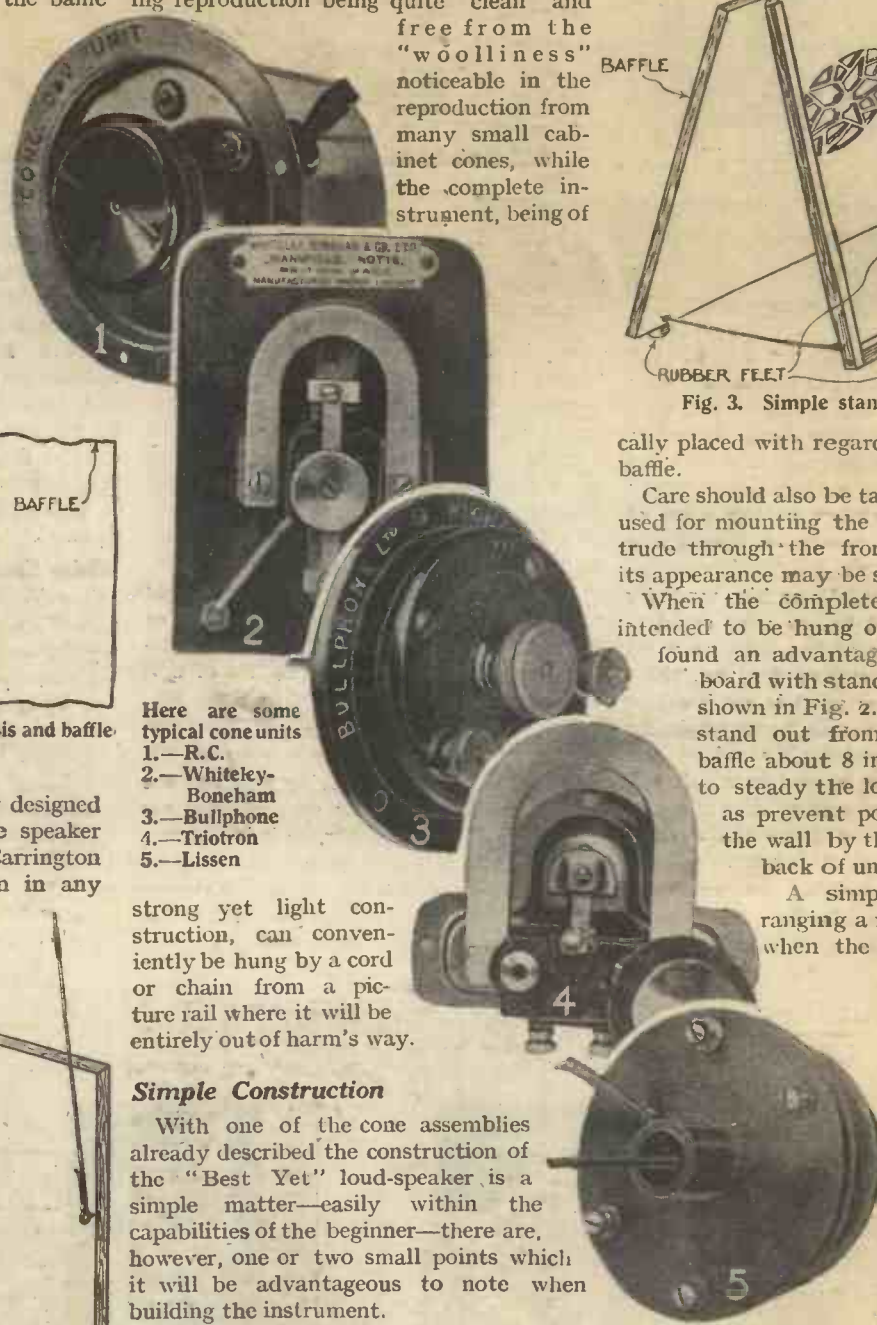


Fig. 2. Projections are fitted to keep speaker away from wall

desired wood and finish to match existing furniture or scheme of decoration.

## Good Tone

Owing to the use of a baffle board in the "Best Yet" loud-speaker, there is no box resonance to contend with, the resulting reproduction being quite "clean" and free from the "woolliness" noticeable in the reproduction from many small cabinet cones, while the complete instrument, being of



Here are some typical cone units  
 1.—R.C.  
 2.—Whitekey-Boneham  
 3.—Bullphone  
 4.—Triofron  
 5.—Lisson

strong yet light construction, can conveniently be hung by a cord or chain from a picture rail where it will be entirely out of harm's way.

## Simple Construction

With one of the cone assemblies already described the construction of the "Best Yet" loud-speaker is a simple matter—easily within the capabilities of the beginner—there are, however, one or two small points which it will be advantageous to note when building the instrument.

In order to make a reasonably air-tight joint between the metal frame of the chassis and the back of the baffle, a green baize washer should be interposed between the metal frame and the wood.

The cheapest way to do this is to purchase a quarter yard of the material, cut it into two pieces and place it on the baffle as shown in Fig. 1 afterwards removing a semi-circular piece from each portion equal to the diameter of the hole in the baffle.

The chassis complete with unit can then be screwed to the back of the board, taking care that the diaphragm is concentri-

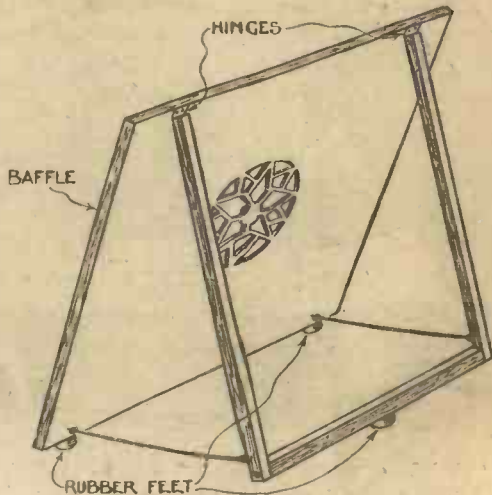


Fig. 3. Simple stand arrangement

cally placed with regard to the hole in the baffle.

Care should also be taken that the screws used for mounting the chassis do not protrude through the front of the board or its appearance may be spoilt.

When the completed loud-speaker is intended to be hung on a wall it will be found an advantage to fit the baffle board with stand-off legs of the type shown in Fig. 2. These legs should stand out from the back of the baffle about 8 in. and will be found to steady the loud-speaker as well as prevent possible damage to the wall by the metal chassis or back of unit.

A simple method of arranging a rear support for use when the loud-speaker is to

be stood on a table or sideboard is shown in Fig. 3. Small rubber feet should be fitted to the baffle and support in the positions indicated in order to prevent any tendency to rattling or risk of damage to the polished top of the piece of furniture upon which the loud-speaker is stood.

Fiji Islands' radio station at Suva is being modernised. Among other things a call bell has been installed by which any ship within 50 or 100 miles of Suva can, in an emergency, arouse the operators during the hours when they are not on duty.



# BROADCAST ARTISTES IN PICTURE



**VIVIAN WORTH.**—One of the most popular and earliest of broadcasters; prior to her entertainment career, she was a winner of scholarship at the R.C.M. and a member of a quartet at St. Paul's Cathedral.



**JACK HYLTON.**—As a leader of jazz orchestras, Mr. Hylton's name is world known. His Kit Cat bands are the most important purveyors of jazz. This month he has appeared personally at 2LO with his orchestra, originally composed of ex-Service men.



**MABEL TAIT.**—This well-known elocutionist and winner of numerous degrees is always assured of a welcome. Her speciality is character studies, but she has a wide classical repertoire.



**SYDNEY NORTHCOTE.**—Another popular wireless vocalist, Mr. Northcote was also an early broadcaster. He has given many recitals at 2LO and taken part in many special performances. He makes a cult of both classical and concert ballads.



**GWLADYS NAISH.**—Well named the "Welsh Nightingale," she has a surprising range of register coupled with exquisite beauty of tone. She excels in oratorio as well as in classical and ballad singing.



**GEORGE BAKER.**—A member of the famous opera company, the B.N.O.C., Mr. Baker has been in frequent demand for wireless concerts. A fine tone and perfect delivery make him an ideal broadcaster.



**GRACE IVELL.**—The partner of Vivian Worth, Miss Ivell has had equally wide experience, and for her war work won the Order of M.B.E. She was in Lena Ashwell's first concert party abroad.



**E. B. ROBINSON.**—The well-known 'cellist leader of the Wireless Symphony Orchestra and late of the London Symphony and Philharmonic Orchestras, heard at 2LO on February 18. He was a member of the earliest wireless trios at 2LO



**UNA TRUMAN.**—One of the best known of all the provincial pianists, Miss Truman is equally well known in London. She is a fine classical soloist and is also heard in duets with her sister, Miss Irene Brook.



# The Importance of Grid Current



IN my article last week, I discussed the effect upon the rectification of the resistance between the grid and filament of the detector valve. It was shown that this resistance is virtually in parallel with the grid-leak resistance and is, in general, so much smaller than the grid leak that the actual value of grid leak employed becomes of secondary importance. The principal function of the grid leak, indeed, is to apply the desired positive potential to the grid of the valve and it is only in so far as the steady state of affairs is altered that the grid leak has any influence upon the circuit.

## Grid-filament Resistance

Actually, the resistance of the valve between grid and filament is of a surprisingly low order in the average detector circuit. Some tests have been conducted at the Furzehill Laboratories on various types of valve and the average value of grid resistance has been determined. The first procedure in obtaining such information is the plotting of the grid-current characteristic. A sensitive microammeter is included in the grid circuit and varying small positive voltages are placed on the grid. In this way, the relation between grid voltage and grid current can be plotted in much the same fashion as an ordinary valve characteristic is obtained.

The currents are only small, being of the order of a few microamperes only, that is about 1,000 times as small as the current in the anode circuit of the valve, hence, particularly careful methods have to be adopted in taking the measurements.

There is naturally a certain difference between valves made by different manu-

*Last week Mr. Reyner wrote an article entitled "Can Grid Rectification be Distortionless?" and here in continuation of that subject he discusses another phase of the matter.*

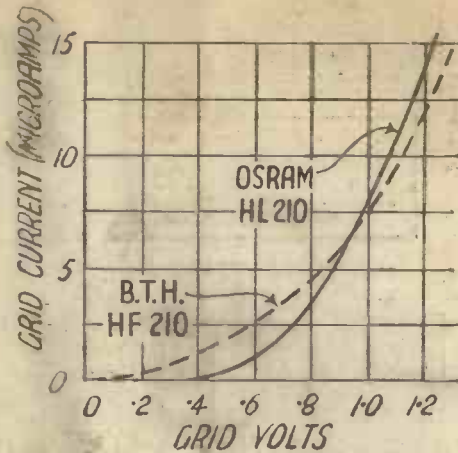


Fig. 1. Grid-current characteristics of B.T.H. 210 H.F. and Marconi-Osram H.L. 210 valves

facturers. For example, the curves shown in Fig. 1 illustrate the respective grid current characteristics of a B.T.H. 210 H.F. valve and a Marconi HL210. The plotting of a large number of characteristics in this way, however, shows that they all lie within certain limits and we can therefore determine a generic or average characteristic which represents approximately the condition of affairs likely to obtain in average practice.

This is the principle which has been adopted in making the measurements described herewith. Clearly, if accuracy is essential it is necessary to go through the process for the particular individual valve to be used, because the actual grid resistance may vary as much as 20 or 30 per cent. from the average value taken from the generic characteristic. In the majority of cases, however, accuracy is not required so much as a general indication of the state of affairs which may be expected.

A complete review of the situation taking account of every different type of valve would be impossible in a brief article such as this, but the evaluation of the results obtained from an average characteristic is within the bounds of practical possibility and should be of some practical utility. Fig. 2, therefore, gives the average charac-

teristic taken on a number of 2-volt H.F. valves, while Fig. 3 gives a similar characteristic for 2-volt R.C. valves. These are the characteristics employed in working out the figures that follow and they may be employed by readers if they wish to work out for themselves the grid resistance under any particular condition. The curves were taken with 60 volts H.T.

## Grid-leak Values

From these results, it is possible, by the somewhat elaborate process which I detailed last week, to determine first of all the actual grid current which will flow with a given leak connected to a given positive potential, and from that to deduce the grid resistance of the valve. Exactly as in the case of an anode resistance, this must be obtained by taking the slope of the grid current curve and not merely by dividing the grid voltage by the grid current. The results obtained by the two methods are entirely different and it is the slope which we require if we are dealing with fluctuating voltages.

In order to obtain some practical results, therefore, a value of 2 megohms has been assumed for the grid leak, and it has been assumed that the end of the leak is connected to 0.5, 1.0, 1.5, and 2.0 volts corresponding to quarter tapings on a potentiometer connected across the filament circuit. This has been done both for the 2-volt H.F. and for the 2-volt R.C. valves, both of which are employed as detectors in different classes of circuit.

The results are given in the table (p. 317) from which it will be seen that the resistance is of quite a low order when the leak is connected to L.T.+. As the tapping on

(Continued on page 317)

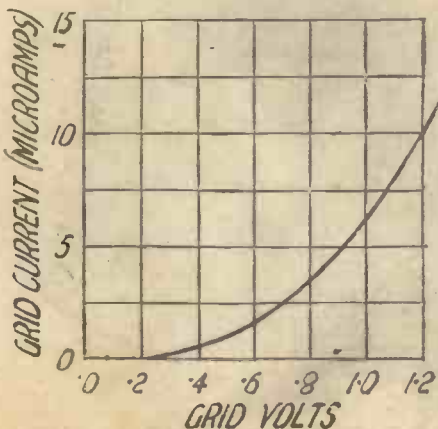


Fig. 2. Generic characteristic for 2-volt H.F. valves

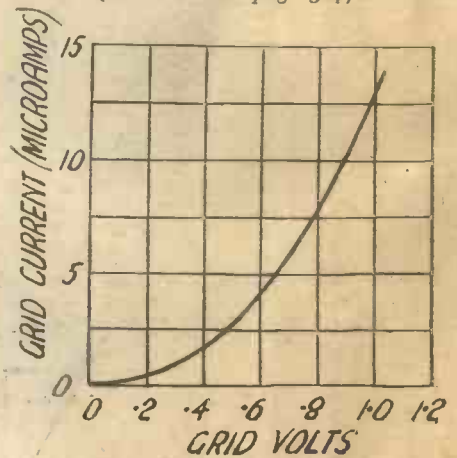


Fig. 3. Generic characteristic for 2-volt R.C. valves



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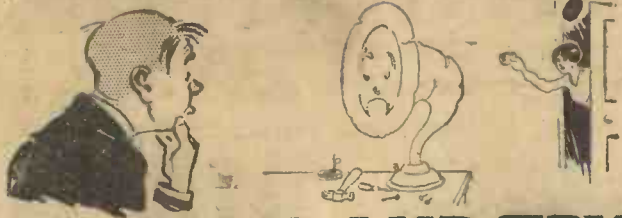
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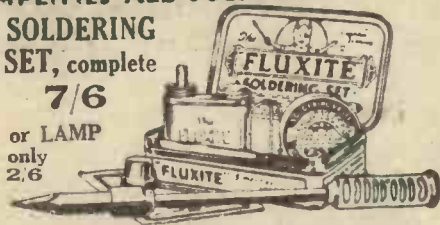
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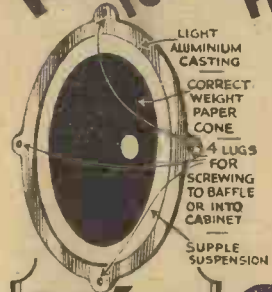
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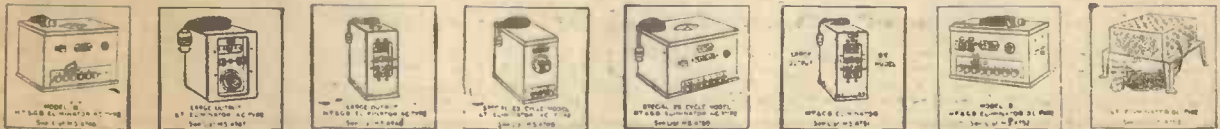
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# On Your Wavelength!

## A "Portable" Matter

NOW that the season of portables is coming to the fore again, some few words regarding frame aeri-als may not be amiss. We all know the furious controversy which rages round the question of whether the frame shall be in the set or whether it shall be separate. The purist claims that it is little short of a crime to put the frame round the set, owing to the very heavy damping effect introduced by the batteries and, indeed, by the set itself, particularly if there is any screening or large mass of metalwork. The other school, on the other hand, say that it is up to the designer to overcome these difficulties and that they prefer to have the frame round the set and not to have it as a separate unit; and that's all there is to it, anyway, and get on with it!

## A Question of Design

As a matter of fact, the effect of the frame depends very largely upon the set. If reaction is applied directly to the frame aerial, then a certain amount of loss in the frame is not of paramount importance because it can be overcome by the application of sufficient reaction. This can be carried too far, because if the resistance is really too high, the reaction becomes exceptionally critical, and it is impossible to obtain any decent performance unless reaction is forced to the limit. There is increasing tendency nowadays, however, not to apply reaction directly to the frame, but to apply it in other parts of the circuit, and in such circumstances the frame only obtains a reaction effect due to a general livening up of the whole receiver and a removal of other damping influences later in the circuit. Frame resistance, then, becomes of importance. It must be remembered that the energy received on a frame is very limited and that the actual current set up in the frame is inversely proportional to the resistance, and nothing else, when the frame is properly tuned. If, therefore, you can halve the resistance of the frame you double the voltage developed across it, other things being equal, and this is surely rather an important point in a portable set.

## A Case in Point

It is quite possible, therefore, that the introduction of large masses of metal into the framework itself will have a very serious effect on the operation of the receiver, and there is a great deal to be said for keeping the frame outside. How important the question of metal is is not often realised. A very interesting case came to my notice the other day, when I happened to be at the Furzehill Labora-

tories and found Mr. Reyner puzzling over a small frame aerial. This frame was actually in a "Sunshine Five" receiver belonging to a friend of his. The symptoms of the receiver were that it simply would not receive 5GB, although it received London quite satisfactorily. In fact, just above London there appeared to be a cut-off. A wavemeter test on the reception indicated that, sure enough, there was a cut-off and a very definite one, the signal strength being reduced enormously at a wavelength a little above London and remaining down until right at the top of the short-wave band. As no effect of this nature had been experienced on the original set, the matter was causing some puzzlement.

## The Cause of a Difficulty

The old original frame as used in the experimental "Sunshine Five" was then hauled out of oblivion and connected to this set, which then proceeded to operate perfectly satisfactorily. Therefore the trouble lay in the frame. A first examination of this revealed nothing amiss, and very careful tests were made of resistance and so on to try to find the trouble. It was not until after some time had been spent in futile searching that four iron screws were discovered holding the framework together. These were good long screws about  $\frac{1}{4}$  in. thick, and were promptly yauked out and replaced with brass ones. A test on the frame immediately showed that the hump had been completely removed and the set now worked with its own frame in a thoroughly joyous manner.

As for me, my ears somewhat flapped. I had never before come across such an effect, and it was certainly an eye-opener to notice the great difference in the results from the changing of four comparatively harmless-looking screws.

## Settling Down

After making all allowances for initial difficulties, I must confess that I was not particularly enthusiastic about the prospects of the present Brussels Wavelength Plan when it had been in operation for a few days. I felt, however, that the cloud which it seemed to fling over long-distance reception must have some kind of a silver lining. I am glad to be able to report that there are now signs of a very distinct all-round improvement. At one time it was no exaggeration to say that every single transmission on both the medium and upper wavebands was heterodyned, not even excluding one's local station. Matters are very much better now, and a trip round the medium band on any even-

ing will bring in a respectable number of stations whose programmes are coming through very well indeed.

## The French Stations

The position has been cleared up considerably by the falling into line of many of the French stations. For some reason a big number of them did not adopt the new wavelengths at the outset, but either stuck to their old ones or wandered about, creating havoc all over the place. Another difficulty was that not a few stations seemed to be unprovided with standard wavemeters—or, if they had them, did not know how to use them. During the first week I collected over a score of instances of wavelength wandering on the part of stations that were nominally using allotted new wavelengths. There has been a big improvement in this respect of late, and results have been very marked.

## Some Thoughts

Meantime, it still seems to me that we are trying on the medium broadcast band the rather unsatisfactory experiment of cramming a quart into a pint pot. Several countries have at the present time far more stations than they should need and, adopting apparently a rather dog-in-the-mangerish attitude, they refuse to give up a single one. Take Sweden. It is a large country, I know, but its entire population does not exceed that of London. And how many stations at a guess do you think that Sweden possesses? A dozen? Try again. A score? You are still under the mark. The total is no less than thirty-one. Of these, Motala is a super-power station rated at 20 kilowatts, whilst Gothenburg and Hoerby are both 10 kilowatts, Falun is 2 kilowatts, Boden 2 kilowatts, and Stockholm 1.5 kilowatts. The number of exclusive wavelengths occupied by Sweden is unreasonably large, in view of her requirements. France possesses no less than twenty-four stations, including six in Paris alone.

## Unnecessary Stations

I cannot conceive that one city can possibly require the Eiffel Tower, Radio-Paris, the Ecole Supérieure, Radio LL, Radio Vitus, and the Petit Parisien. Germany has twenty-eight stations, including five which relay the Berlin programmes, and we ourselves have twenty stations, not a few of which could possibly be dispensed with at this time of day if we really made a gesture of self-sacrifice with a view to clearing up the position on the broadcast band. All of our relays, for example, were started before 5XX went up to 25 kilowatts and before 5GB went on to the air at all. Readers' views on the



## On Your Wavelength! (continued)

point would be interesting, but with the much bigger power available from 5XX and 5GB nowadays I believe that there are several relays that could be dispensed with without loss. A reduction could almost certainly be made if all of our main stations went up to, say, 2 kilowatts. It is probably that wretched crystal complex to which I referred before that is keeping up the number of stations in various countries.

### A Contrast

Some countries seem to be able to manage to give a very satisfactory broadcasting service with a far smaller number of stations. Italy, for example, gets along very well with only six stations—though they are six jolly good ones, as most long-distance men will agree. Spain rubs along with seven stations, Austria with five, Denmark with two, Holland with the same number, and Switzerland, despite her mountainous nature, with five. It may, of course, be argued that heaps of the stations in countries possessing large numbers are only tiny fellows using a fraction of a kilowatt. But it must not be forgotten that the smallest station is quite capable of producing a long range heterodyne on an overcrowded broadcast band. If you don't believe me on this point, just use your set and see what some of the little Swedish quarter-kilowatts can do at a 500-mile range.

### Agreement Wanted

What I would like to see is an international agreement limiting the power used to 4 kilowatts, except for one super-station per country, and suppressing all stations with an output of less than 1.5 kilowatts. In this way I believe that we could secure a wonderful single-valve service for the whole of Europe, with no overcrowding and no heterodyning. Personally, I really cannot see any other way of producing a really satisfactory state of affairs in the ether. I have an inkling that the League of Nations will ultimately become, at any rate, the European wireless authority, and that it is only in something of the kind that we can find a really satisfactory future for international broadcasting.

### Invention versus Discovery

Dr. W. H. Eccles, F.R.S., lecturing recently on "Empire Wireless," drew an interesting distinction between the relative values of inventions protected by patents and those discoveries which by their nature are unpatentable. After referring to the work of Hertz in first producing wireless waves, and to the early papers by Crookes and Lodge, none of which were protected by patents, he dealt with the Marconi "aerial" and the almost simultaneous discovery by Lodge of the principle of electric

tuning. Both these were covered by master patents, as, of course, were subsequent inventions relating to the thermionic valve and its circuits.

### Unpatentable Discoveries

On the other hand, the discovery by Marconi in 1901 that wireless waves would travel around the curvature of the earth's surface, instead of moving in a perfectly straight path, in the same way as a ray of light, could not be patented. It depended, in fact, upon the existence of the Heaviside layer, though this was not known at the time. Another unpatentable "discovery" of very great commercial value was one really due to the amateur wireless experimenter, namely, the extraordinary superiority of the shorter wavelengths (100 metres and under) over those (several kilometres long) then used for long-distance working. This discovery revolutionised all existing standards of station design, and probably saved many millions of pounds by introducing the relatively cheap "beam" stations instead of multiplying expensive stations of the Rugby type.

Dr. Eccles mentioned that the famous de Forest, three-electrode patent was allowed to lapse through omitting to pay a renewal fee of £5. Had it been kept alive it would probably have made the

their research and experiments, but to broadcast instructions to the wide world on this subject is, to say the least, a little bit quaint.

### The Photophone

I was present the other day at the "trade show" of the Photophone, the newest American talking film system, a product of the Radio Corporation of America. The sound-on-edge-of-film method is used with this system, but the shape of the movie picture is the same as with silent films. Hitherto, a portion of the normal screen has been "blacked out" during the projection of talking films which have the sound photographed by the side of the movie. The tone of the new device is excellent, bass notes being reproduced in the right proportion to "middle" and "top." The peculiar screechiness of the very high notes, noticeable in the British Phonofilm and the Movietone, is still present in the reproduction of the Photophone, but it seemed to me that the quality was distinctly better than that of the gramophone record systems, such as Vitaphone, Photophone, etc. The R.C.A. Photophone has a very fine amplification equipment and uses eight moving-coil loud-speakers; these are distributed around the screen, instead of sending the sound actually through the screen.

### Using the Screen

Meanwhile, the latest development in talking films is the actual use of the screen itself as the loud-speaker diaphragm. It has not yet been disclosed exactly how the screen is vibrated, but readers who are familiar with our linen-diaphragm loud-speaker will, no doubt, have shrewd suspicions. Whether or not this latest invention will have any bearing on the future of sound films remains to be seen. At the moment it would appear that quality and perfection are secondary considerations; the manufacturers who succeed in "tying up" the most film-producing companies will win through.

### Getting Up by Radio

I think that it is about time the B.B.C. gave us a few early morning transmissions. I'm sure the bed would not "pull" so hard if it was possible to switch on a loud-speaker (by remote control) and hear a couple of zippy gramophone records at 7.30 each morning. A few physical jerks and something funny would help us to take an early interest in life on the snappiest of cold mornings. Thus would the B.B.C. be encouraging early rising, with beneficial results on the nation's liver! Arrange an electric relay operated by an alarm clock for switching on your set and the B.B.C. would wake you up.

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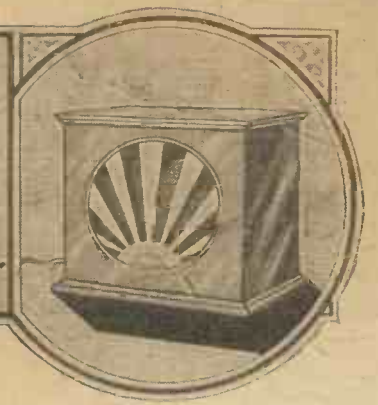
inventor one of the richest men in the world to-day.

### Dangerous Talks

I have been interested in the series of talks about animal life, but was astounded to hear the lecturer instruct listeners in the art of dissecting insects. This dissecting idea seems to me to be hardly the sort of thing to encourage among the general listening public. The B.B.C. may (or may not) dissect little dogs in the course of



# THE LAST STAGE AND LOUD-SPEAKER PURITY



"THE last stage is worse than the first" is a truism which many listeners like to dodge! No matter if the first stage is an H.F. valve, or simply the detector, its troubles can generally be settled by the alteration in value of some component; not an expensive matter.

It is the last stage on which everything depends, and, frankly, it isn't always an inexpensive matter to supply the needs of the final valve. The best of purity given by anode-bend detectors and resistance-couplers can be spoilt if the last valve is incapable of dealing with the final volume.

For reasons of economy many people err on the mean side in buying power valves and large H.T. batteries, though to anyone who takes a pride in getting good results this is a false economy. It is like using second-hand needles in a good gramophone! It isn't too late in the year to make New Year resolutions, and one of them should be to scrap midget H.T.'s and that "power" valve of doubtful make and performance. Also (if the cap fits, wear it), buy a bigger grid-bias battery to give adequate biasing voltage to the last valve.

### Super-power Valves

Nearly every valve manufacturer makes a "super" power valve, and suitable two-volters are the Cosmos SP18 RR, Cossor 230XP, Ediswan PV225, Marconi-Osram DEP240, Mazda P227, Mullard PM252 and Six-Sixty 230SP. If you glance at any table showing characteristics you will see that all the large-capacity power valves have a very low impedance. The Cossor 230XP, for

instance, has an impedance of only 2,000 ohms.

Take any well-known power valve you like, the Marconi-Osram DEP240, for example, and look at the "Instructions for Use" pamphlet given with it. It is recommended that to prevent overloading 150 volts H.T. and 24 volts grid bias should

think about for those who, in 1929, still use a cheap Continental alleged 60-volt H.T. battery! The anode current of 12 milliamps would drain it dry in next to no time, but the fact must be faced that in buying radio parts, price is largely an indication of quality; cheap batteries and valves cannot give first-class results.

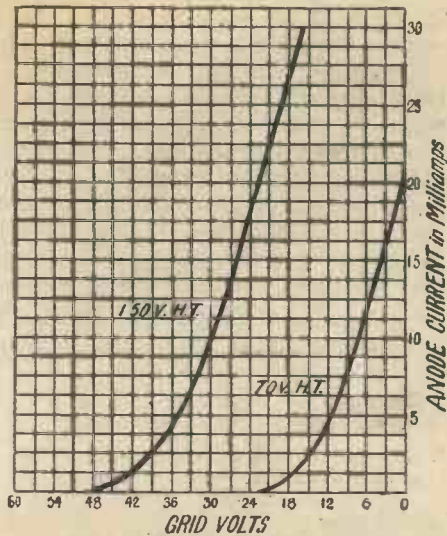
### Grid Bias

The comparatively high grid-bias value recommended is necessary in order to prevent waste of H.T. Within limits, the anode current increases as the grid-bias value is lowered, and as the full 150 volts should be used to get proper reproduction, the G.B. of 24 volts must be used to keep the anode current down to 17 milliamps.

The figures are not so "terrifying" as they may seem to those who are not keen on scrapping old equipment. The H.T. voltage and current are of no moment when a mains eliminator is used, and are, of course, well within the capabilities of any good large-capacity H.T. battery. A good-quality G.B. battery will last until long after the date of buying it is forgotten.

As a matter of interest, it may be noted that the four-volt power valve with the maximum recommended 150 volts H.T. will possibly need only 16½ volts grid bias to pass a current of 17 milliamps. The six-volt equivalent may safely be used with H.T. up to 250 volts, and at that figure a current of 24 milliamps flows when 24 volts G.B. is applied. At 150 volts, and with 12 volts G.B., the anode current is

*(Continued at foot of next page)*



Characteristic curve of typical 2-volt power valve be employed. The anode current is then 17 milliamps. There are three other alternatives of H.T. voltage mentioned, but as these are 130, 110, and 90 volts respectively the results will be nothing like those obtained when 150 volts are "on tap."

Figures such as 150 volts, 24 volts G.B. and 17 milliamps are rather unpleasant to



### THE FIRST OF THE REGIONAL STATIONS

The new 2LO broadcasting station building, at Brookman's Park, Potters Bar, is now more than half completed. Its large size can be judged from this photograph.



## For the Newcomer to Wireless: Accumulators

CAN you give me a few hints on filament batteries? First of all I would like to know if there is any simple rule for finding the most suitable capacity for a given valve set.

Let's see if we can find one. The first thing to remember is that if you want an accumulator to last you must not overdo the discharge rate.

That seems fairly plain; you get the best out of most things, don't you, if you do not overwork them?

Yes; but you must remember that the accumulator mustn't be *under-worked* either.

How do you mean?

What is really good for its health is a series of regular discharges and recharges at a reasonable rate. In other words, if you want to keep it fit give it plenty of work.

Then you mean that the accumulator must not be too big for the work in which it is called upon to do?

Exactly. If you were to run a single-valve set drawing one-tenth of an ampere from a 100-ampere hour ac-

cumulator you would not in most cases be giving the battery enough to do to keep it in a healthy condition.

And what do you suggest?

A good sound rule, I think, is to regard about two hundred working hours as the maximum we should expect from the filament accumulator at one charge. If you make this your limit and use your set on the average about three hours a day this will mean that your filament battery will last between two and three months at one charge. It will thus have to visit the charging station from four to six times a year, which is about right.

How can one find the capacity that fits in with this rule?

Take the makers' rating of each of your valves, add the figures together to find the total for the set and multiply by 200. Thus if you use three "point one" valves the total is .3 ampere and this multiplied by 200 gives 60. A 60-ampere hour accumulator will thus be ideal with this kind of set.

What is the smallest accumulator that

could be used with such a set; economically, I mean?

One of about one-third the capacity, that is to say a 20-ampere hour.

Does the accumulator require any attention between the time when it visits the charging station?

Certainly it does if you want it to last.

In what way?

First of all you should look at it occasionally to see that the level of the electrolyte is correct. If it is too low top up at once with distilled water.

Anything else?

Yes; if you want to keep a real check on your filament battery purchase a hydrometer, which you can do quite cheaply.

How should this be used?

When the battery comes back from the charging station take the specific gravity to see that it is correct—you cannot *always* rely on charging stations. Take it again at intervals and send the battery to be recharged as soon as the gravity falls to the minimum figure stated by the makers.

## "THE LAST STAGE—AND LOUD-SPEAKER PURITY" (Continued from preceding page)

14.5 milliamps. It is the anode-current consumption which is important, and not the anode voltage.

You may be wondering where is the connection between the "capacity" of a last-stage valve and the purity given by the whole set. Obviously, as the signals pass from stage to stage in a set they get louder and louder, and the signal-voltage swings applied to each successive valve grid are greater than those applied to the preceding valve. The last-stage valve has the largest varying voltages applied to its grid, and if the valve is not capable of dealing with these, and amplifying them, without overloading, then it will distort.

To make this quite clear you must glance at the typical power-valve curve on the preceding page. This is simple to understand. The vertical units show the current anode passed by the valve corresponding to any grid voltage, the degree of which is shown by the horizontal units.

You will see that if the grid voltage is set at 24 volts (which is recommended) the current passed when the H.T. is 150 volts is 17 milliamps and the operating point comes on about the centre of the straight part of the characteristic. Provided that the operating point remains on the straight portion, the change in anode current will be strictly proportional as will be obvious to anyone who has studied elementary "maths." If you like, you can prove this proportionality by measuring two grid-voltage anode-current changes from this

graph and finding that the ratio is constant.

But directly the operating point shifts to the curved portion the change is not constant, and this results in one half of the wave producing a different anode-current change from the other half. This means distortion, of course.

### Overloading

The operating point can be moved permanently on to the curved portion by putting up the grid-bias to, say, 36 volts. Alternatively, a very strong signal might shift the operating point temporarily on to the curved portion, and this, in practice, would be overloading the valve.

Comparison between ordinary L.F. valves

and power-valves shows that while the "slope" of the latter may be less, the length of the straight portion is greater, and this gives a wider range over which the operating point may shift without running on to the curved portion. Comparison between the 70-volt curve and the 150-volt curve shows how much greater is the straight portion in the 150-volt case than in the 70-volt curve.

A power valve able to deal adequately with loud signals will *always* improve results from the point of view of purity, because often with a small last-stage valve there will be slight overloading which manifests itself as distortion and not as actual "blasting."

The "push-pull" system is used for the last stage when battery economy is important, because it enables two small power valves to be used in place of one large valve. The H.T. current is lessened because double the normal grid bias is used. The push-pull arrangement is not to be recommended generally because it necessitates special transformers, and usually these cannot be easily introduced into a set designed for a single final stage.



Billy Thorburn—an impression

The decoration of Chevalier of the Order of the Crown of Italy has been conferred upon a Chicago announcer, by the Italian Government, because of his part in having a speech by Mussolini recorded, sent to America and there broadcast.

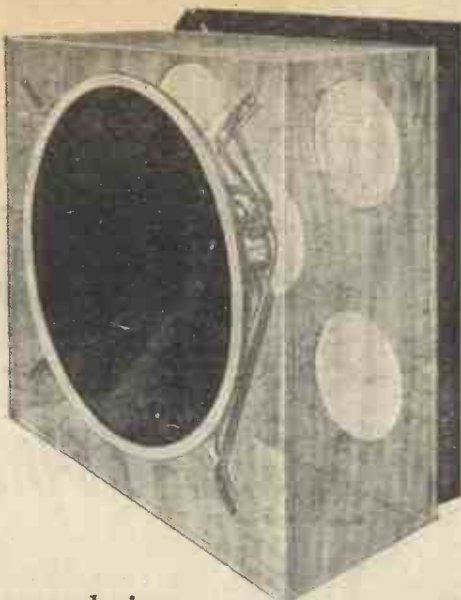


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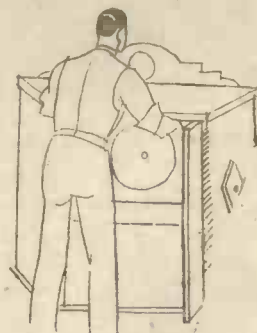
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# WITHOUT FEAR OR FAVOUR



A Weekly Programme Criticism by Sydney A. Moseley

SIR GEORGE HENSCHERL must be a proud man. His sparkling comic opera, *A Sea Change*, had a deserved encore, and I make no doubt we shall hear it again. A tip-top caste, too, with honours to Lesley Dudley, who sang and spoke her part to perfection.

Mr. Bruce Wolfe, on "The Future of the Cinema," was hopeful and helpful. Yet the same problem as regards the "picture" industry is seen in all forms of entertainment.

"Production will improve as the taste of the multitude improves."

The old story. Which came first, the egg or the hen?

Bravo, Hastings Municipal Orchestra—a well-varied programme played like masters.

Granny says: "The horticultural news bulletin was most interesting, particularly the facts concerning potatoes." Well, it's an ill transmission that doesn't wave somebody a bit o' interest.

*The Locked Chest* was quite an ideal little play for broadcasting, and I am glad to see the experiment of putting over inferior stuff by enthusiastic amateurs is on the wane.

An event of artistic importance was the recital by Isolde Menges and John Thorne (in place of Dale Smith). There is no doubt, so far as violinists and pianists are concerned, the B.B.C. give us the very best; for which let us give thanks.

Voices that blended well:—  
Wynne Ajello and Leonard Gowings.

There was a decided freshness and originality in the manner of presenting the discussion between Mr. Arthur Ponsonby, M.P., and Miss Elizabeth Ponsonby. Quite a hit, both in what they said and how they said it.

Jessie Matthews and Sonnie Hale are "stars"—but certainly not wireless stars. Clarice Mayne, however, was better. She is assuredly an artist.

Quite an acceptable pair are Davis and Elsie Waters. A Somerset ditty, a not too American song, and a rollicking tune of old were all well sung.

I stopped smoking immediately Elizabeth Schumann was announced to sing! You never know these wonderful wireless waves, and I was taking no risks.

Tom Jones is a worthy successor to Sandler, of Eastbourne. The concerts are always popular, being chosen from a bright and broad repertoire. I wonder, however, whether we would not tire of some of these items if we heard them nightly?

"Lieutenant-Colonel" (retired) writes to me again from Panton Street, Haymarket, this time "as President of the S.P.P."—which I take it is the Society for Protection of Pianofortes. He protests against the pianist (foreign) and the composer, Shonberg (foreign also), in a performance of "sustained discords. No piano can or should be called upon to produce sounds

which give it such exquisite pain. Continued success to 'Without Fear or Favour.'"

Two letters in the correspondence column interest me. They come as a response to my invitation for 'listeners' opinions on the "taste" of certain transmissions.

One from H. B. H. (London, S.E.), writing: "Had parts of *Hassan* been sprung on me in a mixed audience my discomfort would have been intense."

A. B. (Norwich), however, heard *Casavan* and *Carnival* in company with his wife, and "heard nothing offensive."

I submit, however, this is not a fair test. Would A. B. have liked children to have been present during, say, the rendering of Cecil Lewis's saintly effort?

## BEAM versus CABLE

ONE advantage of the wireless beam over the cable is that it permits of extremely rapid signalling. When sending morse messages by wireless, the maximum keying speed is only limited by the requirement that each "dot" must be of sufficient duration to cover at least a certain minimum number of carrier cycles. Naturally, when using long wavelengths, of the order of 20,000 metres, the minimum time-interval occupied by each "dot" will prevent very rapid signalling.

However, in the case of short wavelengths of the order of 30 metres or less, as used in the beam system, this limitation practically disappears, so that the speed of signalling can be increased almost indefinitely.

On the other hand when morse impulses are fed, say, into a transatlantic cable, the capacity of the latter causes rapid attenuation and distortion, and this in turn places a very definite limit on the keying speed. Conditions can be greatly improved by loading or Pupinising the cable. For instance, a long string loaded at equal distances with beads will transmit a wave impulse imparted at one end much more efficiently than an unloaded string. Modern methods of Pupinising not only allow of an increased keying speed for telegraphic messages, but also open out the possibility of transatlantic speech via the cable.

B. A. R.



The Trix Sisters in caricature



If you don't "care tuppence" about the foreign stations, you are something of an exception amongst wireless listeners nowadays. Despite the fact that a large proportion of licence money goes to the B.B.C. coffers, there is only an inconsiderable proportion of the two-and-a-half million odd licensed listeners who do not, during the course of an evening, listen to one or other of the Continental transmitters.

This is, perhaps, why "threes" are so popular, because the three-valve combination is really the minimum with which foreign station reception can be comfortably enjoyed. Two-valvers do not give sufficient strength on the loud-speaker from distant stations, and the extra third

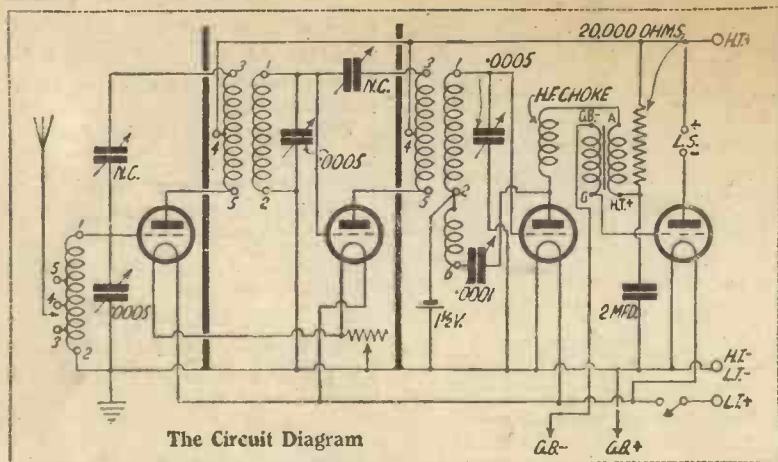
stages (with three-electrode valves) and only one L.F. stage should best be used.

This has been solved in the present instance by using two ordinary H.F. valves in a most efficient neutralised, transformer-coupled arrangement, and making the low-frequency valve satisfactory for all general work by using a good L.F. transformer and a stabilising anti-motor-boating unit.

Just glance at the circuit diagram, given below, to see the general arrangement.

Each H.F. stage is adequately screened from the other and from the detector and L.F. portion, and in each screen stage is incorporated the coil and its associate valve.

The aerial coil is a plain, tapped



valve, either before or after the detector, makes all the difference.

For many localities, however, even a "three" cannot provide a "comprehensive" tour of the Continent.

To make a round of the more easily receivable foreigners there are many people who require a four-valver.

The problem when making up such a four, is whether one screen-grid stage and two L.F. valves or two very efficient H.F.

winding and a variable connection can be made at either the extreme grid end of the coil or at three intermediate tappings to suit the type of aerial used.

A feature of the H.F. stages is that they are coupled by means of transformers having interchangeable primaries, and the advantage of this is that while the secondaries remain constant and are tuned by a .0005-microfarad condenser, the primary windings can be completely changed to suit different operating conditions. As mentioned, both H.F. stages are neutralised.

Leaky-grid detection may seem to be a *sine qua non* in connection with a long-distance set, but in this instance anode-



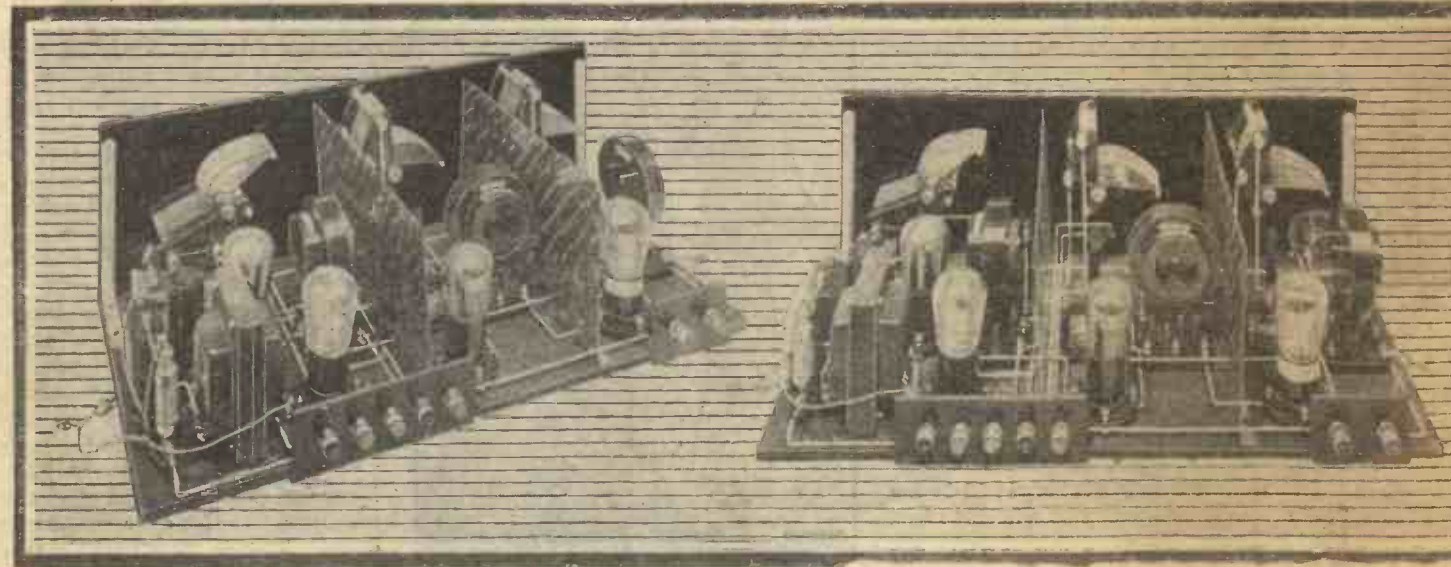
BY THE "A.W." STAFF

bend detection is employed. The reason for this is twofold, as given below.

First, leaky-grid rectification does not work very well when preceded by powerful H.F. amplification, owing to the fact that the grid becomes choked when the impulses are very powerful. Anode-bend rectification is not susceptible to this overloading to such a marked degree.

Second, there is usually quite enough distortion associated with the reception of distant stations (owing to mush) heterodyning and DX fading) and it is advisable to use anode-bend rectification to prevent undue distortion.

The L.F. side is a more or less straightforward transformer-coupled arrangement and the only feature of note is that, as mentioned, a resistance and condenser L.F. stabiliser is included in the anode circuit



These photographs show clearly the layout and wiring of the All-



# UROPE



in the third stage are the detector and L.F. valves, the associated components being the second H.F. transformer and tuning condenser (with which is coupled also a reaction winding and .0001-microfarad reaction condenser, H.F. choke, L.F. transformer and a stabilising resistance and condenser.

For an efficient "four," such as this, the panel is really bare and carries only the three tuning condensers with the knobs in line, and at the extremities a reaction condenser and a rheostat in series with the filaments of both H.F. valves. In the centre is a simple on-off switch cutting off the L.T. to the whole of the set.

As both panel and baseboard are of generous

dimensions there is nothing to be saved by fitting and wiring up some parts in advance of others. Use the blueprint as a drilling diagram for the panel, attaching it by a spot

at each corner to make sure that it does not slip, while the drilling centres are marked lightly with a punch.

All the panel components are of the one-hole fixing type; do not forget the small holes for the panel brackets and for attaching the panel at the bottom edge of the baseboard. Mount all the panel components and attach the panel.

The next stage is to lay out the baseboard and this can also be done with the

blueprint as a guide to the exact positions. It is essential to conform to the dimensions shown, since for reasons of economy in panel space, there is not a great deal of room to spare, as far as the width of each compartment is concerned.

The two screens should first of all be erected for these will serve as a rough guide for the positions of the other parts, which can then be placed where required.

Wiring up is accomplished with rigid wire, such as Glazite, and this is placed where required, direct through the holes in the screens, no further insulation being necessary. Short lengths of rubber-covered flex, with tags soldered at the extremities, are

## LIST OF COMPONENTS

Ebonite or bakelite panel, 21 in. by 7 in. (Becol, Raymond, Paxolin, Ebonart, Radion).

Two ebonite strips, 3 in. by 2 in. and 6 in. by 2 in. (Becol, Raymond, Paxolin, Ebonart, Radion).

Three .0005-mfd. variable condensers (Burton, G.E.C., Polar, Ormond, J.B., Lissen, Burndep, Cyldon).

.0001-mfd. reaction condenser (Bulgin, Cyldon, Ormond, Burton).

7-ohm panel-mounting rheostat (Lissen, G.E.C., Igranic).

Push-pull filament switch (Lissen, Trix, Wearite, Benjamin).

Panel brackets (Bulgin).

Four anti-microphonic valve holders (Lotus, Wearite, W.B., Benjamin).

Three six-pin coil bases (Lewcos, Lissen, Turner, Wearite).

Two baseboard neutralising condensers (Peto-Scott, J.B., Gambrell, Igranic).

High-frequency choke (Lissen, R. I. and Varley, Lewcos, Igranic, Polar, Wearite).

Low-frequency transformer (R.I. and Varley, Ferranti, Mullard, Philips, Lissen, Igranic, G.E.C.).

2 mfd. fixed condenser (Lissen, T.C.C., Dubilier).

20,000-ohm resistance with holder (Lissen, Mullard, R.I. and Varley, Ferranti, Dubilier).

1½-volt grid-cell (Siemens).

Two screens, 10 in. by 6 in. (Parax).

Baseboard, 21 in. by 10 in. (Pickett).

Seven terminals marked Aerial, Earth, L.T.+, L.T.—, H.T.+, L.S.+, L.S.— (Belling-Lee, Eelex, Igranic).

Connecting wire (Glazite), 3 ft. thin single flex (Lewcoflex).

One red and one black wander plug (Clix).

used for the aerial-coil tapping, grid-battery leads, and so on.

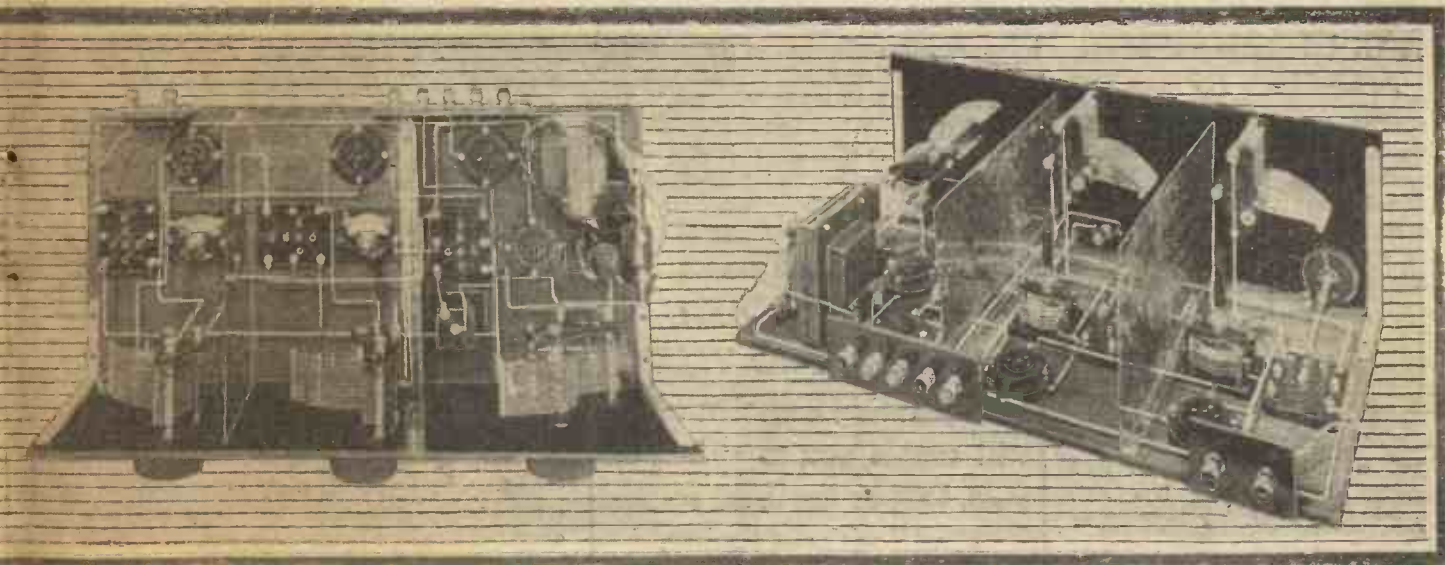
To experienced constructors the job of wiring up this set will present no difficulties and most will prefer to do so with the aid of the theoretical circuit diagram, on which the coil base reference numbers and other wiring details are clearly shown. Nevertheless the blueprint is very handy, when wiring up, for all the wires are shown on it in their exact positions, and can be marked

of the detector to prevent howling, motor-boating and, to a certain extent, threshold howl.

### Constructional Features

If you examine the photographs and the reproduction of the blueprint (the original full-size blueprint, incidentally, can be obtained, price 1s. 6d., post free, from Blueprint Department, AMATEUR WIRELESS, 58-61 Fetter Lane, E.C.4), you will see that the layout of the set is very much in accordance with the circuit diagram.

The essential components contained in each stage are, starting from the aerial end: the aerial coil and condenser, first H.F. valve and its neutralising condenser; in the second stage the first H.F. transformer and tuning condenser, the second H.F. valve and its neutralising condenser;



Europe Four and will be of material assistance in its construction



**"THE ALL-EUROPE FOUR"** (Continued from preceding page)

off with a pencil as their counterparts are actually wired up in the set. This prevents the possibility of any wires being forgotten.

**Screening**

The two Parax copper screens employed have a number of holes drilled along the lower edge through which the connecting rods can be passed. Care must be taken if wire other than Glazite is employed to see that the insulation is not cut on the sharp edges of the holes. In several cases this would result in shorting the H.T. or L.T. batteries.

As a matter of fact, in order to keep the wiring straight and direct, extra holes have been drilled in the two screens, but this is not strictly necessary. In the right-hand screen, looking at the set from the back, extra holes have been drilled for one filament lead and the lead from the anode of the first valve-holder. In the left-hand screen there is one extra hole drilled for the L.T. positive busbar.

Note particularly the two short earthing leads from the moving plates of the aerial and first H.F. tuning condenser to the copper screens. For neatness these short leads are taken to soldering tags which are bolted to the screens.

**Wiring**

Care must be taken with the wiring up of the small terminal strip at the back carrying five terminals for L.T. positive and negative, H.T. positive and L.S. positive and negative. A certain amount of difficulty may be experienced here owing to the fact that there is not much room in which to handle the soldering iron, or the round-nosed pliers which should be used for the right-angled corners of the stiff wire. As is very common practice the L.T. negative terminal is also used for the negative connection from the H.T. battery.

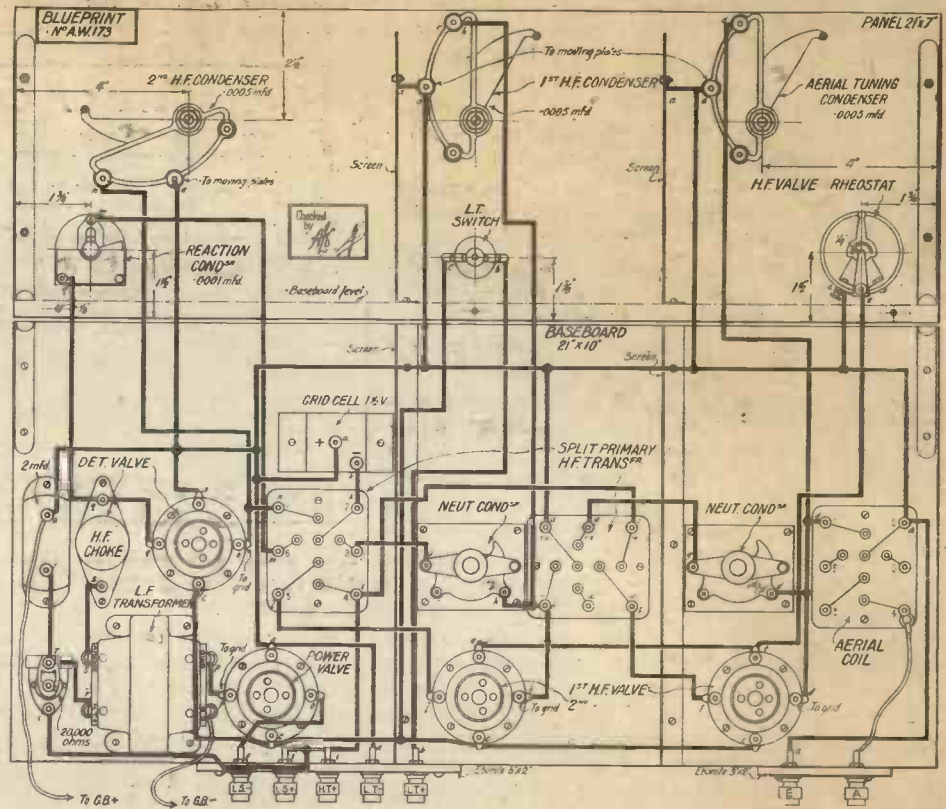
At the back of the second H.F. coil and

nearer to the panel is a baseboard-mounted 1½-volt grid-bias battery. This is connected with the negative terminal to the terminal marked 2 on the coil base, and with the positive terminal to the wire joining the negative terminals of the valve holders.

This bias voltage is sufficient to bring the operating point of the detector valve on to that part of the characteristic suitable for anode-bend rectification. The battery life will be about the same as that of the grid-bias battery used on the L.F. side of the receiver.

Incidentally it should be noted that flex leads to the bias battery for the L.F. valve are taken, one from the G.B. terminal on the transformer, and the other from the L.T. negative side of the anti-motor-boating 2-microfarad condenser. The bias battery is best attached to the left-hand side of the cabinet in the usual clips.

In the next issue will be given operating notes and further details. Don't forget, in the meantime, that the original of this receiver can be seen in the Somerset Street windows of Messrs. Selfridge and Co., Ltd.



The wiring diagram of the "All-Europe Four." Blueprint available, price 1/6

**RAW A.C. CURRENT FOR FILAMENTS**

RAW alternating current fed to a filament will, of course, liberate electrons just as effectively as D.C. current. Unfortunately the electron stream is not steady but fluctuates in sympathy with the rise and fall of the mains current, and therefore produces a hum. To avoid this one can use the indirectly-heated type of valve, or the newer point 8 type, where the mains voltage is stepped down so low that the supply fluctuations do not appreciably affect the electron stream.

It has also been proposed to connect two ordinary valves in cascade, and to feed both filaments directly from the A.C. mains. By making a suitable tapping to a potentiometer shunted across the first filament, the fluctuations arising in the first

valve are fed to the grid of the second in such phase as to counterbalance the fluctuations arising naturally in that valve from the A.C. supply. When a proper balance has been secured the effective output from the second valve reaches the loud-speaker free from any appreciable disturbance due to the alternating-current supply. B. A. R.

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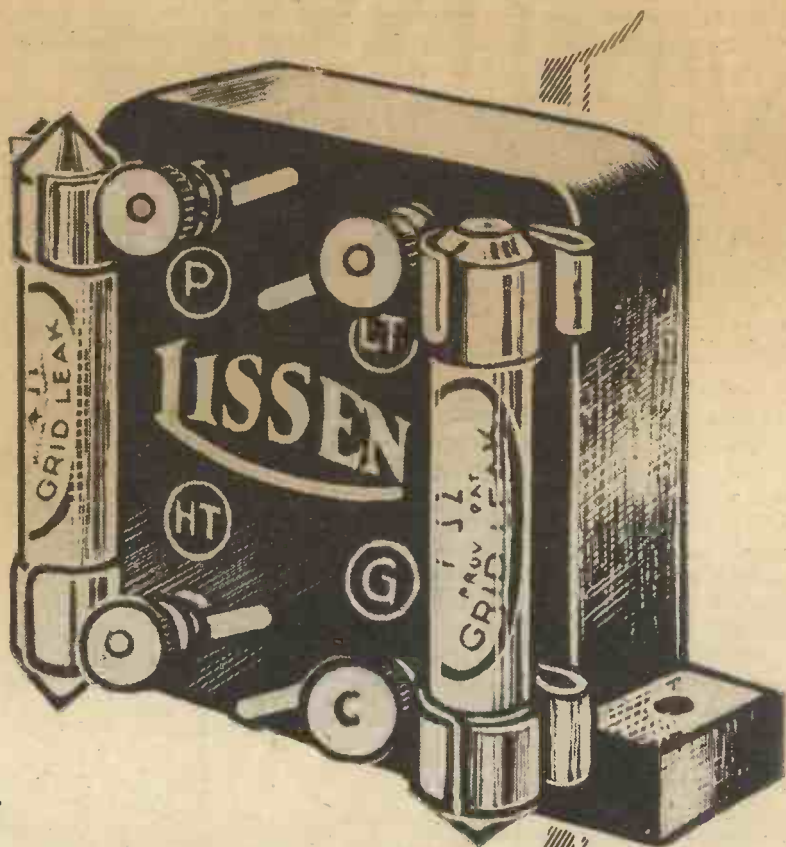
**PERMALLOY**

PERMALLOY is the name given to a series of alloys of iron and nickel having more than a thirty per cent. nickel content. It is characterised by an extremely high magnetic permeability, even for low magnetizing fields. Whilst ordinary pure iron or nickel has an initial permeability coefficient of between 200 and 300, that of an 80 per cent. nickel permalloy is as high as 12,000. It also has a comparatively high resistance, which serves to prevent the formation of excessive eddy currents.

The discovery of permalloy has revolutionised former standards of long-distance distortionless signalling over line-wires and cables. For instance, a submarine cable loaded or Pupinised with permalloy can be operated at eight times the speed possible on a non-loaded cable. B. A. R.



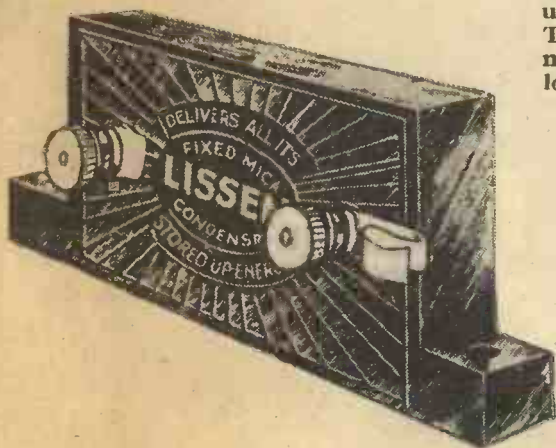
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# MY WIRELESS

Weekly Tips,  
Constructional  
and  
Theoretical—



# DEN *By* W. JAMES

For the  
Wireless  
Amateur

THE craze for high efficiency, regardless of increased tuning difficulties, is gradually dying. No longer is a receiver considered highly efficient merely because there are a number of knobs on the panel. In fact, present-day standards are such that a receiver is considered a good one when it will put up a certain standard of performance upon the user adjusting two or three knobs.

Simplicity is a great feature of modern receivers of good design, and this in turn implies the need for a considerable factor of safety. Modern valves are so good, however, that even amplification over the whole range of audible frequencies is easily accomplished, whilst adequate selectivity is assured by the employment of the necessary number of tuned circuits fitted with condensers mechanically connected.

Receivers with simplified tuning, but providing a high order of selectivity and quality, are, of course, expensive, but they are not proportionately more costly than sets fitted with many controls in order that a skilled user may obtain good results from the minimum number of valves.

### A Mains Problem

The problem of how best to obtain a supply of direct current from alternating current mains is sometimes a rather puzzling one.

A particular example that I had to work out recently was to supply 100 volts 100 milliamperes direct current for a moving-coil loud-speaker field winding and also 100 volts for grid bias.

Eventually I used the arrangement indicated in Fig. 1.

A transformer was connected to a metal rectifier and smoothing condensers, and also to a fixed resistance. The transformer was so arranged that the full output from across the terminals of the smoothing condenser *C*, of 4 microfarads, amounted to 200 volts 100 milliamperes. The resistance *R* had a value of 1,000 ohms. The resistance of the field winding of the loud-speaker was also 1,000 ohms, the circuit therefore passing exactly 100 milliamperes when the voltage was 200.

The voltage across the ends of the resistance by ohms law amounted to 100,

and this was used for the grid bias. Smaller voltages could be tapped off the resistance as required, and I therefore constructed the unit so that this could be done.

### Less L.T. Current

A really good scheme for economising

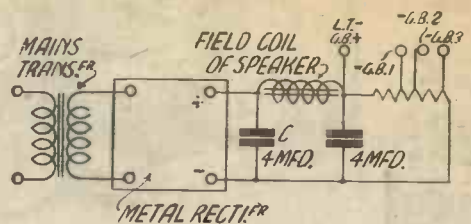


Fig. 1. Supplying G.B. and moving-coil field current from the mains

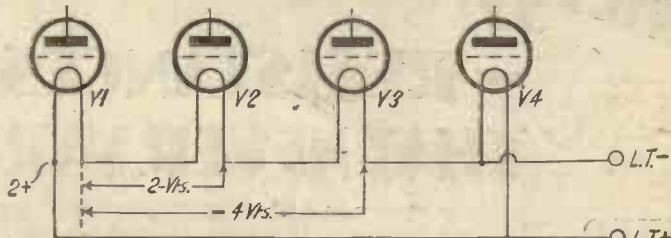


Fig. 2. A novel system of filament wiring with several advantages

filament current is illustrated in Fig. 2.

Valves *V*<sub>1</sub>, *V*<sub>2</sub>, and *V*<sub>3</sub> are of the 2-volt .1-ampere type while the valve *V*<sub>4</sub> is a 6-volt super-power.

The first three valves are connected in series and therefore their filament current amounts to only .1 ampere as compared with the .3 which would be taken were they connected in parallel in the usual manner.

Grid bias may be obtained from the filaments by taking advantage of the fall of two volts across each of the first three valves. The values are indicated in the circuit drawing.

When one of the series connected valves fails through filament breakage, the current to the remaining pair of valves will be interrupted, and it will therefore be necessary to test all three valves in order to find the faulty one.

This scheme of connecting valves is of value when it is essential to minimise the amount of the filament current and enables a user to employ an output valve having a larger filament than would be possible were all four valves connected in parallel.

### At Somerton

During my visit to the Somerton "beam" wireless station I was greatly interested in the methods employed by the Marconi engineers for coupling the receivers to the aerials.

There are several aerials and the lead-in connections are therefore quite lengthy, approaching, I should think, two or three hundred yards in one or two instances.

When one remembers what short wavelengths are employed (from 16 to 80 metres) one would naturally think that a most complicated system would have to be used to avoid heavy losses.

Actually, the aerials are connected to the receivers by copper tubes, which are surrounded by an earthed copper tube. They behave as ordinary transmission lines and the engineers provide couplings at the receivers and aerials which have the result of utilising most effectively the energy collected by the aerials.

### H.F. Couplings

Untuned or semi-tuned high-frequency couplings have for years been employed in portable or self-contained receivers fitted with frame aerials.

This was because tests have shown selective inter-valve couplings to be unnecessary and, of course, in order to minimise the cost of construction and to simplify the tuning.

The frame aerial, with its directional properties and relatively small pick-up, has enabled manufacturers and others to produce sets suitable for home use, but when an outdoor aerial is to be employed such simplified couplings are not always suitable.

It is unwise to rely upon one tuned circuit when a high-frequency valve is incorporated in a receiver that is to be used with an outdoor aerial; the single-tuned circuit is quite inadequate relative to the amount of the magnification available.

A choke, too, is not very satisfactory. In order to obtain stable working the amplification has to be cut down, since the best of chokes has a most uneven impedance curve, and for this reason a receiver fitted with a choke-coupled high frequency stage and a single-tuned circuit connected to an outside aerial must, tune broadly and give poor amplification.





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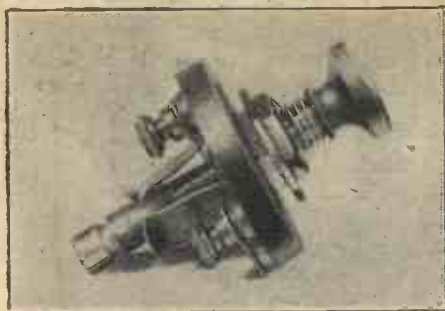
# "A.W." TESTS OF APPARATUS

Conducted by our Technical Editor, J. H. REYNER, B.Sc. (Hons.), A.M.I.E.E.

## Bulgin Push-pull Switch

THE use of a push-pull switch in performing the various switching operations in a set is becoming increasingly popular owing to the small size and convenience of such a component.

We recently tested a 3-point push-pull switch, made by A. F. Bulgin & Co., of 9/11 Cursitor Street, E.C.4, which is similar



Bulgin Push-pull Switch

to their normal 2-point type except that an additional contact is fitted allowing the three points to be connected together in one position of the switch. This component applies particularly for use with such items as centre-tapped coils when it is desirable to change from long to short waves and still retain the advantages of a centre-tapped coil.

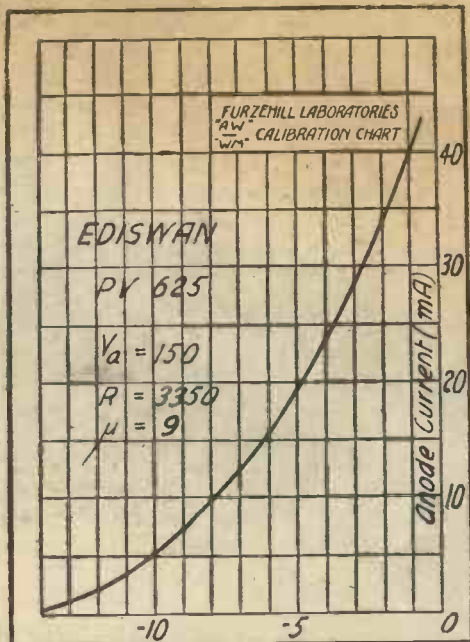
The component is fitted with strong spring contacts and has a smooth action. The finish and workmanship are up to the usual Bulgin standard.

## Ediswan PV625 and PV625A Valves

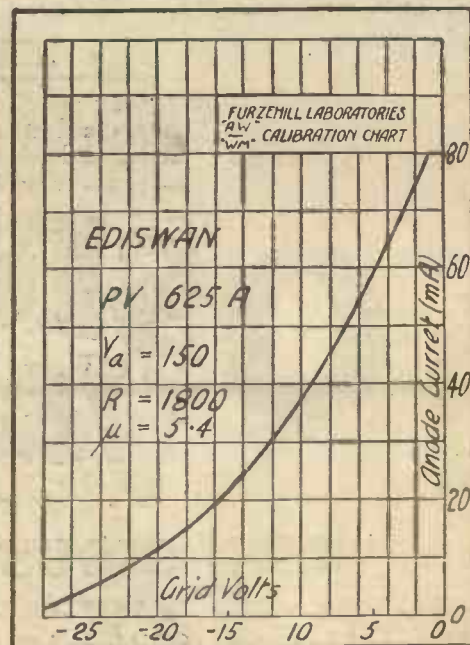
THE design of valves has changed so much during the past year that the characteristics of modern types seem remarkable in comparison with older ones. This applies particularly to the latest power and super-power valves, which have an exceptionally high efficiency and are capable of handling large grid swings with a low filament current consumption.

From Edison Swan Electric Co., Ltd., of 123/5 Queen Victoria Street, E.C.4, we have received the new Ediswan 6-volt power and super-power types, known respectively as the PV625 and the PV625A which have very low impedances and high amplification factors; indeed the mutual conductance of both valves almost reaches the unusually high figure of 3 ma/volt. The internal construction of the electrodes follows the standard Ediswan practice except that they have been enlarged, but in such circumstances the emission from the filament plays a more important part than the dimensions of the electrodes.

Below we show curves taken for these valves together with their characteristics, obtained on our laboratory bridge. The power valve is suitable for use as a last-stage valve except in those receivers capable of giving a very large output, in which



Characteristic Curve of the PV625 Valve



Characteristic Curve of the PV625A Valve  
 In the case of the super-power valve, the PV625A should be utilised. Attention must, of course, be paid to applying the correct value of grid bias, otherwise the filaments will be subjected to undue strain. We also

tried the valves in the laboratory standard amplifier which gave an improved performance as a result.

We have no hesitation in recommending these excellent valves to readers.

## Geeko Unspillable Accumulator

UNSPILLABLE accumulators are essential for portable receivers; they can also be utilised with advantage elsewhere, since spilt acid causes much damage to furniture and clothing. Unfortunately, even the best unspillable accumulators are not completely "unspillable"; under certain conditions they let a few drops of acid escape.

It was, therefore, with interest that we tested a two-volt Geeko accumulator submitted for test by The General Electric Co., Ltd., of 103 Kingsway, W.C.2; this is filled with a solidified form of electrolyte in place of the usual acid and it is impossible, even by severely shaking it, to spill any acid. The Geeko accumulator has a rated capacity of 20 actual ampere hours, we tested it by discharging at half an amp. After 36 hours continuous discharge, the voltage fell to 1.8 corresponding to 18 ampere hours—slightly below the rated capacity.

With a solid electrolyte particular care should be taken to avoid sulphating the plates, and care should be taken to charge the accumulator at the correct rate and



Geeko Unspillable Accumulator

not to allow it to lie in a discharged condition. The accumulator measures 3 1/4 in. by 3 in. by 5 1/4 in.

A message received at Croydon Aerodrome from the R.A.F. wireless station at Cairo states that telephone conversations sent out by an aeroplane which was carrying out tests with a Marconi short-wave experimental telephone transmitter while flying over England were distinctly heard in Cairo. This is a world's record in long-distance telephone transmission from an aeroplane in flight.



# Precision *plus* Performance

Following the line of the "ORMOND" Slogan "High in Quality"—"Low in Price," ORMOND Components are the experts' choice. The discerning constructor gets Ormond because he knows that he is getting products of proved efficiency

## The "ORMOND" S.L.F. CONDENSER

as illustrated here is especially sturdy and reliable. Its bright brass vanes are perfectly shaped and firm. Heavily nickelled and polished skeleton end-plates ensure smooth velvety action and noiseless control. High maximum and low minimum capacity is made possible by the scientifically shaped vanes. Accurate readings over the scale throughout 180 degrees assured. Anti-capacity earthing shield supplied. Easy to mount.

Capacity: .00025, 12/-; .00035, 12/6; .0005, 13/-.  
Also supplied with Friction Control Movement (direct drive and Slow Motion Ratio 55-1).

Capacity: .00025, 19/-; .00035, 19/6; .0005, 20/-.  
Also models of all the usual capacities.

## FRICITION CONTROL DIAL

Here is a dial so beautifully finished and so proportionately designed that it is worthy of the highest class receiver, yet low enough in price for the average pocket. Best quality Bakelite Combined Knob and 4-inch dial. Engraved 180 single degrees for direct drive. Friction control movement for slow motion ratio 55-1. No cogs, no slip, no back lash. Grub screw fixing. PRICE 7/6

*Details and Leaflets on Request.*

All high class radio dealers stock a full range of ORMOND COMPONENTS. Fully descriptive leaflets may be obtained from them. If any difficulty is experienced in procuring ORMOND COMPONENTS write to the address below:—

**The ORMOND ENGINEERING Co., Ltd.,**  
199-205, Pentonville Rd., King's Cross, N.1

Phone: Clerkenwell 9344-6. Grams: "Ormondengi, Kinross."  
Factories: Whiskin St. and Hardwick St., Clerkenwell, E.C.1  
Continental Agents: Pettigrew & Merriman, Ltd., "Phonos House," 2 and 4 Bucknall St. New Oxford St., London, W.C.1.



Advertisers Appreciate Mention of "A.W." with Your Order





FOR the first broadcast from the stage at the Coliseum, on February 26, the B.B.C. engineers met several knotty problems when searching for suitable positions for the microphones, because of the metallic echo given out by the proscenium. Alterations to the stage setting for the act to be broadcast have been specially made by the Coliseum authorities.

Julian Rose will act as *compère* in a notable vaudeville show to be transmitted from the 2LO studio on February 28. The variety turns will include Muriel George and Ernest Butcher, Gwen Farrar and Billy Mayerl, and Charles Higgins in his well-known sketch *The Gas Man*.

On March 6, listeners to 5GB will hear Act II of *Lohengrin* as performed by the B.N.O.C. at the Theatre Royal, Bradford, whilst 2LO and 5XX will relay part of the Carl Rosa Opera Company's performance of *Madame Butterfly* from the Theatre Royal, Glasgow.

Clapham and Dwyer, Tommy Handley, Mamie Soutter, and Hereward Drysdale in whistling solos, will contribute to London's vaudeville programme on February 23.

Fifteen bands are to take part in a concert to be relayed from the De Montfort

Hall, Leicester, on March 2, as the culmination of the week's competition in the sixth annual Leicester Brass Band Festival. The performance will be broadcast from 2LO and 5XX.

In a programme entitled *How Dare We?* at the London studio on March 6, the Gershom Parkington Quintet, and Jack Payne's B.B.C. Dance Orchestra will give a demonstration in parody plagiarism.

From time to time, ether-searchers may pick up a call in Portuguese, "*Postus Amador POEEA, Lisboa, Portugal*," on a wavelength of roughly 307 to 309 metres, slightly below that of PTT Marseilles. For the present it is the only broadcasting station working in Portugal, and it is run privately.

A 10-kilowatt telephony transmitter has been erected at Leysse, situated between Toulouse and Muret, France. It is controlled from the Francuzal Aerodrome, and its service will be limited to communication with aircraft.

WTIC, a high-power station at Hartford, U.S.A., because of the congestion of the ether, has decided to adopt a beam system of transmission. At the same time the station is to be equipped with a system of

100 per cent. modulation, to allow utilisation of its full 50-kw. power.

A dispatch from Peking states that the Nanking Communications Department has decided to erect seven short-wave wireless stations at Hankow, Kalgan, Chungkiang, Shanghai, Nanking, Tientsin and Peking. The Tientsin and Peking stations are to be opened within a month.

On February 23, a running commentary on the Rugby international between Ireland and Scotland, which is being played at Dublin, will be relayed by Belfast. The commentator will be W. P. Collopy, the famous ex-Irish international.

In response to a very wide demand from Scottish broadcast listeners, it has been decided by the Glasgow and Aberdeen stations to include at least one programme of "Scottish song, humour, and story" in their arrangements each week.

An agreement between the Commonwealth Government and the Amalgamated Wireless Co., of Australia, which is the second largest organisation of its kind in the British Empire, makes all the company's patents available to competing manufacturers free of all charge.

A device, resembling a portable typewriter in general appearance, has been perfected to send out SOS signals automatically. It permits anyone not acquainted with telegraphy to transmit latitude and longitude, call letters, and the SOS signal continuously in the international radio code.

Said to be the second most powerful transmitter in the British Empire, South Africa's new broadcasting station is now in operation at Johannesburg.

MR. FLEX OVERLOOKS THE FACT—



—THAT A WIRELESS SET SPEAKS FOR ITSELF





# MR. DICKENS DID NOT WRITE PLAYS!



CHARLES DICKENS was a specialist. He devoted his life to one thing—writing. Even in the use of words he specialised, and, as a result, he is universally acknowledged as the greatest novelist of all time. Like the creator of the immortal Pickwick, we are specialists. For nearly a quarter of a century we have made nothing but

condensers. And because we have never deviated from our task—never expended our energy in the making of other components—the name T.C.C. on a condenser is accepted throughout the world as the undisputed hall-mark of accuracy and dependability. Take no risks: use T.C.C. Condensers in your next Set.



Above: T.C.C. .0003 Mfd. Flat Type Mica Condenser, Price 1/10.  
Left: T.C.C. 2,000 Mfds. Electrolytic Condenser. Price 15/-.

T.C.C. .0003 Mfd. Upright Mica Condenser. Price 1/10.

## FOR OVER 22 YEARS WE HAVE MADE NOTHING BUT

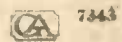
# T.C.C. CONDENSERS

SEND COUPON FOR FREE BOOK!

Enclose 1d. stamp for your free book which shows me how to build an L.T. or H.T. Eliminator.

Name.....  
Address.....  
A.W. 23/2/29

Adv. Telegraph Condensers Co., Ltd., Wales-Farm Rd., N. Aston, Lond. n. W.3.



Mention of "Amateur Wireless" to Advertisers will Ensure Prompt Attention



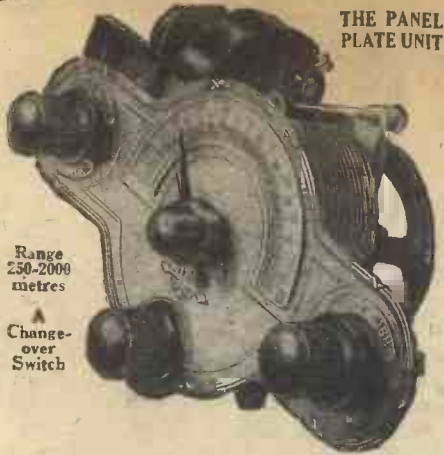
# BROADCAST TELEPHONY

(Broadcasting stations classified by country and in order of wavelengths)

Metres	Kilo-cycles	Station and Call Sign	Power (Kw.)	Metres	Kilo-cycles	Station and Call Sign	Power (Kw.)	Metres	Kilo-cycles	Station and Call Sign	Power (Kw.)			
<b>GREAT BRITAIN</b>														
25.53	11,751	Chelmsford		805	982	Agen	0.3	<b>ITALY</b>						
		(SSW) 15.0		810	968	Bordeaux (PTT)	0.5	275	1,090	Turin (test)	0.5			
248.0	1,230	Newcastle (5NO)	1.0	815	952	Marseilles (PTT)	0.5	333	901	Naples (Napoli)	1.5			
278	1,160	*Leeds (2LS)	0.13	826	892	Petit Parisien	0.5	387	775	Genoa	3.0			
273	1,100	*Sheffield (2LF)	0.13	351	846.7	Algiers (PTT)	2.0	443.8	676	Rome (Roma)	3.0			
288.5	1,040	*Bournemouth		370	817	Radio LL Paris	1.0	450	658	Bolzano	0.3			
		(8BM) 1.0		384	780	Toulouse (Radio)	0.0	504.2	595	Milan	7.0			
288.5	1,040	*Bradford (2LS)	0.13	403	749	Mont de Marsan	0.4	<b>JUGO-SLAVIA</b>						
288.5	1,040	*Edinburgh		414	724	Radio Maroc		308.3	973	Zagreb (Agram)	1.25			
		(2EH) 0.35		416.6	720	Grenoble (PTT)	1.5	529	506.9	Ljubljana	5.0			
588.5	1,040	*Hull (6KH)	0.2	449.8	668	Bordeaux (Radio Sud-Ouest)	2.5	<b>LATVIA</b>						
204.1	1,000	*Dundee (2DE)	0.13	440.8	668	Paris (Ecole Sup., PTT)	0.7	523.2	563	Katva	2.0			
204.1	1,020	*Liverpool (6LV)	0.13	400	636	Lyons (PTT)	5.0	<b>LITHUANIA</b>						
204.1	1,020	*Stoke-on-Trent		1,488	201	Eiffel Tower	8.0	2,060	150	Kovno	15.0			
		(5ST) 0.13		1,701	170	Radio Paris	8.0	<b>NORWAY</b>						
594.1	1,020	*Swansea (5SN)	0.13	<b>GERMANY</b>				242	1,240	Rjukan	1.0			
303	991	Belfast (2BE)	1.0	14.83	20,230	Nauen	20.0	207	1,070	Notodden	0.7			
311	964	Aberdeen (2BD)	1.0	37.85	7,968			365.9	820	Bergen	1.0			
323	928	Cardiff (5WA)	1.0	41.50	—	Doberitz	5.0	387	775	Fredriksstad	1.0			
358	833	London (2LO)	2.0	67.65	4,434			450	658	Aalesund	1.0			
378	793	Manchester		51	5,882	Bergedorf	3.0	456	658	Porsgrund	1.0			
		(2ZY) 1.0		219	1,370	Flensburg	1.5	495	604	Oslo	1.5			
396	757	*Plymouth (5PY)	0.13	240	1,250	Nurnberg	4.0	500	600	Tromsø	1.0			
400	740	Glasgow (5SC)	1.0	250	1,200	Kiel	0.7	566	350	Hamar	0.7			
482	622	Daventry Ex.		250	1,200	Cassel	0.7	<b>POLAND</b>						
1,502.5	192	†Daventry	(5XX) 25.0	263.2	1,140	Cologne	4.0	314	955	Wilno	1.5			
		*Relay stations.	†Relays 2LO.	264	1,133	Muenster	1.5	374	955	Cracow	1.5			
<b>AUSTRIA</b>														
250	1,200	Linz	0.5	272.7	1,100	Kaiserslautern	1.5	386	890	Posen	1.5			
277.8	1,030	Salzburg (under construction)	0.5	280.4	1,070	Koenigsberg	4.0	416.1	727	Kattowitz	10.0			
354.2	847	Graz	0.5	283	1,067	Berlin (L)	0.7	1,401	214	Warsaw	10.0			
455.9	658	Klagenfurt	0.5	283	1,067	Stettin	0.7	<b>ROUMANIA</b>						
455.9	658	Innsbruck	0.5	283	1,067	Magdeburg	0.7	300.3	757	Bucharest	4.0			
619.2	577	Vienna	20.0	321.2	937	Breslau	4.0	<b>RUSSIA</b>						
<b>BELGIUM</b>														
220	1,560	Chatelaineau	0.25	326.4	919	Gleiwitz	6.0	825	363.5	Moscow (PTT)	25.0			
275	1,090	Ghent	0.5	361.9	820	Leipzig	4.0	925	323	Homel	2.5			
329.7	910	Schaerbeek		374.1	802	Stuttgart	4.0	1,000	300	Leningrad	20.0			
		Brussels	0.5	387.1	776	Dresden	0.75	1,443	207.9	Moscow	30.6			
611.9	536	Brussels	10.0	391.6	766	Hamburg	4.0	1,680	173	Kharkov	15.0			
<b>CZECHO-SLOVAKIA</b>														
265	1,130	Kosice	2.0	421.3	712	Frankfurt	4.0	<b>SPAIN</b>						
270	1,086	Bratislava	0.5	452	664	Aachen	0.75	285	1,050	Barcelona				
343.2	874	Prague (Praba)	5.0	455.9	654	Danzig	0.75			(EAJ13)	2.0			
432.3	694	Brunn (Brno)	2.4	462.2	649	Langenberg	25.0	309	970	Orriedo (EAJ19)	0.5			
<b>DENMARK</b>														
330.8	883	Copenhagen		475.4	637	Berlin	4.0	350.5	856	Barcelona (EAJ18)	3.5			
		(Kjobenhavn)	1.0	536.7	559	Munich	4.0	371	809	Seville (EAJ5)	0.5			
1,153.8	162	Kalundborg	7.5	566	530	Augsburg	0.5	400	750	San Sebastian				
<b>ESTHONIA</b>														
403	735	Keval (Tallinn)	1.3	566	530	Hanover	0.7	<b>SWEDEN</b>						
<b>FINLAND</b>														
374	800	Helsingfors		577	520	Freiburg	0.7	261	1,149	Hoerby	10.0			
		(Helsinki)	0.8	1,648.3	182	Zeesen	20.0	265	1,130	Trollhattan	0.4			
1,623	197	Lahti	20.0	1,648.3	182	Norddeich	10.0	315.7	950	Falun	0.5			
<b>FRANCE</b>														
30.75	9,755	Agen	0.25	<b>HOLLAND</b>				346.8	865	Goteborg	6.0			
200	1,500	Fécamp	0.3	31.4	9,554	Eindhoven		438	655	Stockholm	1.5			
211.3	1,420	Beziens	0.1	38.8	—	Kootwijk		545.5	550	Sundsvall	1.0			
252.1	1,190	Juan-les-Pins	0.4	<b>HUNGARY</b>				770	390	Ostersund	2.0			
253	1,155	Montpellier	0.5	651.5	547	Budapest	15.0	1,200	250	Boden	2.0			
254	1,180	Toulouse (PTT)	1.0	<b>ICELAND</b>				1,370	273.9	Motala	30.0			
269	1,116	Lille (PTT)	0.8	833.3	900	Keykjavik	1.0	<b>SWITZERLAND</b>						
273	1,100	Limoges (PTT)	0.5	<b>IRISH FREE STATE</b>				406	739	Berne	1.0			
280	1,070	Rennes	1.5	222.2	1,350	Cork (5CK)	1.5	489.4	613	Zurich	0.5			
291.3	1,070	Radio Lyons	1.5	411	730	Dublin (2RN)	1.5	680	441	Lausanne	0.6			
503	633	Strasbourg	0.3	<b>MANCHESTER</b>				700	395	Moscow	0.5			
310	668	Vitus (Paris)	2.0	Feb. 28	"Duds" Concert Party.						1,010	297	Basle	0.25
<b>GERMANY</b>														
<b>HOLLAND</b>														
<b>ITALY</b>														
<b>JUGO-SLAVIA</b>														
<b>LATVIA</b>														
<b>LITHUANIA</b>														
<b>NORWAY</b>														
<b>POLAND</b>														
<b>ROUMANIA</b>														
<b>RUSSIA</b>														
<b>SPAIN</b>														
<b>SWEDEN</b>														
<b>SWITZERLAND</b>														
<b>TURKEY</b>														

## ... radio set builders!

THE PANEL PLATE UNIT



Range 250-2000 metres

Change-over Switch

The Panel Plate Unit consists of a Double Wave-band Tuner, Slow Motion Tuning Condenser, Change-over Switch assembled on plate, the whole mounted on handsome oak, walnut or mahogany panel. This unit is invaluable to radio set builders. **35/-**

### THE BASE-BOARD UNIT



Only 4 connections from this unit to a condenser and a coil are needed to complete a 3-valve receiver of amazing performance. All uncertainties of baseboard wiring and layout are eliminated.

2 valve Trans. 37/6  
3 " " 50/-  
3 " " R.C.C. 23/-

All Lamplugh radio products are guaranteed for 12 months.

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(Pronounced: LAMP-LOO)



### THE COLLAPSIBLE CABINET

made to match Panels supplied with Panel Plate Tuner, Supplied in oak, walnut or mahogany. It is assembled in a few minutes. **PRICE 28/-**

Send for Lists and Wiring Diagrams from

**S. A. LAMPLUGH, LTD.,**  
KING'S ROAD, TYSELEY, BIRMINGHAM

## CHIEF EVENTS OF THE WEEK

<b>LONDON AND DAVENTRY (5XX)</b>	
Feb. 25	Chamber music.
" 26	Vaudeville.
" 27	Lakme, an opera by Delibes.
" 28	National lecture on "Poetry," by Robert Bridges, the Poet Laureate.
Mar. 1	B.B.C. symphony concert.
" 2	Leicester Brass Band Festival.
<b>DAVENTRY EXPERIMENTAL (5GB)</b>	
Feb. 24	Choral concert.
" 25	Lakme.
" 26	Military-band programme.
" 27	Poor Old Sam, a farce by F. Morton Howard.
Mar. 1	Vaudeville.
" 2	Tess, an opera. Music by Frederick D'Er-langer.
<b>CARDIFF</b>	
Feb. 25	Musical comedy.
Mar. 1	Guyll Dewi Sent, in honour of St. David.
" 2	The Dear Departed, a comedy by Stanley Houghton.

<b>MANCHESTER</b>	
Feb. 28	"Duds" Concert Party.
Mar. 2	Coleridge-Taylor programme.
<b>NEWCASTLE</b>	
Feb. 25	Admiral Guinea, a play by W. E. Henley and R. L. Stevenson.
Mar. 2	International syncoption.
<b>GLASGOW</b>	
Feb. 25	My First Smoker, by William McCulloch.
" 28	Musical comedy.

The radio altimeter, the latest of radio aviation inventions, was shown at the New York Aviation Show. The reflected wave altimeter is claimed to be the most accurate instrument for measuring height known to science.

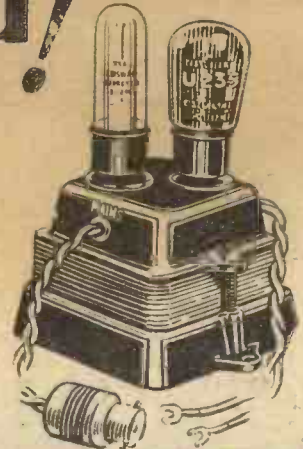


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Keep your batteries well charged with an Ediswan L.T. Charger and lengthen their lives. You know that your accumulators will always be properly charged according to the instructions given.

The Ediswan L.T. Charger will charge two-, four- or six-volt accumulators at 2 amps. from A.C. Mains

Price £2-17-6 complete



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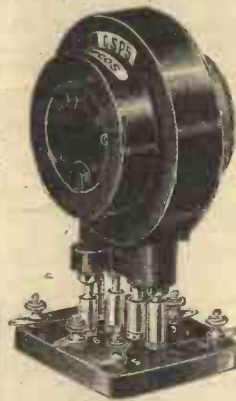
THE EDISON SWAN ELECTRIC CO., LTD, 123/5, QUEEN VICTORIA STREET, LONDON, E.C.4

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THE DESIGNER FITTED LEWCOS COILS TO THE NEW SUPER "ALL EUROPE FOUR" BECAUSE THEIR ALL-ROUND EFFICIENCY AND FINEST QUALITY MATERIALS GUARANTEE PERFECT RECEPTION TAKE THE DESIGNER'S ADVICE AND FIT THEM IN YOUR NEXT SET

**SUPER COILS**

<b>AERIAL COIL</b>			
Ref.	CAC 5	250/550 metres	10/6
"	" 20	1,000/2,000 "	12/6
<b>H.F. TRANSFORMER</b>			
Ref.	CSP 5	250/550 metres	10/6
"	" 20	1,000/2,000 "	12/6
<b>INTERCHANGEABLE PRIMARIES</b>			
Ref.	P4-P14	250/350 metres	3/-
"	P16-P22	1,000/2,000 "	4/-

Please state primary required when ordering

TO ENSURE PERFECT RECEPTION USE THE LEWCOS H.F. CHOKE



H.F. CHOKE

# LEWCOS

REGD.

## RADIO PRODUCTS

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Advertisers Appreciate Mention of "A.W." with Your Order





# 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. See announcement below. **Address Queries**—AMATEUR WIRELESS Information Bureau, 58/6r Fetter Lane, London, E.C.4

## Double-directional Aerials.

**Q.**—It is possible to get a directional effect by using a horizontal aerial, the length of the overhead part of which is greater than three times the length of the down lead; but can a double-directional effect be obtained anyhow?—K.U. (Wigan).

**A.**—Yes, by using a "T" type aerial. In other words, an ordinary horizontal aerial is erected, but the down lead wire is connected to the exact electrical centre of the overhead wire. In this case the length of the two arms should be about three times the length of the down lead wire, but quite good directional effects can be obtained from a "T" type aerial whose arms are only the same length or a little longer than the down lead. Another type of aerial for giving double-directional effects is the triangular aerial as used in D.F. stations. The erection of such is, however, beyond most amateurs.—L. C.

## What Type H.T. ?

**Q.**—I recently built up a four-valve set from instructions in your weekly and then purchased two 60-volt dry-cell batteries of the standard type. These batteries gave good results for about three weeks and then troubles started. Finally, after

six weeks, reception stopped altogether, and on testing the batteries they showed only a very small

## When Asking Technical Queries

**PLEASE write briefly  
and to the point**

A Fee of One Shilling (postal order or postage stamps) must accompany each question and also a stamped addressed envelope and the coupon which will be found on the last page. Rough sketches and circuit diagrams can be provided, but it will be necessary to charge a special fee (which will be quoted upon request) for detail layouts and designs.

proportion of their original voltage. New batteries of the same type would obviously have been

a similar failure, so I instituted inquiries among my friends and they advised treble-capacity batteries. My question is, what governs the type or capacity of battery to be used and how can one tell beforehand what type of batteries to order?—J. F. (Eastbourne).

**A.**—The type of receiver and the valves used govern the type of H.T. battery to be employed, since it must be able to supply as much current as is demanded by all the valves together. To enable you to work out the total consumption of your set and to see what battery should be used, we give the following details. With present-day valves and using the voltages applied to the anodes as usually specified by the valve manufacturers, the following figures, giving their current consumption in milliamps, can be taken as being sufficiently accurate to act as a rough guide in the choice of the H.T. battery: H.F. valve, 1; detector valve with transformer coupling, 2; detector valve with R.C. coupling, 1; L.F. valve with transformer coupling, 2; with R.C. coupling, 1; power valve, 10; super-power valve, 15. The maximum discharge rates for H.T. batteries are as follows: standard capacity, 8 milliamperes; double capacity, 15; treble capacity, 20.—C. L.

# AN APOLOGY

TELEGRAPH CONDENSER COMPANY LIMITED  
DOUBLE MOUNTING CONDENSERS

**A**DVERTISEMENTS have recently been issued featuring the Telegraph Condenser Company's Condensers with the special feature of the double mounting bracket as an innovation first evolved by us, but we find to our regret that this is incorrect.

This feature, for which originality was claimed by us, had already been previously registered by Mr. T. Graham Farish, of Graham-Farish Ltd., on the 16th day of

August, 1926, No. 723271, Class 3, and incorporated in their condensers since that date.

We wish to take this the first opportunity of publicly acknowledging the error, but are happy to announce that arrangements have been made which will enable this special double mounting feature to be continued in T.C.C. Condensers under licence from Mr. T. Graham Farish, the registered proprietor of the design.

**TELEGRAPH CONDENSER COMPANY LTD.**



**M**OUNT your balanced armature unit in a Squire Aluminium Cradle Frame and connect it to a Squire Cone. The cost is only a few shillings, but to get the same rich quality of reproduction by any other methods would cost as many guineas.



The Squire Aluminium Cradle No. 97 is beautifully enamelled with burnished edges. It is rigid, an essential quality which ensures constant setting and enables the speaker to take full output without chatter. It is designed to take G.E.C., Blue Spot, Triotron, Bullphone and other units, giving secure clamping and ready access to adjustment. The price of the No. 97 Cradle Frame only is **12/6**

The Squire Cone Kit, comprising 11 1/2" Kraft Diaphragm (forming 9 1/4" cone), 4 Suedlin Segments and 1 card ring all cut to size and ready for mounting to the Cradle and Unit is supplied only in our LABELLED ENVELOPES and **2/6** costs

The complete Frame and Cone Kit with Plywood clamping board as shown, suitable for fixing to baffle or cabinet, is obtainable of most dealers or supplied post free by us for **15/-**

FREDK.

## SQUIRE

24 Leswin Road, Stoke Newington, London, N.16



### The Wandering Minstrel

**brightened a Dark Age which burnt scientists as wizards... Now is the Wandering Minstrel wizard too - tuning his lays from the ether, calling living voices from across a continent. Yet honoured in that his magic minstrelsy is part of the homeliness of modern homes.**

# Burndept

## screened ethophone

Five valve results from a three valve receiver at a modest price.

20 to 25 stations. Utilizes Screened Grid and Pentode valves.

£12.7.0 complete with valves and royalty from your local dealer.

Write for catalogues and hire purchase terms to—  
**BURNDEPT WIRELESS (1928) LTD., BLACKHEATH, S.E.3.**

## WEARITE COMPONENTS

**WRIGHT & WEAIRE, Ltd.**  
 740, HIGH ROAD,  
 TOTTENHAM, N.17.

- James Special 3 Coils - 25/- pr.
- "Binowave" Coils - 25/- pr.
- Q Aerial Coil - 15/- ea.
- Q Mullard Master 3 Star 15/- „
- Q S.P. H.F. Transformer 21/- „
- Q Reinartz Coil - 21/- „

### WEARITE H.F. CHOKE - 6/6

WEARITE CHOKE 4/6 (SHORT-WAVE)

WEARITE CHOKE - 10/6 (HEAVY-DUTY)

A.C. SWITCH (2-way) - 6/-

DUAL WAVE TUNER, W.G.2, as used in FERRANTI SETS 15/-

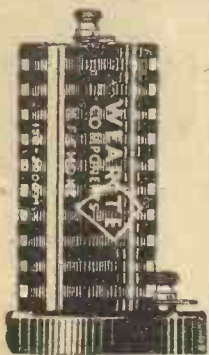
"LISTENER'S 3" COILS, B.B.C., 5, 6 ea., 5XX, 6/6 each

PUSH-PULL SWITCH, G22, 1/-

ARE YOU BUILDING THE "ALL-BRITAIN THREE" ?

WRITE FOR LISTS

Telephones: Tottenham 3847 and 3843



Advertisers Appreciate Mention of "A.W." with Your Order



## LETTERS TO THE EDITOR

The Editor does not necessarily agree with the views expressed by correspondents.

### Offensive Broadcasts

SIR,—I beg to support A. B. (Norwich). There are many facts in this wicked world to which one cannot shut one's eyes. If a play is to be true to life it must at times touch on these facts. In the case of that Aztec Cortez play, for instance, one hardly expects Spanish soldiers of fortune to be even as respectable as they appeared over the wireless.

I do not lose sight of the fact that broadcasts reach a mixed audience, but, even so, I suggest that the younger generation to-day is hardly likely to be much harmed by anything it is likely to hear over the ether. I also suggest that the public are heartily tired of a continued "doctoring" of their morals.—A. M. (Bedford).

### The "All-Britain Three"

SIR,—The above is truly a "wonder" set—I logged thirty-one stations at full loud-speaker strength within two hours of making it.

There is one thing in the construction that might cause a certain amount of trouble to the more inexperienced amateur, and that is the numbering of the coils. The

coils I have are numbered differently from those shown on your blueprint, with the result that the wiring was altered somewhat.

I had some difficulty at first to tune in 5GB; with the H.F. condenser all in I could hardly hear this station, and adjustments to the series condenser only altered the aerial tuning. I eventually got over this difficulty by placing a small fixed condenser across the H.F. condenser. My aerial is 80 ft. long, but I do not suppose that an increase in this would affect the H.F. tuning. Both variable condensers are .0005 S.L.F.—J. (Derby).

### Turin Broadcasts

SIR,—I have recently been hearing Turin very well on about 276 metres, immediately below Kaiserslautern. Although rather badly interfered with, it comes over at very good strength. The call is Radio Turino, and the station closes down about 10.10 p.m. in the same manner as the other Italian transmitters.—A. C. C. (London, E.)

### The "Ace of Twos"

SIR,—In building the "Ace of Twos," recently described in AMATEUR WIRELESS, I had some difficulty in getting proper results from the set, and ultimately traced the trouble to an error in wiring the

anti-mobo, owing to the different markings of the terminals of the Wearite specified in the drawings and the R.I. and Varley, which I had to substitute. Any of your readers who have used an R.I. & Varley anti-mobo unit in place of a Wearite may be interested in the markings of the different units, viz. :—

H.T.—on the R.I. & Varley is marked L.T. on the Wearite.

X on the R.I. & Varley is marked A' on the Wearite.

I found the "Ace of Twos" a delightful set to handle, especially on the ultra-short waves, and with a short indoor covered aerial wire (almost touching a wall) received WGY well on the speaker. I have also logged KDKA and 2NM, as well as scores of French, German, and Spanish short-wave stations. On the B.B.C. wavelengths the local station, also 5XX, 5GB, and several of the more powerful foreign stations came in well on the speaker. Selectivity is all that could be desired from a three-valve set and purity is also one of the features of the receiver.

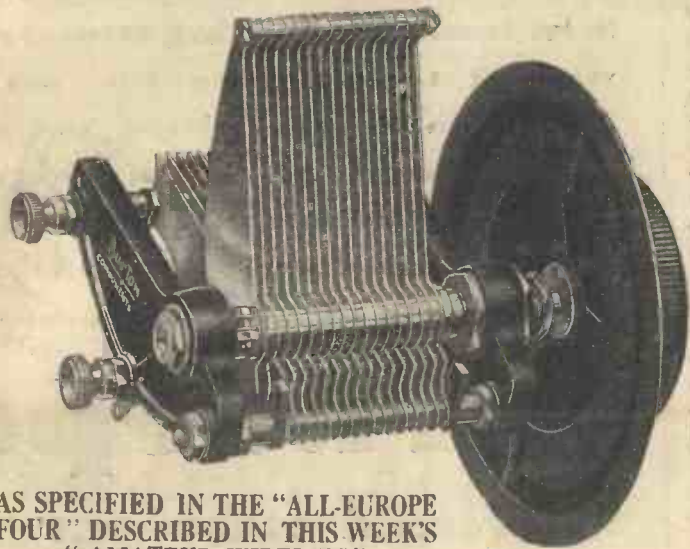
—C. (Old Trafford).

### A Continental Relay

SIR,—Being a reader of your paper, I thought I would write you these few lines to let you know of an interesting relay which I heard last night (February 10). Listening to Nürnberg, a relay  
(Continued on page 316)

NEXT WEEK  
A SET WITH SWITCH CONTROL

# "THE TRIPLE ALLIANCE" THE IDEAL SET



STATION AFTER STATION FLOATING IN THROUGH THE LOUD SPEAKER, AND ASSURING A CLEAN-CUT SEPARATION OF ALL STATIONS REGARDLESS OF WAVELENGTH.

All this and more, is yours for the asking, by installing BurTon Precision Condensers giving greater reception and selectivity, coupled with the BurTon Floating Action, Anti-phonc, Self Locating Valve Holders, and the little brother to the famous BurTon S.L.F. Condensers, the BurTon Midget Reaction Condenser.

### —THE TRIPLE ALLIANCE



BurTon Floating Action, Self Locating, Anti-phonc Valve Holders, Price 1/- each, complete with fixing Screws.



BurTon Reaction Condensers, Panel Mounting Type. Price 4/- each, complete with Dial.

AS SPECIFIED IN THE "ALL-EUROPE FOUR" DESCRIBED IN THIS WEEK'S "AMATEUR WIRELESS"

	Prices :	each.
.0005	Complete with 4 in. Dial	6/-
.00035	" " " "	5/9
.0003	" " " "	5/9
.00025	" " " "	5/9

Manufactured by

**C. F. & H. BurTon, PROGRESS WORKS, WALSALL, ENG.**



## MAKE YOUR OWN CONE SPEAKER

The New Wonder "Nightingale"

### CONE UNIT

Exactly as fitted to our Cabinet Cone Speaker.

Guaranteed to give results equal to the most expensive Loud-speakers yet made:

Full constructional details with each Unit.

### GRAMOPHONE ATTACHMENT

Reduced from 32/6 to 15/- solely as an advertisement for the famous Bullphone Nightingale Loud-speakers. Cobalt Magnet guaranteed for all time:

With 4-inch Diaphragm.

Instantly converts your own Gramophone into a full-power Loud-speaker giving a wealth of pure undistorted volume which must be heard to be believed.

**15/-**  
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**SATISFACTION GUARANTEED**  
or money refunded!



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**BUY ON EASY TERMS**

**5/-** Secures this Speaker

The Nightingale "DE LUXE"

**50/-**  
CASH

or 5/- deposit and 11 monthly payments of 5/-

21 in. high with 14 in. Bell. Mahogany finished, with plated arm and stand

Send Deposit NOW!

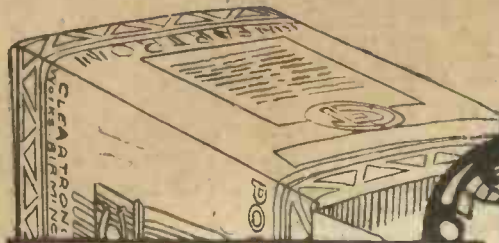
Obtainable from your Local Dealer or direct from:—

**BULLPHONE LIMITED**

**38, HOLYWELL LANE, LONDON E.C.2.**

NIGHTINGALE SPEAKERS

# A Valve fallacy Disproved



"If you want a good valve, you must pay a high price." That's a fallacy which the very first trial of Cleartron Valves will disprove beyond doubt.

With our well-organised factory we are able to sell first-class valves at moderate prices. Cleartron Valves at 4/- and 6/- have satisfied thousands of listeners.

One enthusiast had three Cleartrons that outlasted three accumulators and gave excellent reception all the time.

Every Cleartron has to pass seventeen efficiency tests before it leaves the factory. You need to test it only once—it will prove its worth there and then.

If your dealer does not stock Cleartrons, order direct or send a postcard for brochure describing two- four- and six-volt types for all wireless purposes. Mention your dealer's name.

GENERAL PURPOSE

**4/-**

# CLEARTRON

ALL-BRITISH VALVES

POWER & R.C.C.

**6/-**

London Office and Store: Fetter House, 54, 55 Fetter Lane, E.C.4. Phone: Central 3052.

CLEARTRON (1927) LTD., 21 Cumberland St., Birmingham.

Please Mention "A.W." When Corresponding with Advertisers



**STANDARD'S CHALLENGE!**  
**PROVED**  
 The most economical & efficient form of -  
**H-T SUPPLY**  
 on the market

Hundreds of Testimonials

Once installed PERMANENT H.T. SUPPLY is yours—you need never buy another dry H.T. Battery. The Standard Battery provides a non-sagging, constant pressure of current that ensures an amazing improvement in reception, and completely eliminates "Hum" and "Background." Little or no attention is required to maintain the voltage—all that is necessary is replenishment of the elements at long intervals—a simple and interesting task. This battery LASTS FOR YEARS. It is self-regenerative and recharges itself overnight.

WRITE NOW FOR FREE NEW BOOKLET giving full details of new prices and complete table showing life of battery, which assists in selection of right battery for your set. WRITE NOW.

**REDUCED PRICES**

Prices are now reduced on all models of the battery and all spare parts. 96 volt Popular Model "Unibloc" Cabinet was 8/1 down, now 7/6 down and five monthly payments of 7/6. Cash £2.3s.1d.

Obtainable from Halford's Stores, Curry's Stores, and all radio dealers on cash or deferred terms. Any voltage Battery supplied

We also supply handsome Table Cabinets in which trays of cells can be neatly housed.



Also Super No. 3 battery 9/8 down and five instalments of 9/8.

**STANDARD**  
 SAC LECLANCHÉ

WET BATTERY COMPANY  
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**THE ONLY UNIVERSALLY STANDARDISED COMPONENT IN RADIO!**

Type "B"  
 Type "B" 6d.,  
 Type "M" 4d.  
 Type "R" 3d.

**BELLING-LEE TERMINALS**

Belling & Lee Ltd., Queensway Works, Ponders End Mdx.

"A.W." Solves Your Wireless Problems

**"LETTERS TO THE EDITOR"**

(Continued from page 314)

of Munich, about 7 p.m., their programme was stopped, with the statement that as conditions were favourable, they would relay Melbourne, Australia. This they did with great success. Fading was nil, but atmospherics were rather bad, but not bad enough to spoil the singing of "Handel's Largo" by a lady and the announcing of the station. The set I use is a 0-V-1 with pentode output valve, and I might say that Nuremberg comes through louder than 5GB.—I. B. (London, N.).

**An Experiment**

SIR,—I send you particulars of an interesting experiment concerning reproduction through the medium of the sounding board of a piano with the aid of a cone type loud-speaker. If the outer cover of the piano is removed from beneath the keyboard the sounding board will be exposed. The reed of the loud-speaker is then brought into contact with the sounding board by leaning the loud-speaker against it. No other operation is necessary, and the reproduction, in my opinion, is almost as good as a moving-coil speaker, the bass notes of string instruments being particularly in prominence.

P. E. N. (Halesworth).

**A Good Three-valver**

SIR,—As a regular reader of AMATEUR WIRELESS, I am writing to let you

know the results obtained from the "All-Britain Three." I may say, without any hesitation, it is easily the best three-valver yet designed. I have had everything in sets, from a crystal to a six-valver, and the "All-Britain Three" is my favourite so far.  
 G. (Belfast).

**The "Beginner's One-valver"**

SIR,—May I congratulate you on introducing the "Beginner's One-valver," described in AMATEUR WIRELESS dated September 15, 1928. I obtained the blueprint (A.W.140) and built the set forthwith. It is a great success in every way. Coupled to a two-valve amplifier it is an ideal loud-speaker set, giving splendid volume and purity of tone.

A. H. B. (Canterbury).

"Amateur Wireless and Radiovision." Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. Post free to any part of the world: 3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to "Bernard Jones Publications, Ltd."

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," 58-61 Fetter Lane, London, E.C.4.

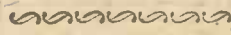
**WIRELESS MAGAZINE**



Big  
 British  
 Wireless



1/-



**GOODMANS SPIDER CHASSIS AND CONE ASSEMBLY**

WITH THIS COMPLETE ASSEMBLY YOU CAN CONSTRUCT IN A FEW MINUTES, a Loud-speaker surpassing all your expectations! ANY GOOD UNIT YOU MAY HAVE—"BLUE SPOT," "TRIOTRON," "BULLEN," or GOODMANS can be used. TWO MINUTES only—and the Unit is fixed in place, by the unique Cleat and Wing-nuts. The complete Assembly is then ready for fixing inside your Cabinet, or to a Baffle Board, with three screws. Lugs are provided on the outer Ring. SIMPLICITY OF CONSTRUCTION AND ASTOUNDING RESULTS are certainties.



**This assembly is definitely ahead of all others.**

It is fitted with a fully licensed GOODMANS' Seamless Cone, made and treated by entirely new and absolutely exclusive doping processes, rendering it remarkably sensitive, and capable of reproduction of a fidelity and brilliance usually associated with the Moving-coil type Speaker.

Illustrated descriptive Leaflet on request.

**GOODMANS**  
 27 FARRINGDON ST. LONDON, E.C.4  
 Telephone—CITY 4472



**"THE IMPORTANCE OF GRID CURRENT"** (Continued from page 288)

the potentiometer is brought over to the negative side, so reducing the positive applied voltage, the grid resistance of the valve rises considerably. Indeed with a 1/4 tap it is no longer correct to assume that the grid leak has no effect upon the result, as it is quite comparable in resistance with that of the valve itself.

It will be remembered that last week I gave a formula showing the critical frequency at which the detector would begin to distort and the application of this formula to the case of a 2-megohm leak with a .0003 grid condenser shows that if the frequency characteristic is to be maintained up to 5,000 cycles per second, the grid resistance must not be greater than 600,000 ohms. All the values given in the tables comply with this proviso with the exception of the 1/4-tapping with the 2-volt H.F. valve.

Provided we comply with this specification for good quality, it is clear that we desire to make the grid resistance of the valve as high as possible, for by this means we reduce the damping imposed upon the detector circuit to which the detector valve is coupled. It will be seen, therefore, from these results that under average conditions and using 2-volt H.F. valves, the best arrangement is a centre tapping or possibly

a tapping at one-third of the distance from the negative end, since as far as one can estimate from the figures already quoted, this would just comply with the limiting condition already laid down.

With an R.C. valve on the other hand, we still do not reach the limiting condition with a 1/4-tap and it is probable, therefore, that this tapping would be the most satisfactory under general conditions. It is perhaps a surprising point that the grid resistance of an R.C. valve should be less than with an H.F. valve. Since the R.C. valve has a higher anode resistance, one is inclined to assume automatically that the grid resistance must also be higher. This does not necessarily follow, because the grid is of closer mesh so that more electrons are attracted to the grid for a given positive voltage than is the case with a more open mesh grid as is used in an H.F. valve.

**The Results**

The results show definitely that in the case of the 2-volt R.C. valve, the grid resistance is only about half that of an H.F. valve, which is a very marked discrepancy and means that with the same circuit, the damping imposed will be twice as great with an R.C. valve.

In the 6-volt class of valve the same state of affairs does not obtain, there being little difference between the two classes of valve as far as grid resistance is concerned. I shall give details for the 4- and 6-volt classes of valve, however, in a future article, attention being confined to the 2-volt class for the first article as this is the most popular type of valve.

TABLE I

Grid resistances for average 2-volt H.F. valve grid connected to L.T. through 2-megohm leak.

Leak connected to	Equivalent tapping	Grid resistance (ohms)
0.5	1/4	800,000
1.0	1/2	400,000
1.5	3/4	290,000
2.0	Full	250,000

TABLE II

Grid resistance for average 2-volt R.C. valve grid connected to L.T. through 2-megohm leak.

Leak connected to	Equivalent tapping	Grid resistance (ohms)
0.5	1/4	450,000
1.0	1/2	280,000
1.5	3/4	180,000
2.0	Full	125,000

**TO HOME CONSTRUCTORS!**  
Build the Peerless "Resonic 2"

Anyone can build this set in 60 minutes. No drilling. No soldering. All Wires cut and bent. JUST ASSEMBLE and then immediately enjoy the radio entertainment, which is of splendid tone and comes in at good loud-speaker volume. Circuit allows use of standard valve (1 H.F. & 1 Power). Blueprint and easily followed Diagram of Connections included with every set. Cabinet and full Kit supplied in Carton.



Regd. No. 456002

**£3.15.0**

Obtainable from all dealers or  
**THE BEDFORD ELECTRICAL & RADIO CO., LTD., 22 Campbell Rd., BEDFORD.**

**DX Short-wave COILS**



For short-wave work specify the famous DX Coils. Experts use them wherever Radio is known. Wound 3 in. diameter; fit standard coil holders; Tinned copper, 6 gauge; open core; can be tapped anywhere by alligator clips. 3, 5, 7 and 9 turns

**7/6**  
The Set of four

**DX COILS, LTD., LONDON, E.8.**

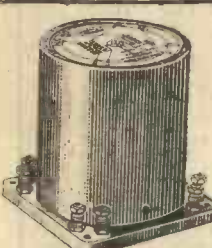
**THE 100% Broadcast Receiver**  
BUILD and OPERATE in ONE EVENING

**FORMO Screened 3 Grid**

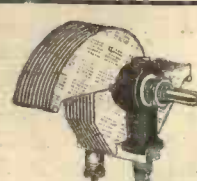


**BRITISH Components Throughout**  
SEND FOR CATALOGUE.


**Famous FORMO COMPONENTS as used in this Set and in all Notable Published Circuits**



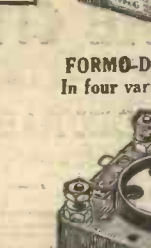
**TRANSFORMER-OUTPUT FILTER CHOKE 25/-**




**"1928" LUG CONDENSER 5/-**  
0005 00035 00025



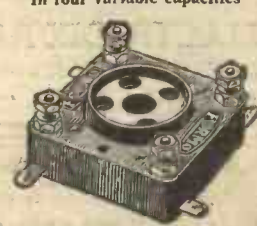
**"DE LUXE" MODEL 6/-**  
0005 00035 00025



**COILS SG 1 & 2 10/6 each**



**FORMO-DENSOR 2/-**  
In four variable capacities



**VALVE HOLDER 1/3**

**THE FORMO CO., CROWN WORKS, CRICKLEWOOD LANE, LONDON, N.W. 2**





The

**SIFAM**

**"HEVICORE"  
L.F. TRANSFORMER**  
introduces Zoxophone "Magic"

Ever heard a Zoxophone when the Sifam "Hevicore" transformer is in action? Those tantalising low notes come out with a clean strength and purity that is nothing short of wonderful—in fact the performance of the "Hevicore" over the whole of the musical scale is masterful. The Sifam "Hevicore" incorporates a particularly heavily constructed core that our research engineers have discovered renders the super performance and action of this transformer, capable of withstanding the heaviest demands of present-day radio—

PRICE  
**17/6**

3-1 ratio

at its price "Hevicore" is the transformer of the day.

By post or from dealers.

THE SIFAM ELECTRICAL INSTRUMENT CO. LTD.  
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Blackfriars Stn., Underground Rly. Phone City 0191.

**OUR BLUEPRINT SERVICE**

Constructors of receivers described in this Journal should make full use of our Blueprint Service and avoid all risk of failure.

**WIRELESS IN PARLIAMENT**



From Our Own Correspondent

A PLEA for a reduction of the wireless licence fee was made last week in the House of Commons by Colonel Howard-Bury, who asked whether, seeing that the receipts of wireless licences amounted to £1,250,000, of which £824,000 were paid to the British Broadcasting Corporation and £254,000 to the Exchequer, it would not be possible to reduce the wireless licence from 10s. to 7s. 6d.?

Sir W. Mitchell-Thomson, however, said he shared the view expressed by the Crawford Committee that a fee of 10s., which was equivalent to 1d. for 3 days' programmes, was not unreasonable, and he did not propose to recommend a reduction.

In answer to a question put by Sir N. Grattan-Doyle, Sir W. Mitchell-Thomson said it was not possible, without undue cost in accounting, to segregate the cost of the specific work of detecting wireless apparatus operated without licences. One thousand one hundred and thirty-five prosecutions were instituted in 1928, and convictions were obtained in all but seven cases. The total amount of fines recovered, including costs, where granted, was £1,186. The difference between the cost of the prosecutions and the amounts recovered was borne out of the proportion of the licence revenue which was retained for management.

**TRADE NOTES**

WOULD Mr. D. Smithers, who wrote to the Dubilier Condenser Co., Ltd., for one of their catalogues, forward to them his address, which he omitted.

Readers considering utilising the mains should write for the latest leaflet issued by E. K. Cole, Ltd., of London Road, Leigh-on-Sea. Particulars of the "Ekco-lectric Straight Three" are also given.

As readers will have seen from the advertisement pages, A. C. Cossor, Ltd., of Highbury Grove, N.5, are issuing a map, showing European broadcasting stations, for the benefit of listeners. We have received a copy and we have no hesitation in advising readers to obtain one, mentioning "A.W." in their application.

With the inauguration of the beam service with the United Kingdom, more than 300,000 messages were dispatched overseas from South Africa last year, a gain of about 100,000 over the year before.

All U.S. naval stations broadcasting weather and hydrographic information and press dispatches, now stop transmitting for three minutes twice each hour to listen on the "distress" wavelength (500 kilocycles) for SOS signals.

Finished in black or beautifully grained mahogany



**36**

**neat-accurate and inexpensive**

Watch for Brownie's latest triumph in artistic moulded components—the "Dominion" Vernier Dial. Special non-back-lash slow motion drive gives very accurate turning, while the action will fit any condenser, and the new design of the dial will enhance the appearance of every set.

**BROWNIE WIRELESS**

"DOMINION" VERNIER DIAL

THE BROWNIE WIRELESS Co., (c.B.) LTD.  
MORNINGTON CRESCENT, LONDON, N.W. 1

**IMPROVE**

Your COSSOR or LISSEN set by fitting the new

**DUAL S.G. COILS**

Better selectivity, strength and range. Valve holder base or panel mounting can be plugged into existing set, no alteration required.

PRICE 10/6 each  
Range 230/2000 metres

COSSOR and LISSEN separate coils 4/9 and 6/6 each.

**IMPROVE**

Your MULLARD MASTER 3 or any similar circuit, fit the popular

**M.4 DUAL COIL**

Six-pin base mounting, less switch 7/9 each  
Panel mounting with switch 10/6 each

AND IF you cannot afford above, make up the BANTAM THREE, the wonderful THREE-POUND-TEN THREE VALVER for which our M.4 DUAL was specially selected.

Remember "A.W." has specially selected **TUNEWELL DUAL COILS** for GLOBE DX 2, BROADCAST PICTURE 4, ORCHESTRA FOUR, Etc. Etc. **WHY NOT DO THE SAME?**

Massive ALL-purpose H.F. Choke 5/9

Makers of Tunewell Wireless Products

**TURNER & CO.**

54 Station Rd., New Southgate, N.11



**MODERN MASTERPIECES No. 4**



"The Newt" or "Little 'Un"

THE Newt's job in life is to destroy unwanted and elusive insects. Just as efficiently, the Dubilier Neutralising Condenser counteracts the effect of the unwanted grid to plate capacity of the valve.

This condenser occupies very little space on the baseboard, either vertically or horizontally. It has a maximum capacity of 50 micro-microfarads and a very low minimum and last, but not least, its price, too, is very low.

# Dubilier Neutralising Condenser

Price **3/6** each

**"TOREADOR SCREEN-GRID FOUR"**  
This set incorporates the latest developments in Receiver design—full constructional details free on request

If unobtainable from your dealer write direct to us, giving his name and address.



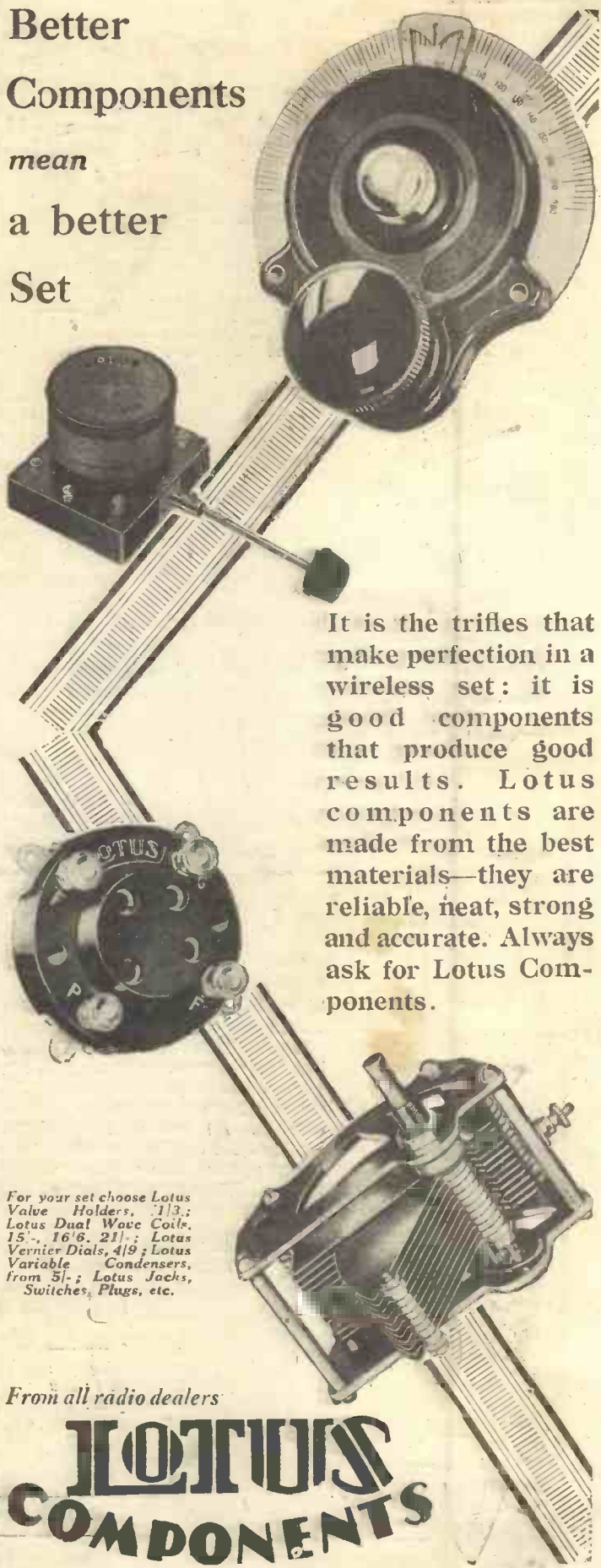
We are exhibiting at the British Industries Fair, White City, February 18—March 1  
**STAND MM50**



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Advt. of Dubilier Condenser Co. (1925), Ltd.; Duxon Works, Victoria Road, N. Acton, London, W.3

**Better Components mean a better Set**



It is the trifles that make perfection in a wireless set: it is good components that produce good results. Lotus components are made from the best materials—they are reliable, neat, strong and accurate. Always ask for Lotus Components.

For your set choose Lotus Valve Holders, 1/3; Lotus Dual Wave Coils, 15/-, 16/6, 2/1; Lotus Vernier Dials, 4/9; Lotus Variable Condensers, from 5/-; Lotus Jacks, Switches, Plugs, etc.

From all radio dealers

# LOTUS COMPONENTS

Garnett, Whiteley & Co. Ltd., Liverpool

Advertisers Appreciate Mention of "A.W." with Your Order.



# PERFECT BALANCE

## 4 TERMINAL TRANSFORMER



A short while ago any Transformer was considered good enough as long as it amplified. Now Radio is becoming a more exact science. Reproduction of the very finest quality is demanded, and only high-class transformers ensure really good results.

This R.I. & Varley Straight Line Transformer is a wonderful example of mechanical efficiency. Its National Physical Laboratory curve proves beyond doubt its exceptional capacity for amplification over the whole musical scale. A huge range of frequencies—25 to 6,000 cycles—is covered. This means equal volume on high and low notes, and thus an added balance and realism to the music.

4 - Terminal Straight Line Transformer

**22/6**

Section D of our new Catalogue, giving full particulars, will be sent free on request.



THE MARK OF BETTER RADIO

# This up-to-date component



# Fills a great need in Radio today

Here is the wonderful Anti-mobo Resistance Capacity Coupler—the most up-to-date component in Europe. Its clever design incorporates the famous R.I. & Varley Anti-mobo device, which is a perfect safeguard against L.F. Reaction, commonly known as "motor-boating." It ensures real stability in any and every Wireless Receiver, and, like all R.I. & Varley products, is absolutely reliable. At 25/- it is at least four or five shillings cheaper than the two components previously required to do its work. Of all the popular components that R.I. and Varley have produced, few have won such universal praise from the experts, and such instant approval from the thousands who have used it in their Sets.

Type Z 25/-  
Type Y 25/-  
Type X 25/-

Section C of our new Catalogue gives full particulars of these famous Bi-duplex wire-wound Components.



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