MY PET WIRELESS GRIEVANCE

Amateur Wireless And Electrics

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PRINCIPAL CONTENTS

WELL ILLUSTRATED

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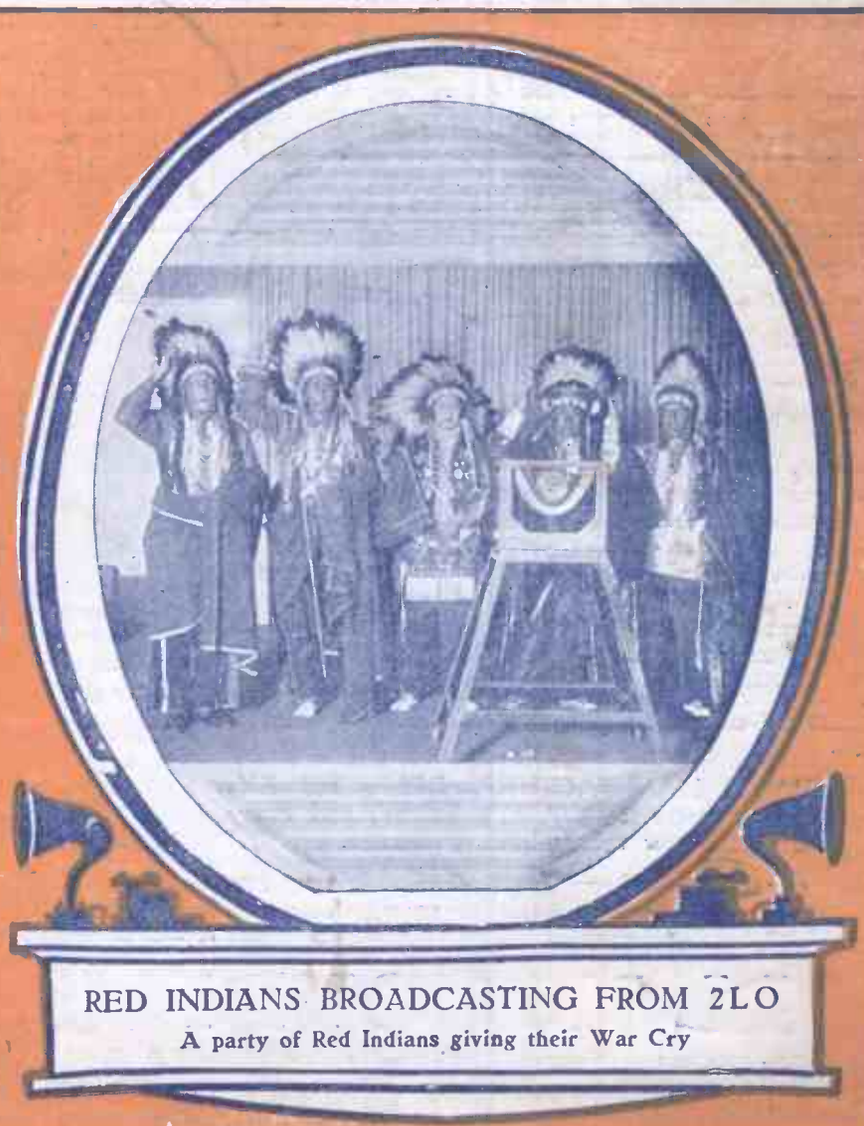


RED INDIANS BROADCASTING FROM 2LO

A party of Red Indians giving their War Cry

Amateur Wireless and Electrics

Vol. IV, No. 91 March 1, 1924

SOUND AND WIRELESS

VERY few of those who obtain entertainment each evening by the aid of headphones or a loud-speaker have any realisation of the difficulty of the duties which they are called upon to perform.

With the text-book diagrams of modulated carrier waves in our minds we usually picture a sound wave as a nice, neat undulation of perfect regularity to whose shape the crests and troughs of ether oscillations are moulded by the transmitting set. Actually a clear-cut regular curve would represent the pure sound of a single note only—and there is no musical instrument that is capable of producing a perfectly pure note!

Qualities of Sound Waves

Sound waves, which travel through the air, obey in nearly all respects the laws which govern those that pass through the ether. The *loudness* of a sound is determined by the amplitude of the wave, the *pitch* by the frequency. Sound waves have a third quality which we call *tone* or *timbre*.

If the note corresponding to the middle C of a piano is played in turn by a violin, a flute, a harp, a banjo and a cornet we shall find that the pitch is in every case the same, and the loudness can be made the same if each player regulates the strength of his bowing, his touch, or his wind. But the *tone* will be quite different in each case, and it depends upon the combinations of harmonics or overtones that go to make up the sound of its note.

If a string, a reed or a tube could vibrate truly we should have pure notes. Actually they cannot. You can see what happens quite easily by making an experiment in your bath. Move your hand sharply so that a wave is set up on the surface. It travels rapidly down the bath until it reaches the end. There it strikes against the metal or porcelain and is reflected back in the direction whence it came. The reflected waves interfere with those that are on their way towards the end of the bath, breaking them up and causing them to become varied. Instead of one wavelength there are now several.

Fundamentals and Harmonics

Just the same thing occurs in whatever is made to vibrate to produce musical

Fig. 1.—Diagrams of Vibrating Strings.

sounds. In Fig. 1, A shows how a string would vibrate in such a way as to give out its own pure note or fundamental. At B we see that the wave has been reflected from the upper fixed end of the string, causing besides the fundamental two vibrations of shorter wavelength and higher frequency to occur. The note given out will thus be a combination of three: the dominant, which will be by far the loudest, and two different notes of higher pitch. We shall not be conscious on hearing the note that it is threefold, but the presence of the higher notes will give it a characteristic tone. The harmonics of the violin are quite different from those of the piano; hence the same note played on both will have two distinct timbres. Fig. 2 shows the actual composition of the middle C as played on piano, violin and flute. The size of the notes represents their respective loudness.

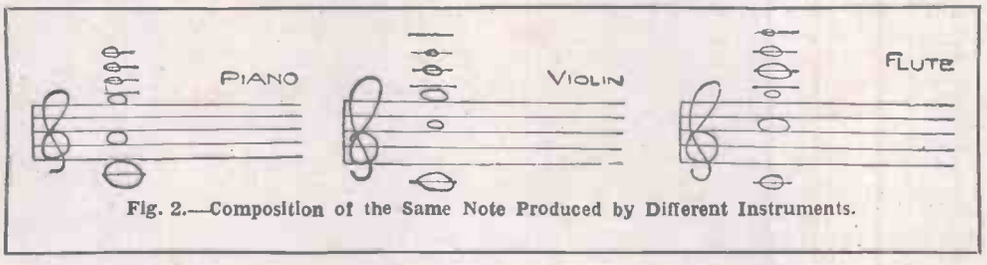


Fig. 2.—Composition of the Same Note Produced by Different Instruments.

We see, then, that our conception of the neat single curve must go. Instead, the curve of even the simplest sound is a series of jagged curves. Fig. 3 shows the very simple case of a note having only one harmonic. It will be seen that during the first part of the rise of the wave of the dominant note (A) the wave of the harmonic (B) rises also. The resulting wave (C) will therefore rise steeply at first, since the two forces are acting with one another. Just before the dominant wave reaches its crest that of the harmonic starts to fall. The rise of the resulting wave is checked and it begins to drop sharply. Its fall, however, is arrested by a rise in the harmonic wave, and a kind of hump is formed. Succeeding cycles are influenced in the same way.

The two pure waves A and B thus combine to produce the complex wave C. In the violin at least three waves combine; there are more in the note of a piano, and in the voice of a good bass singer as many as sixteen harmonics have been detected to one note. If the combination of the two curves A and B gives such a broken contour as that of C, you may imagine what a curve which is a composite of seventeen would be like!

When a chord of three notes is struck on the piano you have a resulting wave which is the product of three others, each of which is a compound of many. Add a violin to the piano and matters become far more complicated.

The Duty of a Diaphragm

When a full orchestra is playing the diaphragm of the microphone and that of the loud-speaker are called upon to deal not with one wave, but with thousands of complicated forms at one and the same time.

And here another difficulty creeps in. The diaphragm of the loud-speaker being capable of vibration has its own natural frequency to which it will respond more readily than to any other. Hence if the instrument is not very carefully designed it will give undue emphasis to certain notes with very unpleasant results.

Again, unless the transmission of an orchestral piece or a chorus is very care-

fully conducted by means of special microphones and the careful placing of players or singers, mere noise instead of musical sounds will result.

What is the difference between music and noise? All sound is conveyed by *sine waves* which may be combined to form composite waves. A glance at Fig. 3 will show that though the contours of the resulting wave are jagged, the same humps and hollows occur in succeeding cycles. The wave is thus regular and will produce a musical note. Noise is the result of confused waves so broken up that there are no regular cycles.

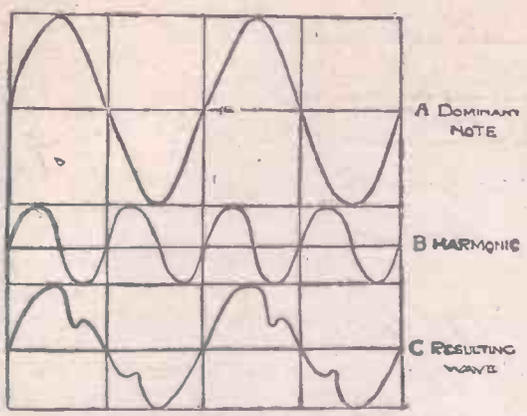


Fig. 3.—Composition of the Compound Wave.

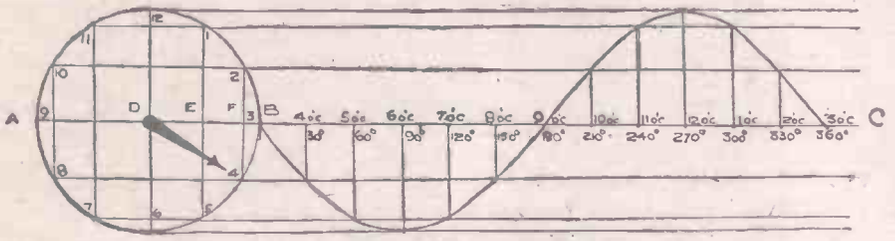


Fig. 4.—Explanation of Sine Wave.

Sine Waves

The term sine wave is one so often used in wireless that it may be as well to see exactly what it means. If we look at the dial of a watch (Fig. 4) we shall see that when the long hand moves from twelve o'clock to one it sweeps through the same distance as when it travels from one o'clock to two, or from two o'clock to three. But if we rule vertical lines from twelve, one and two down to the diameter AB we shall find that the horizontal distances DE, EF and FB are very different from one another.

Let us produce the diameter as shown to C and mark off along it twelve equal spaces instead of the unequal spaces DE, EF and so on. The hand moves from three o'clock to four; we drop a perpendicular from the first division of BC to the level of four o'clock on the dial. Others follow growing longer until six o'clock is reached, then they become shorter and shorter until at nine o'clock no line is drawn. Thence they rise until twelve o'clock, and fall again till the starting point, three o'clock, is reached once more.

We can now draw a curve touching the ends of the perpendiculars; this will be a true sine curve. We may describe each half of it as a semicircle so altered that the horizontal distances truly represent distances travelled round the circumference.

Sound waves, like those of light, heat and wireless, all take the sine wave form whatever may be their size or their frequency. Even the most complex sound waves may be resolved into a number of separate sine waves. Thus given the wave C in Fig. 2, we could analyse it into the two sine waves A and B.

The loud-speaker's task, then, is no light one. The miracle of telephony is that one thin disc can respond so accurately to the tens of thousands of tiny impulses that reach it practically simultaneously. Yet the greatest movement that the diaphragm makes is not more than one two-thousandth of an inch, or about half the thickness of the finest cigarette paper, and not more than one-thousandth of the energy that reaches the telephones or the loud-speaker is used in producing these tiny movements. The rest is wasted, chiefly in heating the windings of the magnets.

J. H. R.

SUBTERRANEAN WIRELESS

THE recent mining disaster in Scotland has revived the suggestion of utilising wireless as a means of underground communication, particularly in connection with life-saving schemes. Experiment has already shown that wireless waves will penetrate through at least 100 ft. of solid earth, and it is probable that this distance could be considerably extended. For instance, signals have been received after passing through over 100 ft. of sea water, where the rate of attenuation should be much higher than through the solid earth on account of the higher conductivity of the salt water. The greater the electric conductivity of a medium, the more "opaque" it is to ether waves, and *vice versa*. This fact has also been utilised in connection with methods recently employed for locating subterranean ores and mineral deposits by means of wireless "search" rays.

H.

The American term BCL means broadcast listener.

Bosphor Pronz Again "Assists" the Query Staff

On Earths

1. WHAT kind of wire shall I use for my earth lead?

A fairly thick wire painted at the end to resemble an earthworm makes an artistic and natural earth.

2. In the absence of a water-pipe, what do you advise me to do?

Complain to the local water-supply people.

3. How long should an earth lead be?

Usually an earth lead is of sufficient length to reach from the receiving set to the earth plate. If it falls short of this length it will not be efficient.

4. What is a counterpoise?

A capacity earth.

5. What is a capacity earth?

A counterpoise.

6. How deep must I bury my earth?

As deep as you can so that the high-frequency resistance will be as low as possible.

7. I have no water-pipe handy, and I do not want to disturb my grass lawn by digging it up. What should I do for an earth?

Obtain a large piece of wire netting and spread it out on the grass. Get a small boy to sit on each corner so as to keep it flat. It is better to remove the netting before running the lawn-mower over the grass.

8. Should an earth wire be insulated?

Not necessarily; but such a wire should be covered with a liberal coating of Slippery Sam compound so as to make it as difficult as possible for slugs and other low-frequency climbers to climb up it.

9. What is the objection to a gas-pipe for an earth?

The objection lies in the undesirability of having therms and ions chasing each other along the same conductor. You should consult a standard work on thermionics if you desire further information on this point.

10. Do I require a special kind of earth with a frame?

It all depends on what you want to grow in the frame. If you want to grow a solenoid of the cucumber type, you will require a fair degree of amplification in the shape of artificial fertiliser.

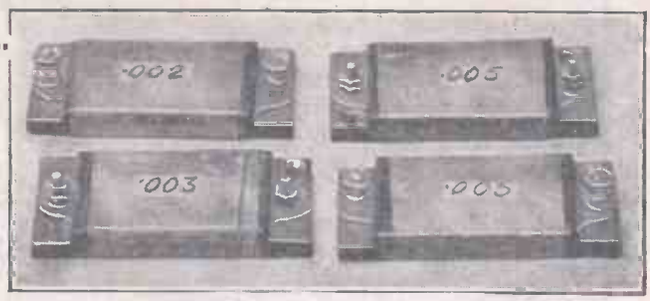
11. What is the best thing to do with a poor earth?

Bury it out of sight.

12. What happens if I use my earth for an aerial?

Nothing, generally.

MAKING YOUR OWN FIXED CONDENSERS



Photograph of Group of Condensers.

THE fact that so many condensers are used in wireless circuits, especially multi-valve sets, is sufficient to warrant the amateur constructing his own, especially when it is realised how simple they are to make.

From the following it will also be seen that they can be made to a desired capacity which can be relied upon as being reasonably accurate.

The method of construction described below is somewhat different to that ordinarily used.

The photograph illustrates a few of the condensers made for the writer's sets, and it will be seen that they are uniform in size and in design, and present quite a neat appearance. The capacity is denoted on each, and terminal nuts are fitted for attaching connections. Whilst admitting that soldered connections are superior, the writer has found that condensers of different values have to be tried before the best results are obtained, and this necessitates an easy method of changing connections. Terminals, therefore, will save a lot of time.

Capacity Values

The most usual values are .0003 microfarad for grid condenser, .002 to .004 microfarad for telephones, .005 to .01 microfarad for reservoir condenser of H.T. battery, and .002 microfarad as a stabilising condenser for the primary of the L.F. transformer. These values may be varied to suit individual requirements.

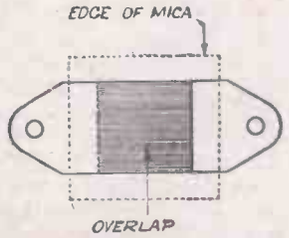


Fig. 1.—Explanbtion of Overlap.

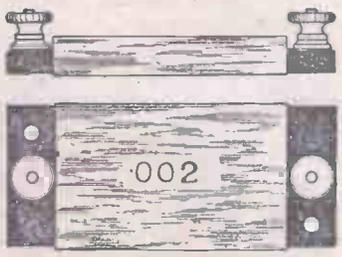


Fig. 3.—Elevation and Plan of Finished Condenser.

Construction

Working on the fact that the capacity between two tinfoils having an "overlap" or effective area of 1 sq. in. when interspaced with mica .002 thick is .001 microfarad, it is easy to determine the number of foils and their size for any capacity (Fig. 1 illustrates the meaning of overlap). For instance, a condenser of .0003 microfarad requires two tinfoils having 1 in. by .3 in. overlap and one mica, or alternatively four tinfoils .5 in. by .3 in. and three micas.

After deciding upon the overlap, cut the mica sheet ½ in. larger in width and length, thus allowing ¼ in. from the edge

Capacity	*Numbers and size of tinfoils*	
Microfarads	*2 tinfoils and 1 mica*	*4 tinfoils and 3 micas*
·0001	1 × ·1	·5 × ·1
·0003	1 × ·3	·5 × ·3
·0005	1 × ·5	1 × ·25
·0007	1 × ·7	1 × ·35
·001	1 × 1	1 × ·5
·002	1 × 2	1 × 1
·003	1 × 3	1 × 1·5
·004	1 × 4	1 × 2
·005	1·5 × 3·3	1·5 × 1·6
·006	1·5 × 4	1·5 × 2
·007	1·5 × 4·6	1·5 × 2·3
·008	2 × 4	2 × 2
·009	2 × 4·5	2 × 2·2
·01	2 × 5	2 × 2·5
·02	3 × 6·6	3 × 3·3

of the tinfoil to the edge of the mica. This refers to all capacities, and is to ensure that no leakage occurs round the edges.

When the parts are prepared, after coating lightly with shellac, lay the first tinfoil on the ebonite block E (Fig. 2), which is 3½ in. by 1½ in. by ¼ in. thick and is provided with two 4 B.A. studs. Next coat the mica sheet with shellac also and proceed similarly with the remaining layers.

In Fig. 2 E is the ebonite base, S studs, M mica and T the tinfoils.

A piece of cardboard C cut to the same size as the mica forms a substantial protector for the layers.

Finishing

To complete the condenser, press it for a few hours by placing a weight upon the cardboard, after which bind the whole with two or three turns of shellacked paper. The completed condenser should then appear as shown in Fig. 3.

The table shows the number and sizes in inches of tinfoils and micas for different capacities.

H. J. T.

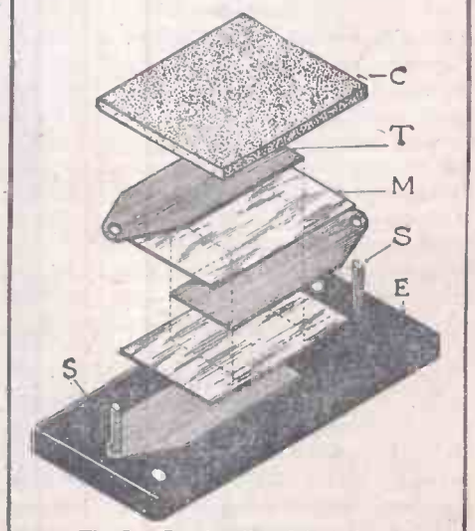


Fig. 2.—Constructional Details of Condenser.

EBONITE AND SULPHURIC ACID

MANY a dealer has found to his regret that it does not pay to put a wireless instrument with an ebonite panel in his window and allow it to be exposed to strong sunlight for a long time. No doubt amateurs also have found that if they do not lacquer the terminals and brass work on their instruments they go black in course of time. This occurs more rapidly with matt-finished panels than with polished ones. The reason for this is quite simple. Ebonite contains a large proportion of sulphur, which can easily be detected by its smell when a piece is sawn or filed, and the action of strong sunlight together with moisture in the air causes this sulphur to turn into sulphuric acid.

This not only spoils the brass work, but it also has a bad effect upon the insulating qualities of the top surface of the panel. For this reason all ebonite work should be stored in dark places. In electrical laboratories where there is expensive and delicate apparatus the blinds are always kept half drawn.

J. F. S.

MY PET WIRELESS GRIEVANCE

A Husband!

MY pet wireless grievance is—my husband!

We have a valve set which my husband made himself, and never feels entirely satisfied with—like most creators.

Sometimes we sit a whole evening "listening"—the fire burning cheerfully, the wee bairn asleep, work done. Blissful evenings!

Alas, there are others! Evenings when too little high- or too much low-tension, imagined rough reception, etc. etc., cause constant upheaval from the armchair opposite mine.

Then there are those periodical experiments which cut out whole "chunks" of the programme, while I wait hopefully, but not too surely, for the pending improvement.

Those occasions, too, when Brown comes across, and I listen unintelligently to the stream of technical conversation. I only understood once. That was when they took the entire apparatus over to Brown's to try the effect on *his* aerial. I only remember the effect on my temper.

But what have come nearest to causing serious domestic disturbances have been some of the week-ends. The aerial altered on Saturday, only to go back to its old place on Sunday; the trial of different valves guaranteed to get "maximum results on minimum current"; the new circuits with their aftermath of solder, wire and—disappointment.

Ah, well! I try not to be unsympathetic or ungrateful, but some day I will build my own set, with a circuit beyond reproach.—(MRS.) IVY CHAPMAN (Pendlebury).

Intervals

MY pet wireless grievance is intervals; that is, those intervals which can be eliminated, and by so doing improve the programme. I think there must be about half an hour wasted in a night's programme sometimes, and I would like to suggest a way of using these waits. Between songs, for instance, the announcer could give a few words on the composer or singer of the song. On a humorous night jokes could be split (preferably new ones), thus keeping up the spirit of joviality. If these suggestions could be carried out it would keep the listeners-in interested during the whole time the programme was on, and would also help experimenters considerably.

Another use the intervals could be put to would be to have a tuning note sent out, so that listeners-in who have only just connected up could tune their sets without annoying their fellow listeners-in for miles around. This is my only grievance, and it could be removed by taking heed of the above hints.—L. H. THOMPSON (Manchester).

Standards

WHY is it that experimenters and constructors should have so much difficulty in obtaining standard-size parts necessary in the construction of wireless apparatus. Every dealer in wireless gear appears to have a standard (?) of his own. In variable condensers, for instance, one meets with several different sizes of plates and washers. I fail to see the reason for this variation, as it is a source of much annoyance to find that in building up a piece of apparatus, say a screw or some small part is minus, and a search is made in the junk box, a part found, and then when it comes to fitting them together one is either too large or too small. Naturally this usually happens when shops are closed or when it is not convenient to go racing about for parts to suit. How many times do you happen to get a piece of 2 B.A. rod to fit a few nuts, same size, that you might have handy? Not very often, unless a die or tap is available to remedy matters. In the latter case, which is common, it is a case of inaccuracy in the manufacture, and I think that it is time some of the makers of these parts learned to use the micrometer.—W. RUSSELL (Smethwick).

THIS IS OUR DISCUSSION PAGE

READERS are here given an opportunity of contributing their opinions on topics of the day. Mrs. Ivy Chapman, Ivy Villa, Station Road, Pendlebury, is the writer of the letter placed first on this page, and we shall send her one guinea in due course. The writers of the other letters printed will each receive 7s. 6d.

In continuation of the idea we invite any reader to send us by first post

Next Wednesday, March 5

a bright, non-technical, interesting letter of not more than 250 words (written on one side of the paper) on the subject mentioned below.

We shall publish as soon as possible about five or six of the letters and for the one placed first shall pay **one guinea**, whilst for any other letter published on the page we shall pay 7s. 6d.

Envelopes should be addressed: **Discussion Page**, Editor, "Amateur Wireless," La Belle Sauvage, London, E.C.4.

"Discussion Page" letters not printed will be destroyed. No correspondence on the subject can be entered into.

The next subject is:

"Why I Welcome High-power Broadcasting"

Call Signs

I AM one of those who, starting with a 7s. 6d. crystal set, have become so engrossed in "wireless" that by degrees I have reached the three-valve stage.

At present I am infected with "stationitis." That is to say, my chief pastime is to compile a list of stations received by my set. The list is getting quite a long one now, and includes, of course, amateur, commercial and broadcasting stations.

Sunday mornings and the evenings before the B.B.C. start are my happy hunting times. But with my "pet" pastime comes my pet grievance, and it is this: A great many amateur transmitters fail to give their call sign either when they come on or when they close down or change over.

A few nights ago I faintly heard a station which had every indication of being a long distance away (and this is where the excitement comes in), for I was hoping it would prove to be a long-distance "record." So I stuck it for half an hour, waiting for the call sign. But all we got was: "Well, Fred (?), I think this has been my best transmission so far, and if you are getting me O.K. perhaps you will let me know in the morning. I am closing down now."

This is very exasperating, to say the least, and I think that amateur transmitters might pay a little more attention to this small but important matter for the benefit of their large (but unseen) audience.—A. S. HANDS (Moseley).

Selfishness

I THINK that the chief wireless grievance of the true amateur is the utter selfishness of the average broadcast listener. You are constantly hearing such expressions as: "I think that all Morse stations should close down during broadcast hours." "No amateur transmission should be indulged in during the same period." "All stations using spark or arc should be converted to valve," etc.

Do broadcast listeners realise that of all the users of the ether they are of the least importance?

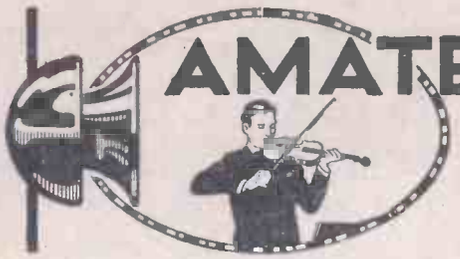
Do they realise that a lot of the jamming that they experience is through the badly-designed apparatus that they use?

Do they know that amateur transmitters have a perfect right to use the 180-metre wavelength during broadcast hours?

Do they realise that valve transmission would be unsuitable for a lot of the work done by ships, etc.?

Do they ever think of the enormous inconvenience caused to hundreds of amateurs by broadcasting, and that the

(*Concluded on page 274*)



AMATEUR TRANSMISSION

THE MICROPHONE

IN order to transmit speech and music it is necessary in the first place to "modulate" the continuous wave generated by the valve transmitter. By the term modulate we mean that the audible-frequency speech vibrations are superposed on the steady wave emitted from the aerial, thus causing the amplitude of the carrier wave, as it is termed, to be varied according to the particular sound being transmitted.

Modulation

Now the modulation in a wireless telephone transmitter is by no means as easy as might be imagined at first sight. First and foremost the carrier wave must be an absolutely pure sine wave. In order to obtain this the high-tension feed to the valve, from whatever source it is produced, must be quite free from ripples. Secondly,

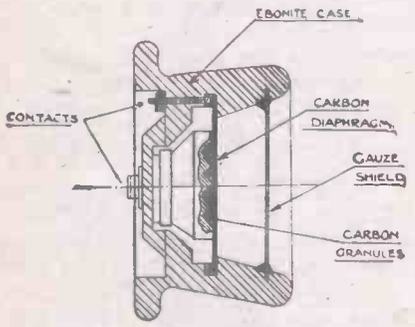


Fig. 1.—Section of Carbon-type Microphone.

it should be remembered that the ordinary spoken sentence, when shown graphically as a sound wave, is exceedingly complex, and therefore the instrument used for superposing these vibrations on the carrier wave must be capable of reproducing this complex wave as perfectly as possible. For example, the sound "ah" consists of a fundamental frequency of approximately 800 cycles per second, varying to a frequency of 180 cycles per second.

The only instrument which is at present capable of satisfactorily reproducing the complex wave form of human speech and music in a manner suitable for telephony is the microphone.

Types of Microphone

Various designs of microphone are in common use, most of which are based on the original Post Office "solid back" type. The naval pattern shown in the accompanying diagram (Fig. 1) is a very suitable type for amateur use. From this it will be seen that a carbon diaphragm is employed, this being divided into a number of pyramid-shaped pieces to the points of which are fixed small tufts of silk; these damp the vibrations of the diaphragm and help to prevent "packing" (or sticking) by keeping the carbon granules in place.

Briefly the action of the microphone transmitter is as follows: So long as the diaphragm remains stationary the current in the microphone circuit remains steady, but as soon as the diaphragm vibrates the contacts between it and the carbon granules are varied, thus producing what is termed the "phenomenon of loose contact" and causing alterations in the resistance of the microphone which vary the current flowing through it.

Methods of Modulation

We may now consider the various means which are employed to modulate the carrier wave, and these methods may be classified as follows:

(1) Modulating the aerial resistance. (2) Modulating the grid voltage of the oscillating valve. (3) Modulating the anode voltage of the oscillating valve.

The first method is very simple, and consists simply of a continuous-wave valve transmitter with the microphone connected in the earth lead. When the microphone is spoken into its carbon granules are shaken up and its internal resistance varied in accordance with the sound waves; this varies the aerial resistance and modulates the amplitude of the carrier wave. This method is only suitable for very low powers, and in any case the microphone must be placed on the earth side of a "stopping" condenser inserted in the earth lead. The function of this condenser is to prevent the high-tension voltage flowing through the microphone.

Owing to the comparatively high resistance of the microphone, the aerial resistance will be increased accordingly, thus reducing the radiated power. For this reason if the microphone is inserted in the aerial circuit it is best to couple it to the earth lead by means of a microphone transformer (very similar to the telephone transformer used in a receiver) so that the microphone resistance is not actually in the aerial circuit. When this is done the stopping condenser may be omitted.

The writer is of the opinion that for the amateur who is starting telephony transmission the grid-voltage modulation method is probably easier than anode-voltage modulation, and we shall therefore deal with the grid control first. In this case the microphone is inductively coupled through a microphone transformer to the grid circuit as shown at X Y in the diagram on page 365 of AMATEUR WIRELESS No. 71. The complete microphone circuit is shown in Fig. 2. Here, as in the first case, the resistance of the microphone will alter when spoken into, thus varying the steady potential applied to the grid, which in its turn will vary the aerial current.

Anode-voltage Modulation

Finally we come to the modulation of anode voltage. This method employs two valves, the oscillator and a modulator. Their plates are in parallel and are both fed through an iron-cored inductance (known as a choke) placed between the plates of the two valves and the positive of the high-tension supply. The microphone, as before, is inductively coupled to the grid of the modulating valve. When speech is not taking place, the oscillating valve is generating an unmodulated continuous wave in the aerial, the modulating valve simply taking a certain steady

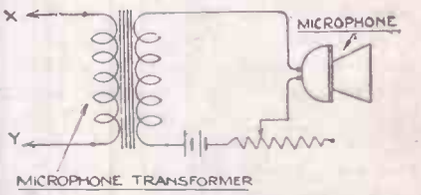


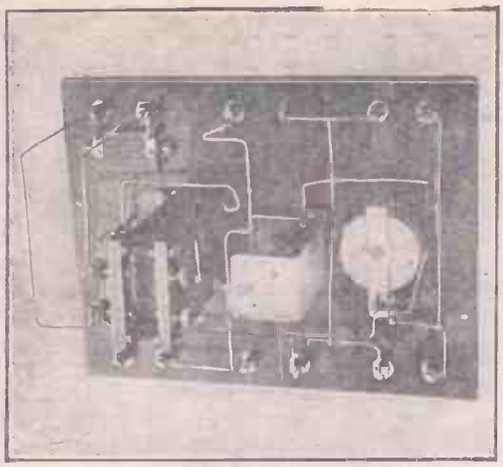
Fig. 2.—Diagram of Microphone Circuit.

current. When the microphone is spoken into, the grid potential and therefore the plate current of the modulator will be varied at speech frequency.

Owing to the very large inductance of the choke coil these variations of current cannot come from the high-tension supply and therefore the plate voltage of the modulating valve will be varied in accordance with the speech in the microphone; thus the amplitude of the carrier wave will be suitably modulated. G. L. M.

L.F. TRANSFORMERS

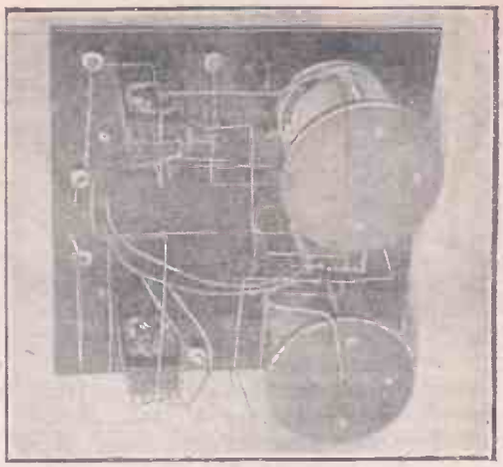
IN a set employing more than one stage of low-frequency amplification there is very likely to be interaction between the transformers. This can be prevented by earthing the iron cores. The transformers must also be mounted as far as possible from one another. Further precautions against howling can be taken by encasing the transformer or the whole L.F. amplifying unit in an iron case. F. F. B.



Photograph of Back of L.F. Panel.

A Four-valve Unit Set

The concluding article of a series of three on the building of a selective receiver.



Photograph of Back of Tuner Unit.

THE chief features of the low-frequency panel are the facilities for the introduction of low-frequency reaction on to the aerial-circuit coil if desired (see Fig. 6), and the negative grid-bias battery, the value of which depends on the kind of transformer used and will have to be found by experiment. A high resistance may be shunted across the secondary winding of the L.F. transformer at a small sacrifice of signal strength if desired.

For demonstrations in large halls it is advisable to use a power amplifier, but for ordinary loud-speaker work this set will be found to be absolutely satisfactory both for all the British stations and also the Continental stations.

It will be noticed that the voltage in the plate of the first H.F. valve is considerably lower than for the other stages. The reason for this is that the signals on the grid of the first valve are comparatively weak, hence the grid voltage is small, and to get perfect amplification a balance of oscillations on each side of the zero point of the valve must be obtained.

The actual plate voltages used by the writer are as follows: 30 volts on first H.F., 45 volts on second H.F. or detector valve, 75 volts on the L.F. valve with 2½ volts negative grid-bias (Fig. 7).

The photographs show the wiring of the different units. The frame aerial, shown in the photograph on p. 189, is used for broadcast receptions. It consists of six turns of rubber-covered flex, spaced ½ in. apart, on a 7-ft. square frame. It is tuned by means of .001 microfarad variable condenser.

W. H. L.

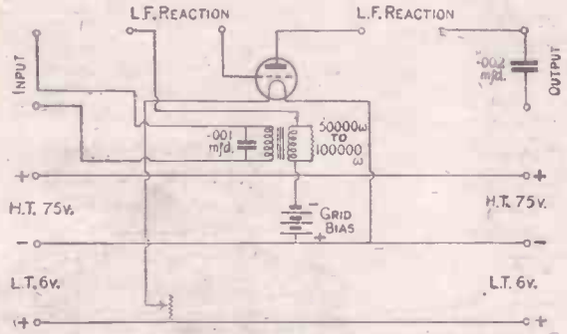


Fig. 6.—Circuit Diagram of Low-frequency Unit.

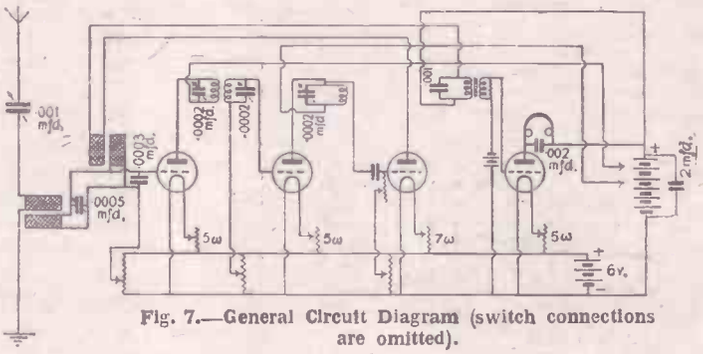


Fig. 7.—General Circuit Diagram (switch connections are omitted).

PROMISE OF CHEAPER VALVES

A NEW process has been invented by means of which thermionic valves can be manufactured by mass methods at a relatively low cost. This is rendered possible by adopting an improved method of mounting the electrodes in the glass stub of the valves. Instead of sealing each electrode support and leading-in wire directly into the stub, they are first secured to four short tubes, which are then mounted on a jig. The glass tube forming the stub is next brought into position, and is heated until soft, when the end of the glass is pinched in so as to embed the lower ends of the tubes firmly in position.

This operation can be carried out by comparatively unskilled labour at an increased rate of output. It is to be hoped that this innovation will be followed by a substantial drop in prices.

M. A. L.

PENNY-IN-THE-SLOT WIRELESS

THE coin-freed wireless receiver has already made its appearance in the country which first put the grid in Professor Fleming's valve and which now specialises in "tickler hook-ups." A coin inserted in the slot closes a switch for a limited period and so completes the aerial circuit. The tuning is left to the patron's fancy.

By a further extension of the same idea it is proposed to bring broadcast into every home by way of the electric light wires. The whole electric supply system is fed with modulated high-frequency energy which does not interfere in any way with the ordinary current. In each house a meter is fitted which, when a coin is introduced, allows a loud-speaker or phone set to be connected up.

A. M.

BROADCASTING IN DENMARK

ENTHUSIASTIC amateurs in Denmark are never tired of trying to pick up the United States programme, although their country lies in a somewhat more unfavourable position to receive America than other European countries.

However, now that it has become dark during the hours that America transmits, conditions for hearing are much better than during the light summer evenings, and some of the Danish amateurs have lately made it a practice to "listen-in" for America about 3 or 4 o'clock in the morning. Several of these enthusiasts report getting different American stations, particularly Schenectady (W G Y) on a 360-metre wave, orchestra music, solos and speeches being plainly heard.

Interest continues to increase, and it is estimated that there are now approximately 10,000 amateurs.

C. E. G.

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Its sound principle and splendid performance have inevitably created a great demand—for it is now realised as the ideal form of filament control for all types of valves.

The fact that valuable space has been devoted to its condemnation shows how it is feared on the market.

All suggestion of "packing" is entirely unfounded, and next week we shall give a full description of its construction, which should be interesting to all.

2/9
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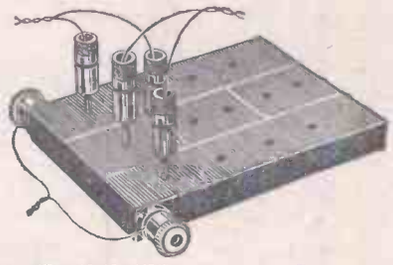

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With Wecovalves, Wuncell and similar valves use 2 cells in parallel.
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USE RADIAX SUPER-CELLS AND AVOID DISAPPOINTMENT

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2 way for Igranic Coils ... 4/6 &	5/0
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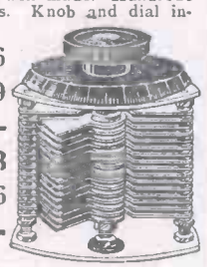

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On Your Wavelength!

When Experts Differ

THE other day, as is not infrequently the case, a strong wireless atmosphere permeated the railway carriage in which I travelled to town. Upon this occasion heavy guns were in play, the cause of argument being the somewhat abstruse problem as to whether the plate current of a valve, as measured by a milliammeter, increases or decreases as the grid and plate coils are brought into tight coupling—in other words, as the valve is set into self-oscillation. One enthusiast with tousled hair and an imposing expanse of forehead was emphatic to the verge of violence. He had tried it out and knew, without a shadow of doubt, that the plate current fell as the point of oscillation was reached. His protagonist, however, remained obdurate. He also had experimented, and stoutly insisted that the plate current rose in such circumstances.

The rest of us maintained a respectful silence. Nevertheless, I was intrigued, and put the point at luncheon the same day to a wireless pundit who sometimes condescends to me in matters of this sort. His reply solved the mystery and left both of my fellow-travellers with divided honours. For grid voltages below a certain value it appears that the average plate current rises as the valve starts to oscillate; whilst for grid voltages above this value the commencement of self-oscillation causes the current to drop. A curious point, which I pass on without further comment to those who have traffic with such things.

A Television "Valve"

Strenuous efforts are at present being made to solve the difficult problem of wireless television. Among the many ingenious contributions to this subject mention may be made of the Nakken valve, in which the ordinary nickel plate is replaced by a metal having photo-electric properties. It is well known that sodium-potassium amalgam, for instance, will emit a stream of electrons when exposed to light, and especially to ultra-violet rays. There are many other substances which also exhibit this peculiar reaction to light, and it is obvious that the phenomenon offers a possible means of translating light-rays of varying intensities into corresponding electrical effects, a process which lies at the root of the problem of television.

In the Nakken valve the normal current through the plate circuit can be controlled by directing a beam of light of varying intensity upon the photo-sensitive plate. The latter thereupon shoots off electrons at a rate which depends upon the intensity of the light ray. This sets up changes in the plate potential, which in turn controls the value of the plate current passing through the external circuit. Instead of making the plate of light-sensitive material, the grid may be so constructed. A beam of light which has been passed through a photographic negative is then caused to traverse the grid. The different gradations of light create corresponding fluctuations in the value of the grid potential, and these are, of course, reflected in the current flowing through the plate circuit.

The Great Broadcasting Station

We have heard quite a lot recently about the B.B.C.'s project for erecting somewhere near London a huge central station working with an output so great that it would probably bring a very large part of this country within crystal or, at any rate, single-valve range of the Metropolis. The power suggested is 25 kilowatts, and it is proposed that the wavelength shall be somewhere round about 1,600 metres. The station would transmit quite independently of 2 L O, two entirely different programmes being given at the same time. At first sight the scheme seems to be a very sound one, for not only would it give the crystal man a much better chance, but it would also solve to a very large extent the problem of simultaneous broadcasting. At the present time there is some difficulty in working over land-lines owing to the effects of induction and to other causes as well. With such a powerful station all relaying could be done through the ether. The B.B.C. would simply be putting into practice on a much larger scale the system already in use for transmitting opera from the Old Vic Theatre via 2 L O.

Some Snags

However, I see quite a number of breakers ahead. In the first place, I do not think that the suggested wavelength of 1,600 metres will be found very satisfactory. With telephony you get as a rule a very powerful harmonic on one-quarter the fundamental wavelength. If you can tune your set down to very short wavelengths you will find that 2 L O comes in very powerfully on a little over 90 metres, this being a quarter of 365, his real wavelength. The first harmonic, too, one-half the wavelength, is usually quite a powerful one; several correspondents have already reported their ability to hear 2 L O when their sets are tuned to 182.5 metres. With a 25-kilowatt transmission on 1,600 metres we might expect a bad harmonic of 800 metres and a still more powerful one of 400. This last coming right in the middle of the present broadcasting band would probably be found seriously to interfere with reception of existing stations. The Air Ministry, too, I imagine, would not welcome 1,600 metres, for they make use of a wavelength not very far removed from this. Even if they raised no objection their own transmissions would cause a good deal of annoyance to broadcast listeners.

I very much wonder how big a wave band a 25-kilowatt transmission would cover at, say, 30 miles' range. I rather fancy that except with sets of the most selective type everything else would be blotted out for at least 200 metres on either side. This means that Radiola would be wiped off the map so far as south-country listeners are concerned, which is a blow not to be contemplated lightly.

Converting Sets

The point that has been made that all the existing sets designed for broadcast reception only would have to be re-made is not nearly so serious as it might appear at first sight. There are very few sets of any kind which cannot be loaded up without any great difficulty by the use of larger coils or of fixed condensers placed in parallel with the existing ones. It does not, of course, conduce to efficiency to add a great deal of capacity in parallel, but when working upon the reception of a transmission so powerful as that contemplated, efficiency is not a matter of vast moment, since you have a great deal more to play with than is the case now. The greater the power, the less efficient need sets be. For example, if you live in London quite close to 2 L O, where the power received by your aerial is enormous compared with that which reaches those five or ten miles away, you can receive his transmissions by hooking up a receiver consisting simply of a crystal detector and a pair of telephones. It will come through even if you use neither tuning coil nor condenser—and you cannot imagine a much more inefficient outfit than that! It should not cost more than a couple of pounds to convert a short-wave valve set with a double-circuit tuner so that it will be able to receive on 1,600 metres. With simpler sets the job is one that anyone could do, for in most cases all that would be necessary would be to buy or make a single-coil holder, to provide it with a basket or honeycomb coil, and to wire it between the lead-in and the aerial terminal of the set.

One good thing about a more powerful transmission would be the likelihood that howling would be very much reduced.

On Your Wavelength (continued)

Most of that with which we are troubled at present emanates from single-valve sets whose owners are pushing reaction up to its limit in order to obtain the loudest possible signals from a comparatively weak transmission. Deal out 25 kilowatts and you will give them automatically pretty well as much power as they want without their having to use reaction at all.

The Amateurs

It is apparent that favourable conditions for long-distance transmissions are not always consistent, even over a very small area. For instance, the week-end Saturday and Sunday, February 16 and 17, my Belfast correspondent reports that whilst reception of amateurs in the London district was well-nigh impossible, he received fair speech from 6 N H on .4 to .5 ampere aerial reading and strong speech from 2 N M, both situated at Caterham! As a rule it is comparatively easy for him to receive 2 O N on speech, but last week, although 2 O N was working well, it was extremely difficult for him to receive that station at all. As the distance between Caterham and Wanstead or Walthamstow is not more than thirty miles, it appears that whilst one area might be favourably situated as regards D.X. work, a close-by area on the same night at approximately the same time might be under some atmospheric condtions which make it impossible for it to carry out successful work of this nature.

By the way, I regret that through a clerical error I referred to the stations 1 X A R and 1 X A M as being Dutch stations in my last week's notes, whereas they are, of course, American. I must get rid of my "Dutch valve"; it's becoming an obsession!

Dutch Valves

Speaking of Dutch valves, of which kind things have been said in these pages, a V24 valve with positive grid leak is equal to this valve at any time in "detecting" properties. It is, of course, more expensive in first cost, but it will, if properly handled, outlast many "Dutchmen." It gives very pure rectification, the microphonics, etc., often apparent with Dutch valves, being entirely absent. I could never quite understand why people enthused over Dutch valves. They are certainly good straight rectifiers, but when the same valve is used with any form of regeneration its shortcomings become apparent. You cannot get into the "silent point" in a carrier wave so easily with a Dutch valve as you can with a V24. Another equally good valve is the Cossor. I think that many people make the mistake of using a standard grid leak connected to L.T. negative or shunted across the grid condenser, whereas many valves serve quite well as rectifiers if the grid leak is made positive instead of negative.

"Ready-made" or "Home-made"?

One persistent question faces the enthusiast bursting into the wireless game: "Shall it be 'ready-made' or 'home-made'"? The question is not altogether one of difference in financial outlay, since there are quite a number of components now on the market at prices which savour of "Ford-iness"—and what is more, they are reliable! For example, as long as I can buy a solenoid coil ready wound and tapped for half a crown, or a variometer complete with knob and dial for another shilling or so, I do not feel tempted to buy the parts and wind the things myself. Our wireless literature is bristling with tips on how to make such components—and very ingenious most of them are—but a little consideration of what to buy and what to make is worth the amateur's while. There is not the slightest doubt that a lot of the units for a home-made set can be constructed on the kitchen table, and, further, they will work. In fact when one views some of the "home-mades" in the wireless line it is hard to conceive of the impossibility of anything working.

The Wrong Way—

A tack hammer would probably drive a railroad spike if you had the time to stay with it and the hammer lasted as long, but there are better ways. Not fully understanding just what efficiency in a receiving set means, the beginner is pleased with results which he will consider very meagre indeed after a few months' experience. This is as it should be, for the knowledge and bumps he gets in constructing his first set will be the best education he could have. He will learn that to make a really efficient coil is not as easy as rolling off the proverbial log. I have seen so-called coils on which the wire was draped rather than wound, but their perpetrators were ecstatic over them because they worked—or at least made an effort. Similarly I have come across novices who proudly exhibit weird contrivances which they had made for vario-couplers, and because they had one coil on a shaft wobbling about inside another coil they deemed such description justified.

—and the Best Way

The kernel of the matter is that the beginner would do better to put himself in the hands of a more experienced friend when he comes to make his own set. Such a friend will advise him to give up attempts at constructing his own transformers and other complicated work and direct his ingenuity to the more straightforward tasks. The proper designing of a panel, for instance, will give the home mechanic lots of scope for his engineering ability. It includes a judicious arrangement of the various parts for minimum losses; the careful drilling of holes in just exactly their right places so that taps and dies function smoothly; and the placing of parts behind the panel to avoid clashing of signal energy and to make for the shortest possible leads. The assembly of a set, including the making of a presentable cabinet, has in itself the elements of a job worthy of the mettle of a first-class artisan, and the kitchen-table wireless engineer will be well advised to exert most of his genius along these lines, leaving the construction of units to those who, through specially designed appliances, are able to build parts which are beyond the range of the home workshop.

New Plays for Old

While giving all possible credit to the intentions of the directors at 2 L O to give us suitable plays, they have not yet found the right medium, as evidenced by *The Tragedy of Mr. Punch* and *Columbine*. It was obvious in both cases that sight was as necessary as hearing. Why not hark back to some of the old plays?

A Unique Experiment at 2 L O

With the laudable desire of gaining both "on the swings and the roundabouts," if I may be thus allowed to describe the B.B.C.'s Symphony concert given last Friday night at Central Hall, the idea was an excellent one, but unfortunately it did not work out as well in practice as in theory. Listeners in the actual hall had one of the greatest musical treats in their lives. From the wireless standpoint it was not so satisfactory. Every listener-in must have realised the difference that would have been made had the same programme been carried out in the B.B.C.'s own studio. Central Hall, Westminster, frankly speaking, is not the best acoustically even for an ordinary concert, and for broadcasting purposes it is certainly not suitable. The consequence was that the instruments near the microphone were overpowering, those far away inaudible. I do not doubt that alterations can be made, but it would be interesting to compare notes on the experiences of other listeners-in. THERMION.

It is stated by a writer in a local paper that if the artistes get too near to the microphone at the Cardiff station sparks are caused in the control room!

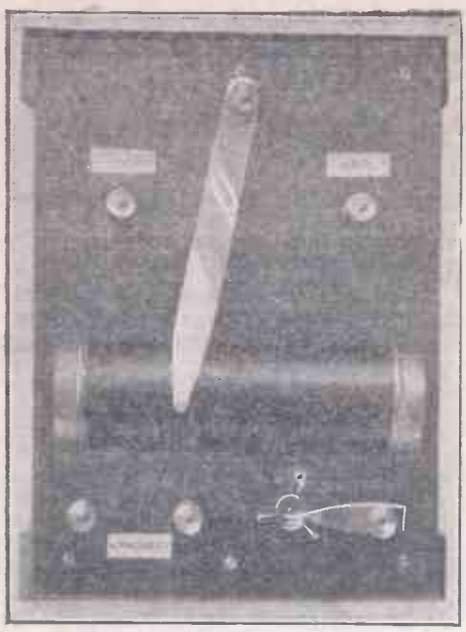


Fig. 1.—Top View of Receiver.

A CRYSTAL RECEIVER FOR BROADCAST RECEPTION

A CHEAP, compact and very efficient crystal receiver for broadcast transmissions may be easily constructed by following the directions given in this article.

A photograph of the complete receiver is shown by Fig. 1. The necessary components are a baseboord stiffened with two cross pieces, six terminals (two of which should be of the pillar type), a strip of springy brass for the tuning arm, a crystal detector, an incandescent gas-mantle box, and some No. 24 S.W.G. enamelled wire, together with a few screws and other oddments mentioned later.

The baseboard is first prepared. It is better if made of some well-seasoned hard wood, such as mahogany or walnut, and should be 8 in. long by 6 in. wide by ¾ in. thick. Two cross pieces each 6½ in. by 1 in. by ¾ in. should be fixed at each end.

The positions of the components can be seen in Fig. 2. The holes for the terminals for aerial, earth and telephones should be drilled and then the baseboard may be varnished or french polished.

Tuning Coil

The inductance coil can next be wound. For this an upright incandescent gas-mantle box is quite suitable as a former. These are usually 4½ in. long and 1½ in. in diameter. For those living near Aberdeen or Birmingham, stations having a higher wavelength, it is advisable to use a tube of 2 in. in diameter and of the same length. It should be well dried and given a coat of shellac varnish or paraffin-wax. Two circular wooden blocks each ¾ in. thick are prepared and are glued in the ends of the former so that ¼ in. projects. This is to enable the coil to be screwed to the baseboard later on (Fig. 2).

The wire used is No. 24 S.W.G. enamelled copper, and about 2 oz. will be required for the gas-mantle box, or more in proportion if the larger former is used. One end of the wire is well secured by twice twisting round a small brass brad driven into one circular end piece close up to the cardboard tube. The whole tube is then wound full. This requires a little care in order to make a satisfactory job. Care should be taken to see that all turns of wire lie close together. The last turn of all is passed twice round another small brad and about 6 in. of wire is left for making a connection to the earth terminal. A coat of shellac may be given in order to fix the wire in position.

The coil may be fixed permanently in position with brass screws. The loose end of wire is placed on the left and passed through a small hole in the base to the under side. The axis of the coil should be 2¾ in. from the front edge (Fig. 2). Terminals for aerial, earth and telephones may now also be screwed into position.

The tuning arm is made from a strip of springy brass ⅛ in. thick, 5½ in. long and ½ in. wide, cut and filed to shape as shown in Fig. 3. A hole is drilled at the wide end large enough to clear one of the pillar-type terminals. About ⅛ in. of the narrow end is bent over at right angles to form the contact on the coil. This should be nicely rounded off with a file and emery-cloth so that no sharp corners remain.

The best position for the tuning-arm pivot terminal must be found by trial. The arm is first bent to a nice curve, as in Fig. 4, and then arranged in position so that the contact travels as nearly as possible along the top of the inductance. In the set shown the pivot terminal is 1 in. from the back edge. This is first screwed in position with the head removed, the tuning arm is next put on, then a spring washer, followed by the terminal head, which is screwed down until the arm will move freely. A spare terminal head may be screwed tightly down to the first one to act as a lock nut. The arm is now moved backwards and forwards several times with the contact end pressed firmly on the coil so that it removes all the insulation from the wire where it passes over. A small ebonite knob should be fitted in a convenient position.

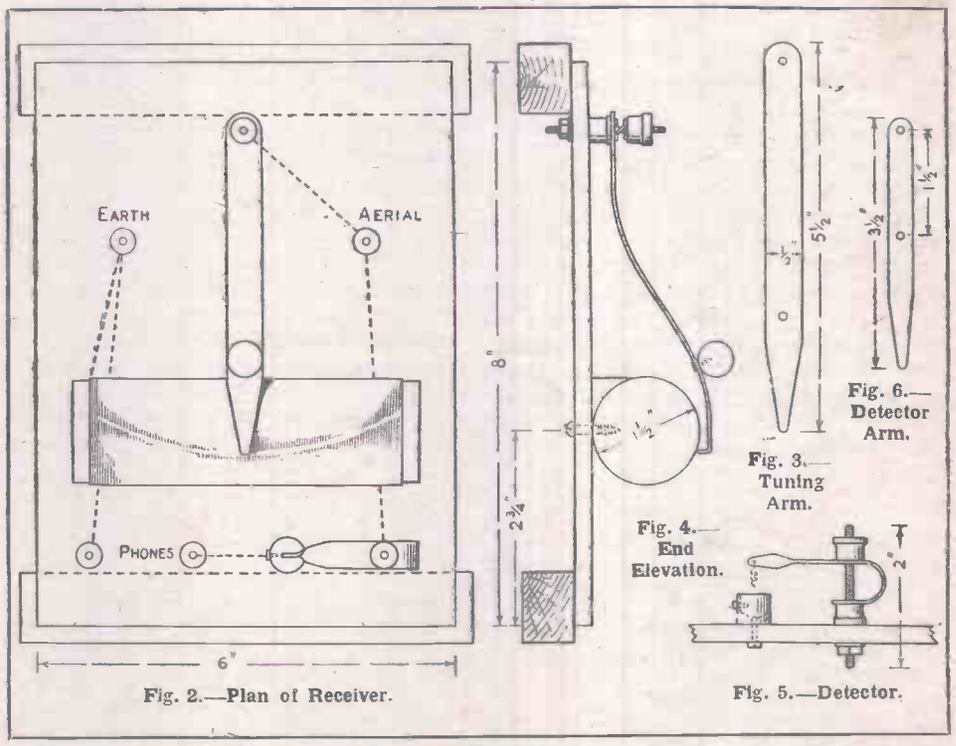


Fig. 2.—Plan of Receiver.

Fig. 3.—Tuning Arm.

Fig. 4.—End Elevation.

Fig. 5.—Detector.

Fig. 6.—Detector Arm.

Detector

A simple crystal detector may be easily constructed as follows: The remaining pillar-type terminal with its head removed is screwed into position as shown in Figs. 2 and 5. A strip of ⅛-in springy brass 3½ in. long and ⅜ in. wide should be cut and filed to shape as given in Fig. 6. The two large holes are of a size sufficient to clear the pillar of the terminal which forms the upright. The broad end is then

bent to a semicircular shape so that the two holes are over one another. About ⅛ in. of the narrow end is given a half twist with a pair of pliers, and a small hole is bored in it close to the end. Through this is passed a short piece of thin bare copper wire—about No. 30 S.W.G. will suit admirably—a spot of solder serving to fix it securely. The loose end can be twisted into a spiral to form the catwhisker. By cutting obliquely across the wire with a pair of scissors it is possible to obtain a very fine point as a contact for the crystal. The crystal cup should be fixed immediately below the contact point of the crystal and the detector is then complete.

Three ivorine labels to mark aerial, earth and telephone terminals may be fixed in their positions if desired, and the receiver is then ready for wiring up, which is the final operation.

The necessary wiring connections can be seen in Fig. 2 shown with dotted lines. They should be made underneath the baseboard. The aerial terminal is connected to the pivot terminal of the tuning arm and also to the detector upright. The crystal cup is connected to the right-hand telephone terminal. The loose end of wire from the coil is joined to the earth terminal. The left-hand telephone terminal is also joined to the earth terminal. No. 24 S.W.G. enamelled wire is quite suitable, care being taken to see that all the insulation is removed where contact is made with terminals, etc.

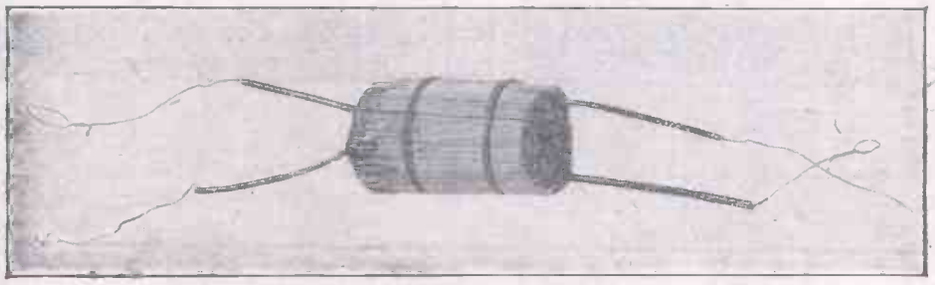
In use a light contact is first made on the crystal, and if a sensitive spot is found the tuning arm is moved either to the right or left until the loudest signal strength is obtained. This should be followed by another adjustment of the crystal detector, which will possibly again result in greater strength.

With this set at 4½ miles from 2 L O the orchestra can be clearly heard and the music recognised when holding the telephones at arm's length. The telephones should be of 4,000 ohms total resistance. With an efficient outdoor aerial good results should be obtained up to at least 20 miles, but, as with a receiver of any type, much will depend on the efficiency or otherwise of the aerial arrangements. E. M. K.

AROUND THE SHOWROOMS

Hedgehog Transformer

ALTHOUGH most low-frequency transformers have built-up, laminated cores, many experimenters prefer the hedgehog type of instrument with its comparatively rough bundle of soft iron wires. Some people are of the opinion that these transformers are more efficient than others, owing to the totally enclosed field. Certainly they seem to have all the advantages of a shrouded transformer and are ideal for tucking away in some corner of a set. The photograph shows a hedgehog transformer as supplied by Wates Bros., Ltd., of 13-14, Great Queen Street, W.C.2. I believe the ratio is 1 : 5.



Wates Bros.' Hedgehog Transformers.

Protecting the Phones

MOST of us, I suppose, treat our phones worse than any other of our apparatus. We leave them about in all kinds of dusty and dirty places (I do, anyway!). But there is no longer any excuse for doing that. Mr. W. H. Bishop, A.M.I.A.E., of 12, Corporation Road, Dudley, has just put on the market a bag made of damp-proof material in which a pair of phones can be placed when not in use. In this way they are kept clean and out of the dust. These bags cost 2s. each.

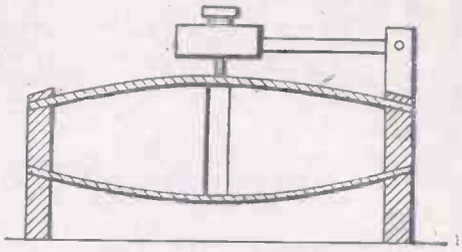
"Holbornite" Crystal

THOSE of us who are crystal users must be pleased at the change that has come about in the method of buying and selling the "little pieces of stuff that glitters." Not so many months ago you went into a shop, asked for a piece of your favourite "ite," and were then told to choose a piece, by carefully handling and inspecting it from a large tray of specimens. Now that is all changed. You can buy a piece of "Holbornite" crystal, nicely packed in a glass tube, for 1s. Thus you know that the crystal has not been handled and rejected by other buyers equally fastidious with yourself. If it does not give good results you can change it. VANGUARD.

PROGRESS AND INVENTION

Wooden Loud-speaker

MANY and various are the types of loud-speaker that have been invented. One of the latest has a sound box similar to that of a violin. Two thin veneered

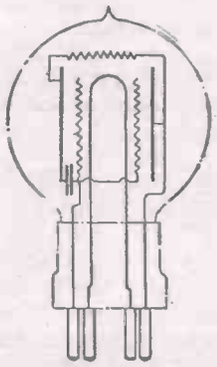


Wooden Loud-speaker (No. 207,487/24).

panels, between which are placed wooden cores, are held by thick vertical supports. In the top panel two sounding holes are provided; vibrations are transmitted to the bottom panel by the wooden core. A telephone receiver, to the diaphragm of which a rod is attached, rests lightly on the top panel. Vibrations of the diaphragm thus cause the sound box to give loud signals. The bottom panel must be raised some distance from the surface on which the instrument is placed.

Valve Improvement

IN amplifying circuits it is well known that the valve elements are frequently interconnected by resistances and capacities. With multiple-electrode valves it is proposed in Patent No. 209,775/24 (E. K. Hunter, of Battersea, S.W.) that the elements should be inter-connected by



Valve Improvement (No. 209,775/24).

reaction components inside the bulb itself. By this arrangement only four leading-in wires would be required, two for the filament and two for the first grid and last anode of the system respectively. In the diagram a connection is taken straight to the first anode, then through a resistance to the second anode; this last is connected to one grid through a condenser. The electrode supports are not shown.

"BROADCASTING FROM WITHIN"

WITHIN the past eighteen months or so in which broadcasting has been developing most of us will have tried to visualise the happenings within the broadcasting stations. How far our impressions were right and how far they were wrong we are now able to learn at first hand. In "Broadcasting From Within" (Geo. Newnes, Ltd.) Mr. C. A. Lewis (Uncle Caractacus) gives up a real peep behind the scenes.

In the very early days we were all wont to grumble at the delays and intervals and criticise adversely the programme, but a perusal of this book shows us that there was a reason for every irritating pinprick which we experienced. Here is Mr. Lewis's description of the daily scenes in the studio of the first broadcasting station, then situated at Marconi House: "There were four microphones in this studio, and, would you believe it, the engineers positively could not leave them alone. They tapped them, shouted at them, coaxed them, and whispered to them every minute of the day. They hung them here and then there, they played the piano to them, took their temperatures, measured their appetite, and, in fact, treated them like a lot of spoiled children. And more than this, they insisted on silence in the room while they were doing it.

"Now you can imagine the state of the room! A dozen or more artistes waiting audition, half a dozen engineers playing with microphones, two screaming telephones, a typewriter, and amid all this Mr. Jefferies, single-handed, attending to everyone and producing at the end of the day a three-hour musical programme." Can we wonder but that delays were inevitable?

It must not be thought that even at the present day everything runs smoothly, for although programmes are planned weeks ahead there is always the possibility of some item of immediate interest cropping up which will upset the most carefully laid plans. Then, as Mr. Lewis says, again there is always the chance of something going wrong, and the breach has to be glossed over somehow.

Although "Broadcasting From Within" is not an official record of the B.B.C., it gives as much of its history as will interest the average person. It tells of the early Writtle transmissions and of the early days at 2 L O when the station had to close down for three minutes in every ten to listen for possible S.O.S. signals. In the chapter devoted to details of organisation some insight into the cost of broadcasting is given. The payments made for entertainment purposes alone, exclusive of station expenses, we are told, approximate £2,000 per week, or £104,000 per year, a figure which, though it seems high, does not occasion so much surprise when it is realised that about 6,000 concerts are given annually.

We have a listening acquaintance with many of the staffs of the broadcasting stations, but there are many others whose acquaintance we make for the first time in the chapter headed "The People Behind the Microphone." There is even a mystery man who is called the Time Wizard. To him, we are told, we owe the perfect 'cello tones, the bright vocal qualities and the natural speech that we receive. His identity is a secret outside 2 L O, but we could make a shrewd guess.

Altogether the book is one that will interest every listener-in. The price is 2s. 6d.

U.S.A. Broadcasting Relayed

THE re-transmission of American broadcast last Saturday was the culmination of weeks of experimental work carried out night after night by the B.B.C. engineers. An army hut in the R.A.F. aerodrome at Biggin Hill, Kent, was leased to the B.B.C. for this purpose.

The aerial used at Biggin Hill on Saturday was a six-wire cage T-aerial, 30 ft. high and about 30 ft. long. Particular attention has been given to the insulation. A four-wire counterpoise is slung between the metal masts that support the aerial. There is also a 4-ft. frame aerial, with two turns of wire on it, inside the building, which is used at times.

The room in which the apparatus is housed is about 5 ft. wide and 20 ft. in length. A bench along one side carries the apparatus, which includes nine high-frequency valves on the neutrodyne principle, a detector and three power valves.

Biggin Hill is connected to 2 L O by land-line, and when America has been tuned in the programme is relayed to London, where it is re-transmitted.

K D K A, the Westinghouse Company's station at East Pittsburg, now transmits with a power of 7 kilowatts, which is an increase on the power used during the last transmission.

Saturday's programme started just after 11 o'clock and finished at 11.50 p.m. It consisted of the following items: "Blue Bells of Scotland," "British Grenadiers," "Marseillaise," "Russian National Anthem," and "Yankee Doodle."

At 11.50 p.m. Capt. Eckersley spoke from his house in Hampstead by telephone to 2 L O, and his speech was then broadcast. He said that it was unfortunate that the programme had been interfered with by atmospherics, which were unavoidable, but they would try again.

WIRELESS AND THE QUEUE!

WIRELESS is abolishing theatre queues. Even now the gallery and balcony queues at the Winter Garden Theatre, where "The Beauty Prize" is being played, have been done away with, the public being admitted at 6.45 p.m. From 7.0 p.m. to 8.0 p.m. the audience is entertained by the broadcasting from 2 L O. The Winter Garden is the first theatre in London to make use of broadcasting in this way, and the enterprise of the management is to be commended. We hope that the idea will be taken up elsewhere.

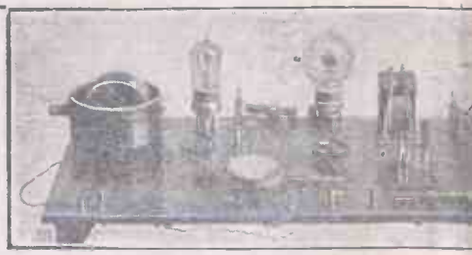
In commenting on the innovation, Mr. Archibald Haddon, the B.B.C. dramatic critic, said recently: "The other evening in the gallery of the Winter Garden Theatre I heard the sound of bells. It was the seven o'clock time signal from 2 L O, and it rang through the theatre from gallery to stalls, and even along the corridors, as loudly and clearly as in the broadcasting studio. Instantly the hum of conversation in the gallery ceased, and when the announcer at 2 L O started to give out the news bulletin no other voice could be heard among the hundreds of people waiting for the rising of the curtain.

"The scene before me reminded me of a passage in a speech I made several months ago to the members of a playgoer's club in London. 'Broadcasting,' I said, 'will one day be used for the entertainment of playgoers waiting in the queues or auditoriums.' Already the prophecy is fulfilled. The Winter Garden is the first theatre in England to make the innovation. On the night of my visit it was a great success. The speaking voices came over without distortion, and a piece of operatic music sounded like the quiet playing of the theatre's own orchestra."

Two loud-speakers working in conjunction with a "Gecophone" receiver make the broadcasting audible.

A plant propagator is useful in raising plants from seeds or cuttings where a greenhouse is not available, and how such a miniature garden frame may be made is well illustrated and described in the current issue of "Work" (3d.). Other articles included in this number are: "Amateur Silverwork: Making a Locket in Oxidised Silver"; "Player Pianos: Repair and Adjustment"; "Turning a Two-throw Crank"; "Fixing Wired-on Perambulator Tyres"; "Upholstering an Easy Chair"; "A Sensitive Electroscope"; "A Darkroom Measure-rack"; "Making Sewn Seats in Boots."

A REFLEX OR DUAL-AMPLIFICATION SET



DUAL amplification circuits are deserving of more attention than apparently is bestowed on them by the amateur. There appears to be a feeling among wireless enthusiasts generally that a dual circuit is a "freak" circuit, though nothing could be further from the truth. Some argue that a valve cannot be expected to function well as both high- and low-frequency amplifier at the same time.

Efficiency

The life or the general efficiency of the valve cannot be in question, as the filament current remains approximately the same whether it is used on the H.F. or L.F. side or as a dual amplifier, the only difference being that the grid has fed to it rectified current superimposed on the H.F. current, and the plate passes into its circuit both frequencies. Obviously there is no greater strain on a valve under these conditions than when it is functioning solely as radio- or audio-frequency amplifier. As for difficulty in operating dual sets, the one about to be described is far from being "tricky"; in fact, most of the annoying faults to be found in some single- and multi-valve sets have yet to make themselves known. The fact that variable condensers find no place in this set may account for its easy tuning.

The Circuit

The circuit illustrated in Fig. 1 is of a cheaply and easily made set giving dual amplification by one valve and a stage of high-frequency amplification by the other, a crystal serving as rectifier. It will be seen that H.F. current is amplified by both valves before rectification takes place, the L.F. current induced in the secondary of the L.F. transformer being passed back via the A.T.I. to the grid of the first valve for amplification at audio-frequency, and so to the phones.

When the switch connected with the grid condenser between valves is in, the second valve is used alone, giving dual (one stage of high- and one of low-frequency) amplification. In this way the first valve is cut out and only the second used. This latter then acts as dual-amplifier, the L.F. current being fed back to the grid of this valve. When this switch is open both valves are in use. The right-hand contact of this switch may be omitted.

The switch behind the L.T. terminals when open cuts off both L.T. and H.T. (in the negative connection of both). Primarily the purpose of this switch is to cut off the L.T. accumulator, the object being to obviate the slow discharge of the battery through the potentiometer when the set is out of use for any lengthy period, during which leakage across the potentiometer might be considerable.

The switch with the longer knife on the right (front) merely cuts off the H.T. in the positive connection. When changing valves, or connecting battery leads to the set, this switch should remain open until the filament current has been switched on and the valve lighted. In this way burnt-out filaments can be avoided.

Fig. 2 shows the wiring and general lay-out of the set, and should be helpful to the constructor.

With a low, very inefficient aerial (single run, 40 ft. over-all, including lead-in), very badly screened by tall trees and high buildings, at a distance of five miles the broadcasting station comes in at readable strength at some yards on a home-made loud-speaker, using only the second valve. The loud-speaker, by the way, consists of an earpiece and a loud-speaker diaphragm mounted in a simply-made wooden box to which is attached an old phonograph horn. No doubt a properly constructed loud-speaker would give better results, and with an ordinary aerial the results should be all that could be desired.

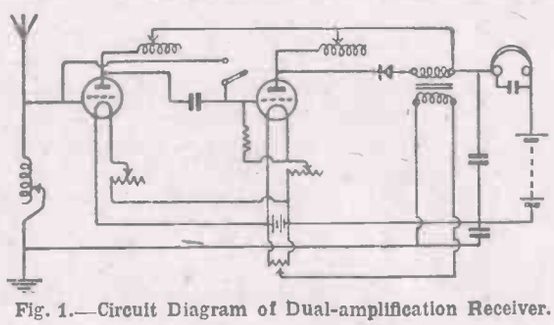


Fig. 1.—Circuit Diagram of Dual-amplification Receiver.

Using the wire mattress of a bedstead, one valve (the second) gives loud signals in the phones. Bed-clothes and even a person in bed make no difference in signal strength.

The set can be constructed in a very inexpensive manner. Greater space than that shown in the photographs should be allotted to the plate tuner of the first valve. This set was originally designed for only one valve, but later another was added. This accounts for the small space left for this tuner.

Tuners

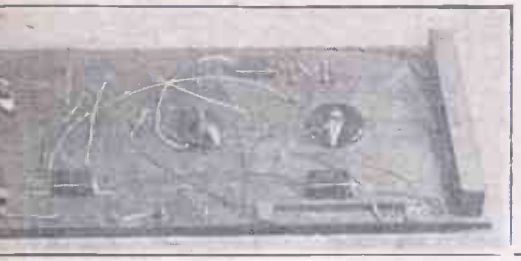
The tuners on the set as photographed are for broadcast reception (four coils of 90 turns each). One of the large coils (360) is also shown on the right.

The writer's set is built up on a piece of ¼-in. American white-wood (bass) 11 in. by 22 in., mounted on two lengths of wood 1¾ in. by 1 in. The insulating properties of two thin coats of shellac varnish are sometimes underrated, but this may be because the fact is overlooked that it is obviously no good laying a coat of insulating material on the outer surfaces only of wood, for it is necessary after the board is drilled to see that the *inner* surface of all holes is given a coat also. If this is done the efficiency of this wood, or mahogany, or oak, seems to be fairly high and to compare very favourably with ebonite, which is more difficult to work and more expensive.

Although in the diagrams a grid-leak is included in the coupling to the second valve, it was not found necessary on the writer's set. A leak (preferably a variable one) may be provided, especially if ebonite is used for the base-board (or panel, as the case may be). When treated wood is used, a high resistance leak is apparently provided by the wooden base, as in the case of the set under review, and the addition of a leak is not called for; in other cases one may be necessary. A short length of slate pencil makes a good improvised leak; it may be held between brass or copper clips at each end.

Left.—Photograph of Dual-amplification Set.

Below.—Photograph of Back of Panel.



This article describes a set that will appeal to those who are fond of experimenting. An unusual feature of the receiver is the inclusion of 2 H.F. valves.

The aerial tuner may be a single-slider solenoid (which will give quite excellent results) or a variometer or a tight- or loose-coupler of any type. It need not be expensive, but it should be efficient. If a slider-type tuner is used, see that the wire is of heavy gauge, at any rate, for short-wave reception; it is then easier to adjust the slider at its best. Fine adjustment results in louder signals.

The plate tuners may be slider-type coils, but the writer uses basket coils, details of which are given later. These coils are plugged into the sockets S1 to S4 and S5 to S8, which are in pairs. The two coils plugged in are in series with each other in each case, and constitute a variometer for anode tuning. Valve sockets are used for this purpose, the pins being soldered to the leads (which should be flexible) of the coils. The relative positions of the coils are altered, thus giving a variometer effect. Tuning is not at all critical; it is, in fact, slightly broad.

For valve holders ready-made holders may be used, or four valve sockets set up for each valve. Bell-wire (20-gauge) was used for wiring the set now described. Hertzite crystal gives good results, but a good specimen of talite gave somewhat better signals (both with a silver contact). The value of the fixed condensers is .002 microfarad, with the exception of the grid condenser, which is .0003. That across the H.T. battery may be larger, while in many cases that shunting the phones may be omitted. The transformer is of unknown make, but apparently a good one, ratio 1-4, retailed at about 14s. 6d., and gives quite good results. There is absolutely no distortion and no noise. Remember that a bad transformer can mar a set, so get the best you can afford.

With some types of L.F. transformer a grid potential for the valve amplifying at both frequencies may be found desirable, especially if a loud-speaker is employed or phone wires are run any distance from the set.

Potentiometer

The potentiometer need not be bought; in fact, one taking up less space than the usual commercial article is quite easily made from a lead pencil. A good H pencil will be found to answer admirably. The seams in the wood should be scraped along their entire length, and after soaking for a few minutes in cold water, if a thin, sharp knife is inserted into the seam, it will open, leaving the plumbago embedded in one half. A gentle pull should bring away the loosened case, leaving the plumbago uninjured.

Two short strips of brass, each drilled at one end to take a small screw and bent in the form of two stairs (two "treads" and a "riser") can be used to hold the half-pencil down to the baseboard, from which it should be raised at each end by placing a thin piece of wood between its under side and the baseboard. The two strips, which make firm contact with the ends of the plumbago, are connected to the positive and negative respectively of the accumulator. A sliding contact is provided by another strip of brass or copper (about 2½ in. by ¼ in.), bent so as lightly to grip the pencil, thus making contact with the plumbago. A short length of heavy-gauge wire would probably serve quite as well. The lead from this slider goes to the secondary of the L.F. transformer. Once the potentiometer is adjusted under working conditions it may remain untouched.

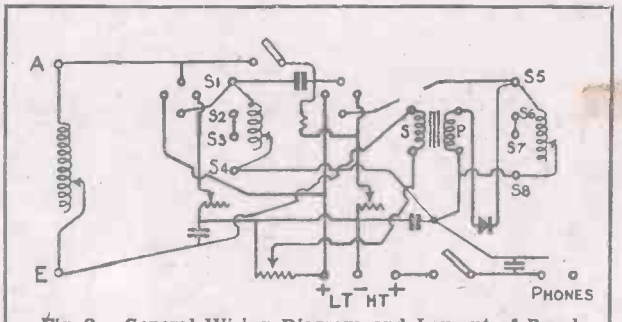


Fig. 2.—General Wiring Diagram and Lay-out of Panel.

The basket coils used on this set for anode tuning are: Four each of 90 turns and two each of 180 and 360 turns of 34-gauge wire, and two of 300 turns of 40 or 42 wire. This wire may be d.c.c. or enamelled. Finer gauge wire may be used, but as the wire is thinner the number of turns in each case should be less. The inner diameter of these coils is about 1 in. If it is more than this the number of turns must be less in each case. The first four are wound on single cardboard formers, but the larger coils are on double formers, having cork or wood cores of ½ in., ¾ in. and 1 in. in length respectively. All are duolateral-wound—that is, the wire is passed into every other slot. In this way quite a lot of wire is contained on a comparatively small former, though the air spacing between wires remains large.

For broadcast reception of between 300 and 800 metres two of the 90-turn coils will tune each anode. The larger coils are for higher wavelengths. One each of 300 and 360 will be found about right for F L (Paris) on 2,600 metres.

Aerial

The spring mattress is quite an excellent substitute for an indoor aerial, and will surprise those who have never previously tried it. The results obtained with a full-size aerial are really wonderful. There is no need to cramp the set into small space, except with the object of portability. Longish leads do not matter much, so long as they are fairly straight from point to point and are kept as far apart as possible when crossing one another. Noises can be set up when two leads are allowed to pass too closely. Half an inch seems to be ample spacing.

The writer would suggest that the set be built up on a base raised on two pieces of quartering, say 2 in. by 1 in., and that it should be provided with a cover. The clearance of 2 in. under the base allows for ample spacing of connections. This is certainly a better way of arranging a set than setting up a panel upon a box, because dust can so easily collect on the surface of the panel. The cover should be provided with a few small holes for the purpose of ventilating the set—damp and dust should be excluded at any cost if efficiency is to be maintained.

The clarity of reception of telephony, both in phones and loud-speaker, is extra-

ordinary. Sets depending upon valve rectification are far behind the faithful reproduction of speech and music obtained with crystal rectification. The crystal, after all, is a much better rectifier than the valve, though it has none of the amplifying qualities characteristic of the latter. The statement that two valves and a crystal are not quite equal to three valves is true, but only where amplitude of sound is concerned. A slightly lesser volume, plus greatly increased clearness of speech and music, certainly give the crystal greater claims to popularity than the valve as a rectifier.

Using only one valve on this set, the results are equal to two valves and a crystal; using the two valves, the resultant signals are equal to those of good sets employing three valves and a crystal. Good hard valves will give best results, as they are used on these sets only for amplifying. Valves of different makes may be employed, a separate filament resistance being used for each, but the plate potential may be the same for both. W. S.

MY PET WIRELESS GRIEVANCE

(*Concluded from page* 260)

amateurs are forced to stay up until twelve o'clock and later in order to carry out their experiments?

I think that if the broadcast listener studied these points his attitude would change a great deal.

He is the youngest of the large wireless family, and therefore should be willing to give way to his elder brothers.—A. S. BROWN (London, S.E.).

Accumulators

ACCUMULATORS! That sums up in one word my pet wireless grievance. But I suppose I must give some reasons for my dislike for these unfortunate, unoffending, but extremely useful pieces of apparatus. The accumulator itself is not the cause of my wrath—in some cases I believe it may become quite an ornamental object, and a good, large specimen gives its owner a feeling of worth and consequence—but it is the troubles incident upon its upkeep. First of all there is the fatigue of continually carrying several pounds weight round to the nearest garage and back. Linked with this objection there is the kindred trouble of constant expense. I am not a plutocrat. Lastly, there is the question of stray acid. When one finds oneself sitting on a little pool of it—well!

I had great hopes when, at the last wireless exhibition, the new .06 ampere valves made their appearance. But, alas! when one was tried on my dual-amplification set (which seems to have the remarkable property of working well on alternate days), however well the said valve may have been working on a "straight" set, and although tried on one of the dual-amplification's good days, the trial was a distinct and absolute failure. Apparently I must grin and bear with my accumulators. I have one consolation, however: I can grumble at them without being answered back!—H. S. HARDWICK (Forest Hill).

If only — —

EXCEPT for the fact that my accumulator always runs out at the critical moment, and that oscillation appears to be on the increase, and that my set never works when visitors are present, and that the Post Office people never forget to remind me about the renewal of my licence, I don't think I have a pet grievance.

Apart from the fact that the "atmospherics" excuse is wearing rather thin, and that the best programmes are always given on the nights when I am out, and that the man next door is continually scratching his crystal, and that the phrase "Please stand by for two minutes" gets on my nerves, and that Greenwich is always several minutes wrong by my watch, everything is bliss and joy.

If only dull-emitters were the price of bright-emitters, and my aerial did not get used as a clothes line, and the family would let me use the set for experimental purposes sometimes, and a cat-proof H.T. battery could be invented, and there were fewer wireless papers or more days in the week to read them in, and AMATEUR WIRELESS came out twice a week, wireless would be a very jolly game indeed.

The one thing that *does* get my goat is, why can't electrons be made non-oscillatable?—J. F. STANLEY (Highgate).

Some of these transmissions are commercial or official. Wavelengths and times are liable to alteration without notice. The times given are according to Greenwich Mean Time.

London B.B.C. Station (2 L O), 365 metres. Weekdays, 3.30 p.m. to 4.30 p.m., concert; 5 p.m. to 5.30 p.m., women's half-hour; 5.30 p.m. to 6.15 p.m., children's stories; 7 p.m. to 10.30 p.m., concert and news. Sundays, 3 p.m. to 5 p.m., concert; 8.30 p.m. to 10.30 p.m., concert and news.

Manchester B.B.C. Station (2 Z Y), 375 metres. Weekdays, 3.30 p.m., concert; 5 p.m., women's half-hour; 5.25 p.m., farmers' weather report; 5.30 p.m., children's hour; 6.20 p.m. to 7.15 p.m. and 7.45 p.m. to 10.30 p.m., concert and news. Sundays, 8.30 p.m. to 10.25 p.m., concert and news, etc.

Birmingham B.B.C. Station (5 I T), 475 metres. Weekdays, 3.30 p.m. to 4.30 p.m., concert; 5.30 p.m. to 6 p.m., women's half-hour; 6 p.m. to 6.45 p.m., children's hour; 7 p.m. to 10.30 p.m., concert and news. Sundays, 8.30 p.m. to 10.30 p.m., concert and news, etc.

Newcastle B.B.C. Station (5 N O), 400 metres. Weekdays, 3.45 p.m., concert; 4.45 p.m., women's half-hour; 5.15 p.m., children's hour; 6 p.m., scholars' half-hour; 7 p.m. to 10.30 p.m., concert, news. Sundays, 8.30 p.m. to 11 p.m., concert and news, etc.

Cardiff B.B.C. Station (5 W A), 350 metres. Weekdays, 3.30 p.m. to 4.30 p.m., concert; 5.30 p.m. to 6 p.m., women's half-hour; 6 p.m. to 6.45 p.m., children's hour; 7 p.m. to 10.30 p.m., concert and news. Sundays, 8.10 p.m. to 11 p.m., concert and news.

Glasgow B.B.C. Station (5 S C), 420 metres. Weekdays, 3.30 p.m. to 4.30 p.m., concert; 5 p.m. to 5.30 p.m., women's half-hour; 5.30 p.m. to 6 p.m., children's hour; 7 p.m. to 10.30 p.m., concert and news. Sundays, 8.30 p.m. to 10.45 p.m., concert and news, etc.

Bournemouth B.B.C. Station (6 B M), 385 metres. Weekdays, 3.45 p.m. to 4.30 p.m., concert; 5.15 p.m. to 10.15 p.m., concert and news. Sundays, 8.30 p.m. to 10.15 p.m., concert and news.

Aberdeen B.B.C. Station (2 B D), 495 metres. Weekdays, 3.30 p.m. to 4.30 p.m., concert; 5 p.m. to 6 p.m., women's half-hour and children's corner; 7 p.m. to 10.30 p.m., concert and news. Sundays, 8.30 p.m. to 10.30 p.m., concert and news.

Sheffield (Relay) B.B.C. Station (6 F L), 303 metres. Programme relayed from one of the main stations daily.

Königswusterhausen (L P), 2,800 metres. Daily, 7 a.m. to 8 a.m., Stock Exchange news; 11 a.m. to 12.30 p.m., news and concert; 4 p.m. to 5.30 p.m., Stock Exchange news.

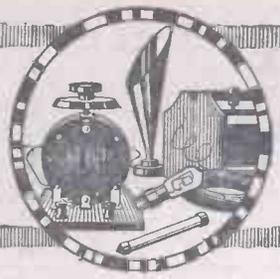
Croydon (G E D), 900 metres. Daily.

Eiffel Tower (F L), 2,600 metres. Daily, 6.40 a.m. to 7 a.m., weather forecast; 11 a.m. to 11.30 a.m., weather forecast; 3.40 p.m., Stock Exchange news; 5.30 p.m. (Saturdays excepted), Bourse closing prices; 6.10 p.m., 7 p.m., and 7.20 p.m. (Sundays only), concert and news; 10 p.m., weather forecast.

Paris Concerts Radiola (S F R), 1,780 metres. Daily, 12.30 p.m., concert and news; 1.45 p.m., first Bourse report; 4.30 p.m., Bourse closing prices; 4.45 p.m., concert and news; 6.45 p.m., news; 8.30 p.m. to 9.30 p.m., concert; also concert from 2 p.m. to 3 p.m.; 10 to 10.45 p.m. on Sundays.

Rome (I C D), 3,200 metres. Daily, 10 a.m.

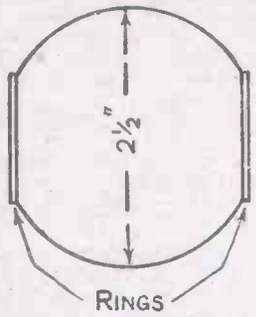
Ecole Supérieure des Postes et Télégraphes, 450 metres. 3.30 p.m. to 4 p.m. (Wednesday and Friday), 7.45 p.m. to 10 p.m. (Tuesday and Thursday), 2.30 p.m. to 7.30 p.m. (Saturday), concerts.



PRACTICAL ODDS AND ENDS

Making a Simple Rotor

AN ordinary tennis ball with the outer covering removed makes an excellent rotor. Two holes should be cut in the ball to enable the connections to be made inside, and two thick cardboard or rubber



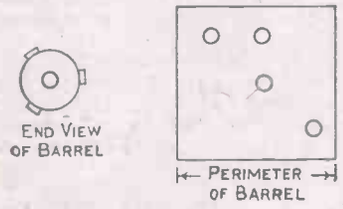
A Simple Rotor.

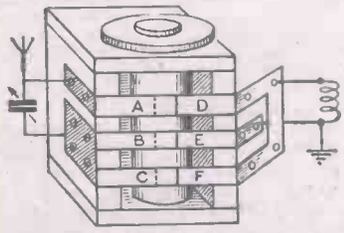
rings should be fitted over the holes to form the flanges on which to commence the windings. The cardboard rings will adhere quite firmly if glued on, but rubber rings can be affixed with rubber solution.

The completed rotor should be well shellacked before being used. If it is used with an ordinary piece of 3-in. cardboard tubing as a stator an excellent variometer can be constructed. H. V.

Barrel Switch

A FORM of barrel switch that can be constructed by amateurs is shown below. This is arranged as a series-





Details of Barrel Switch.

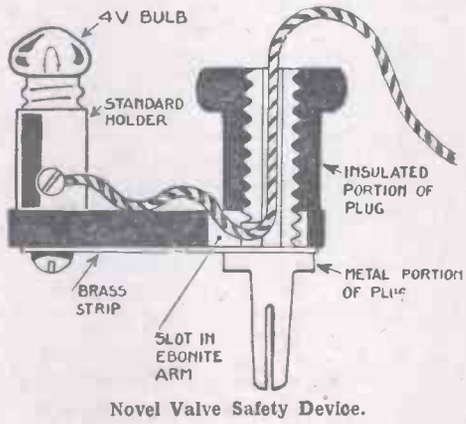
parallel switch for a tuning condenser, which can also be cut out of circuit altogether. The method of construction is clear from the diagrams.

It will be seen that the spring contacts, which normally lie apart, are forced together at the overlapping points when the studs on the switch are turned up beneath them. When A and D make contact the coil is connected direct to the aerial without the condenser. When C and F connect, the condenser is in series; it is in parallel when A and D and B and E connect. Ordinary brass screw heads can be used as studs. F. G. G.

Valve Safety Device

THE illustration shows a novel safety device which at the cost of a few pence obviates the risk of burning out the valve filament should an incorrect connection or other fault cause the valve filament to be short-circuited across the H.T. supply.

An ebonite extension arm about 1¼ in. long by ⅛ in. thick, provided with a plain hole at one end for the lamp holder and a slot at the other end sufficiently wide



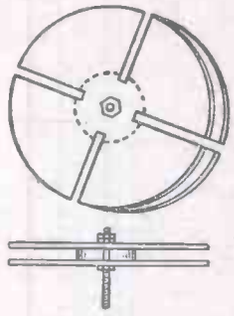
Novel Valve Safety Device.

to pass the screwed metal portion of the wander plug, is required. The slot should be long enough to allow a free passage for the insulated connecting wire, which is carried right through the metal portion of the plug to the body of the lampholder. A thin strip of brass clamped underneath the ebonite arm provides the necessary return connection to the live portion of the wander plug. C. A. L.

Slab-coil Winder

WITH the winder described below slab coils may be bound with thread without removing the former cheeks, thus avoiding the necessity of dipping them in wax, which is particularly undesirable with small coils. All that is required are a centre washer 1 in. in diameter and ¼ in. thick, with an ⅛-in. hole in the centre; two cheeks ⅛ in. thick and 3½ in. in diameter, with an ⅛-in. hole in the centre; and a length of 4 B.A. rod and three 4 B.A. nuts.

Run four slots into the cheeks, as shown in the diagram, to within ¾ in. from the centre; run four corresponding slots ⅛ in.

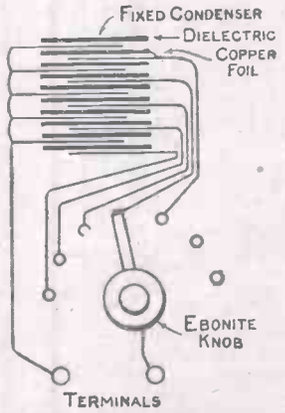


Slab-coil Winder.

deep in the centre washer; then lock the washer and cheeks together with three nuts. Wind your coil and bind by putting a thread through the slot in the centre washer, over the top and through again. Do this two or three times at each of the four slots and your coil is finished and ready for work. J. McG.

Simple Variable Condenser

THIS is simply a fixed condenser with one set of plates joined up in series and a tapping taken from each of the other set of plates. These may be taken to studs mounted on an ebonite panel, and



Variable Condenser.

the capacity increased or decreased by means of a switch arm. For fine tuning this can be shunted by a vernier condenser if desired. R. G. M.

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, lay-outs, diagrams, etc., on separate sheets containing querist's name and address. Always send stamped addressed envelope and Coupon (p. 287.)

Non-oscillating Two-valve Receiver

Q.—I have been using a single-valve reaction circuit, and never had any difficulty in making it oscillate. I have now added a note magnifier and am unable to get the best results from the set because I cannot bring the circuits anywhere near the oscillation point. How can I improve matters? Circuit enclosed.—C. V. (Nottingham).

A.—From the diagram it appears that you have not fitted a fixed condenser across the primary of the low-frequency transformer. This will account for lack of oscillation. The condenser across the primary winding should have a capacity of .002 microfarad, although the capacity value is not critical. A condenser of reliable make should be used.—P.

Number of Plates Required for Condenser

Q.—Will you please state the number of plates required for a fixed condenser of .01 microfarad capacity?—M. F. (Birmingham).

A.—Use ten pieces of copper-foil, with an overlay of about 2 in. by 1 in. Sheets of mica (slightly larger than the plates and .002 in. in thickness) will be suitable for the dielectric. If it is intended to use this condenser across the high-tension battery care should be taken to see that the insulation is perfect and that the two sets of foils do not touch.—W.

Variable Condenser to Tune Variometer

Q.—Is there any advantage in using a variable condenser in conjunction with a variometer?—J. P. (Chorleywood).

A.—A variable condenser will not assist much as far as fineness of tuning is concerned, but if it is desired to heighten or lower the wavelength of the variometer a fixed condenser will come in very useful. To lower the wavelength of the aerial circuit connect the condenser between the aerial side of the variometer and the aerial terminal. The condenser should be connected in parallel with the terminals of the variometer to lengthen the wavelength.—W.

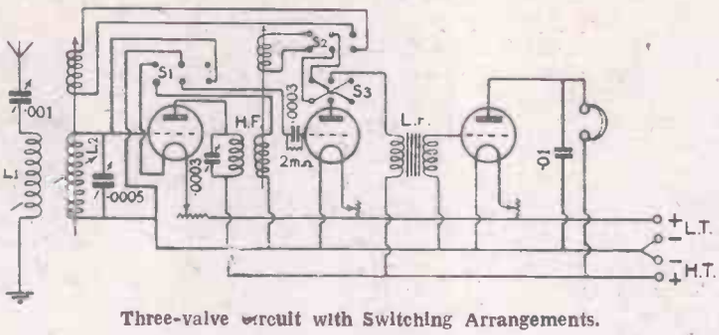
Self-oscillation with H.F. Amplifier

Q.—I have a high-frequency amplifier, which gives good results, but there is great difficulty in preventing self-oscillation. A potentiometer is fitted, but this does not seem to give sufficiently delicate regulation. I do not use a reaction coil, and would like to know if any improvemnt can be effected.—G. P. K. (Hampstead).

A.—Many commercial potentiometers suffer from the fault you mention. A good plan is to remove the wire from the potentiometer former and wind it on a small bobbin. The former can then be wound full of No. 30 S.W.G. resistance wire, so that it has a resistance of something like 50 ohms. The bobbin is connected on one side to the positive filament, and on the other to one end of the 50-ohms resistance. The other end of this resistance is connected to the negative filament. This will give very delicate adjustment, and should cure your trouble. The H.T. voltage might also be cut down if the set still persists in oscillating.—A. L. M. D.

Switching for Three-valve Set

Q.—I am about to construct a three-valve set having one stage of high frequency, a detector and one low-frequency stage. Please give a diagram showing how to change reaction from the high-frequency transformer to the secondary circuit inductance, to cut out the high-frequency valve, and to change the direction of the reaction coil.—J. H. (Grimsby).



Three-valve circuit with Switching Arrangements.

A.—The illustration shows the switching required. You are advised to use the ordinary form of change-over switch such as the knife-blade pattern, with a fair distance between contacts. On no account use key or Dewar switches in high-frequency circuits, unless specially made for this class of work. In the diagram the switch S1 is used for cutting out the high-frequency stage, S2 changes over reaction from the closed circuit coil L2 to the high-frequency transformer marked H.F. and switch S3 is used for changing the direction of the reaction coil.—P.

Internal Wiring of Receiver

Q.—Is there any advantage in using bare wire in preference to insulated wire, or bare wire covered with sleeving, for wiring up the interior of a receiver?—B. H. (Dover).

A.—There is a certain advantage, because when using bare wire the constructor of the receiver takes very good care to keep all the bare wires as far away from each other as possible in order to obviate the risk of short circuits. This reduces the capacities between the various leads, and makes for much more efficient working, especially in high-frequency circuits. When using covered wire, there is always a tendency to place the leads too close together, in the belief that as long as the wires cannot touch everything is certain to be all right.—B.

Variable or Fixed Grid Leaks?

Q.—Is it advisble to incorporate a variable grid leak in an ordinary straight circuit?—M. J. M. (Bromley).

A.—It is certainly useful to have a variable grid leak in any circuit, as if different valves are used as detector, different values of grid leak will be advisable. Rather than use a variable leak the writer prefers to use a number of fixed leaks in conjunction with a variable condenser.—W.

Accumulators Not Retaining Charge

Q.—Kindly tell me what is wrong with a battery of accumulators. These are fully charged, but I can only get a small proportion of discharge from them.—M. G. R. (Portsmouth).

A.—The usual reason for low efficiency in a battery of accumulators lies in either of two things: sulphated plates, or loss of active material. If the positive plates look rusty instead of a chocolate brown after fully charging, and have whitish patches, this indicates the presence of insoluble lead sulphate, which being inactive contributes nothing to the output and much reduces the capacity of the cells, according to its extent. There is no real remedy when sulphation has gone too far. The best way is to withdraw such plates as are affected, carefully scrape and scrub them, until the white film is got rid of and recharge at half normal rate for a lengthy period until the proper colour again. It is not a pleasant process, nor is it free from risk in amateur hands, as old plates are very fragile and sometimes drop to pieces with their own weight. Then replacing after treatment, see that the acid electrolyte is of correct strength, and if any doubt exists wash out the glass boxes and refill with fresh acid, sp. gr. 1.200. When loss of capacity is due to the active material coming away from the lead grids, owing to age or overcharging, it can usually be diagnosed by the presence of a quantity of brown deposit at the bottom of the glass boxes, and nothing can be done to restore the full capacity but re-pasting the grids. It is a trouble that usually first starts by too zealous charging in the direction of putting in too great a charge in relation to the discharge current required. After a time the plates suffer through repeated overcharging, and the rapid evolution of the gases disintegrates the paste. The next time charging is done the effects are enhanced, because the original capacity of the battery is still further reduced.—A.

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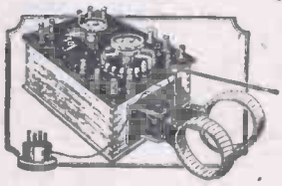
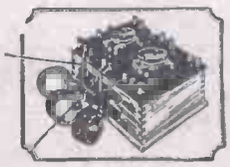
¶ Full particulars of the Peto-Scott Unit System are given in the new 48-page Catalogue (post free 3d.), and in Peto-Scott's Wireless Book, 1s. 3d. (1s. 5d. post free).



Reactode Unit No.

Detector Unit No. 4

Crystal Detector Unit No. 6



Tuner Unit No. 1

H.F. Unit No. 3

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Gilbert Ad. 579

The Editor's Lecture at Ipswich

(By Courtesy of the "East Anglian Daily Times")

THE Garratt Memorial Hall, Ipswich, was crowded to its capacity on Wednesday, Feb. 20, when, under the auspices of the Ipswich and District Radio Society, a lecture was given by Mr. Bernard E. Jones, the Editor of AMATEUR WIRELESS, who took as his subject "The Simplicity of Wireless."

The Mayor of Ipswich (Dr. J. R. Staddon) presided, supported by Mr. R. Stanley Lewis, the president of the Ipswich Society, and others.

Demonstrations of various sets of wireless followed the lecture. A very hearty vote of thanks was accorded the lecturer on the motion of the Mayor, seconded by Mr. R. Stanley Lewis.

[At the conclusion of the lecture, and after the Mayor had left the chair, members of the Ipswich Radio Society and friends—probably as many as 150 people—thronged round the platform to inspect the exhibits, amongst these being a two-valve set designed by the staff of AMATEUR WIRELESS and built by Messrs. Peto-Scott Co., Ltd. (it will be described in AMATEUR WIRELESS shortly); a 'Filtofone attachment (Peto-Scott Co., Ltd.); an Edison Bell crystal receiver (J. E. Hough, Ltd.); a complete one-valve receiver (Economic Electric, Ltd.); two L.F. amplifying units (City Accumulator Co., Ltd.); two "Sparta" loud-speakers (Fuller's United Electric Works, Ltd.); "A" type adjustable phones (S. G. Brown, Ltd.); H.T. batteries (Siemens, Ltd.); "Ora" valves (Mullard Radio Valve Co., Ltd.); Cossor P1 and P2 valves (A. C. Cossor, Ltd.); Marconi Osram R5V valves (General Electric Co., Ltd.); and Ediswan AR valves (Edison Swan Electric Co., Ltd.). Messrs. Boddey, Page and Co., of Ipswich, kindly supplied accumulators and other equipment.]

CATALOGUES

DETAILS of, and instructions for using, their two-stage low-frequency amplifier are given in a booklet received from the General Electric Co., Ltd., of Magnet House, Kingsway, W.C.2.

Readers in the neighbourhood of Southport can hire 6 volt 90 ampere-hour accumulators from Oddie and Culshaw, Ltd., of Yellow House Lane, by paying £1 deposit and 2s. per week for recharging.

The February issue of their "Wireless Bulletin" (for the trade) has been received from G. Davenport (Wireless), Ltd., of 99-105, Clerkenwell Road, E.C.1.

From the Fellows Magneto Co., Ltd., of Cumberland Avenue, Park Royal, N.W.10, we have received a catalogue of sets and components.

A VARIABLE condenser has been produced in America that makes use of mercury plates, which can thus be varied in area. The dielectric is mica.

■ ■ ■

In the United States there are fifty-nine broadcasting stations owned and operated by newspapers.

■ ■ ■

Four transmitting stations are to be built in Greenland, by the Danish Government, as an aid to the weather-forecasting service.

■ ■ ■

Broadcast listeners in the neighbourhood of Southampton blamed amateur experimental transmitters for causing interference recently. It seems, however, that the C.W. station B Y C at Horsea was to blame. The Radio Society of Great Britain assures us that amateurs are seldom to blame in such cases.

■ ■ ■

Lately the B.B.C. have been receiving numerous letters from America, stating that 2 L O has been heard. But as the items mentioned were not broadcast, and the hours named were all after three o'clock in the morning, when 2 L O was closed, the B.B.C. have come to the conclusion that the messages emanate from some American amateur transmitter.

■ ■ ■

An attempt to prove that loud-speakers do not produce distortion when handled properly will be made at the "Ideal Home Exhibition." All the well-known makes of loud-speakers will be worked, only the name and any peculiarities in shape, etc., will be veiled. Nothing special will be used, the loud-speakers being similar to those that can be purchased by anyone.

■ ■ ■

It is suggested that it would be a good plan to have the French Talks sent direct from France, we in turn relaying a course in English to one of the French broadcasting stations for the benefit of French listeners-in.

■ ■ ■

A letter has been sent to the Prime Minister, signed by thirty leading members of the theatrical profession, the subject being the burden which the entertainment tax places upon industry. It is pointed out that the entertainment profession is having to face more and more competition from other forms of amusement, notably broadcasting.

■ ■ ■

According to reports received by the B.B.C., listeners-in greatly appreciate the French talks.

■ ■ ■

To-night (Thursday) the first of an hour's music by living composers will be broadcast. Compositions by Mr. J. B. McEwen will be played by the Spencer Dyke String Quartette. Mr. McEwen intends to be present to superintend the broadcasting of his music.

Next Week's Broadcasting

March 2—8

Items Simultaneously Broadcast.*

Sunday, 2nd. Time Signals and General News Bulletin.

Monday, 3rd. Radio Association Talk. B.B.C. Literary Critic.

Tuesday, 4th. Time Signals and General News Bulletin.

Wednesday, 5th. B.B.C. Dramatic Critic.

Thursday, 6th. B.B.C. Musical Critic. Radio Society of Gt. Britain Talk.

Friday, 7th. B.B.C. Film Critic.

Saturday, 8th. Savoy Orpheans and Havana Bands.

*Except where otherwise stated, all items simultaneously broadcast originate from the London studio.

London (2 LO)

Sunday, 2nd. Organ Recital from Concert Hall of the National Institute for the Blind. Address by Rev. J. Scott-Lidgett.

Monday, 3rd. Two wireless plays, *The Dogs of Devon*, and *Foiled Again*.

Tuesday, 4th. Centenary of National Lifeboat Institution. "Nautical" Programme by the Wireless Orchestra, "One Hundred Years of Lifeboat Work," by Sir Godfrey Baring, Chairman of the Institution.

Wednesday, 5th. The Wireless Orchestra.

Thursday, 6th. Readings from his own works by Mr. John Drinkwater. Savoy Orpheans and Havana Bands.

Friday, 7th. Symphony Concert from Central Hall, Westminster.

Saturday, 8th. *Carmen*, relayed from the "Old Vic."

H.R.H. the Prince of Wales is to broadcast a speech on the British Empire Exhibition, of which he is President, from 2 L O on March 18. The speech will be simultaneously broadcast.

■ ■ ■

The time wasted in the programmes of the B.B.C. last year owing to breakdowns in the transmitting apparatus amounted to less than ¼ per cent. of the total programme time.

■ ■ ■

Mr. McAdoo, who is a candidate for the Presidency of the U.S.A., has applied for permission to erect a broadcasting station, from which he hopes to deliver his election addresses. The proposed station is to cost £6,000, and will be capable of sending messages to any part of the country. The call sign is W G M, Mr. McAdoo's initials.

■ ■ ■

The Edinburgh relay station will be situated at the New University Buildings in Teviot Place. The aerial will be fitted to a chimney 175 ft. high.

■ ■ ■

At the British Government's Pavilion at the British Empire Exhibition the Post Office will show a complete wireless telegraph system.

■ ■ ■

Members of Dundee Town Council are to use their influence, it is reported, to secure the erection of a relay station in the town.

■ ■ ■

The new Argentine station at Monte Grande has a power of 800 kilowatts. Ten steel towers, each of which is 690 ft. high, support the aerial wire.

■ ■ ■

Great developments in "super-power" broadcasting stations are predicted by Mr. David Sarnoff, a well-known American wireless expert.

■ ■ ■

At a recent auction of railway lost property the topical touch was introduced by the offer of a wireless set.

■ ■ ■

Within the last few months addresses in Esperanto have been broadcast from the Birmingham, London, Newcastle, Bournemouth and Aberdeen stations.

■ ■ ■

It is extremely likely that the question of broadcasting Parliament will come up for discussion again very shortly.

■ ■ ■

Communication over a distance of 6,250 miles will, it is expected, be carried out

(*Continued on page 282*)

RADIOGRAMS (*continued from page 281*)
between the French stations at Bordeaux and Saigon (Indo-China).

■ ■ ■

A new high-power station has been opened at Monte Grande, near Buenos Aires. A station has also been erected at Haapoal, on the west coast of Esthonia.

■ ■ ■

A special wireless exhibition is to be held at Geneva at the end of May and beginning of June.

With the reduction of the B.B.C. royalty to 1s. cheap crystal sets are coming into their own again and can be legally used by holders of broadcast licences. The well-known "Brownie" set, which sells at 7s. 6d. in the ordinary way, can be obtained stamped "B.B.C." for 1s. extra. This set is now fitted with a moulded ebonite cap and nickel fittings.

Human Detectors

SIR,—It may be of interest to your correspondent, R. H. (Teddington), to know that his body probably acted as an electrolytic detector during his reception of the National Physical Laboratory's signals.

The body may be divided into two zones, of different potential, by a line passing midway through the base of the heart and through its apex.

The potential difference is small, measurable in millivolts, and is of a fluctuating nature. It is produced by the action of the heart muscle, and is used as a means of diagnosis in some conditions.

The two arms fall one in each zone, and in diagnosis are connected to an Einthoven's string galvanometer and tracings made of the fluctuations.—R. D. F. (Liverpool).

Long-range Crystal Reception

SIR,—The letter of E. N. (Goldthorpe) which appeared in your issue of February 16, alleging that all the B.B.C. stations had been received on a crystal set was interesting and, may I say, amusing (if a joke was intended).

There is nothing remarkable about the achievement, as such capabilities are common to all crystal sets since the era of re-transmitting. I hardly know whether your correspondent is in earnest or endeavouring to pull our legs; but if he goes so far as to state that all B.B.C. stations have been received by direct transmission, then I must needs protest against such an extravagant claim without sufficient data being furnished.—J. W. (Stockport).

[The experience of E. N. is not an isolated case.—ED.].

Harmonics

SIR,—In AMATEUR WIRELESS of February 16 mention is made by E. L. S. of the reception of L'Ecole Supérieure on 225 metres.

For very many months past I have had excellent reception of this station on its

(*Continued on page 284*)

CORRESPONDENCE (*continued from page 282*)

first harmonic, using a detector and one L.F. On 225 metres, with my receiver, this station comes over with great strength and eight times in ten is stronger than when the receiver is tuned to the fundamental. So much so is this the case that should I wish to listen to this station I invariably tune in the harmonic and appear to get rid of a great deal of jamming.—A. H. G. (Weston-super-Mare).

Wavelength Ranges

SIR,—I am going to attempt to solve a problem mentioned by E. T. W. J. in No. 62 and by W. N. S. in No. 66.

It was mentioned in both these letters that a station can be heard above its exact wavelength with much greater intensity than if it were tuned (the receiving set) to a corresponding difference below the transmitted wavelength.

To my mind it is all a question of frequency. For the sake of argument, let us suppose that the transmitted wavelength is 600 metres, and the tuning above this wavelength is 800 metres. Therefore the corresponding *wave* difference below 600 metres is 400 metres.

For the benefit of beginners, I might mention that the frequency of a wave 1 metre in length equals 300,000,000 cycles per second, also that the frequency is reduced as the wavelength is increased and *vice versa*. To find the frequency of any wave, we divide 300,000,000 by the known wavelength; the answer will be in cycles per second.

Then:

600 metres equals 500,000 cycles per second.
800 ,, 350,000 ,, ,,
400 ,, 750,000 ,, ,,

It is seen that the frequency of 800 metres is 125,000 cycles less than the frequency of 600 metres, and 400 metres is 250,000 cycles more, which is double and is rather a big difference and must be reckoned with. To proceed, if 800 metres is 125,000 cycles less than the frequency of a 600-metre wave, then the corresponding difference in frequency more than 600 metres is: 500,000 + 125,000, equals 625,000 cycles per second, or 480 metres.

Therefore by tuning 120 metres below we have the same signal strength as 200 metres above 600 metres, thus it will be understood why the signal strength diminishes when the receiving set is tuned to 400 metres more so than if it were tuned to 800 metres; in other words, it is at a disadvantage to the extent of 80 metres.—W. E. (Melbourne, Australia).

Crystal Transmission

SIR,—I read with interest the letter by H. F. C. (London) and tried the simple experiment of conversing with a fellow-listener through our crystal set. An unintended listener picked up our conversation and at once objected to my experiment. I wrote to my local B.B.C. station and asked if they had any objection to the experiments. I enclose the reply from the B.B.C., which you can, as well as this letter, make use of.—A. E. R. (Aberdeen).

SIR,—With reference to your inquiry a few days ago of converting your receiver into a transmitter by using the B.B.C. carrier wave, I must make it clear that this is contrary to the P.O. rules and regulations, also the licence which you hold.

For the British Broadcasting Company, Ltd.—C. G. HARDING, Engineer in Charge (Aberdeen).

Crystal Reception

SIR,—I have been very much interested for some time past in your correspondence columns with regard to crystals. I recently made up a simple circuit and got 2 Z Y sufficiently loud to hear every word. Further experimenting eventually brought in all the B.B.C. stations except Cardiff, and I eventually heard Eiffel Tower music.—A. J. (Royston).

A Curious Case

SIR,—I possess a home-made one-valve set, and have used an indoor aerial, about 24 ft. in all, at first simply attached to the ends of a cornice pole and a nail. Results were good. I then made a 4-ft. square frame aerial, results still good. Only one end of the frame aerial is used on aerial terminal, the other one is free.

(*Continued on page 286*)

CORRESPONDENCE (*continued from page 284*)

The earth wire is on the earth terminal. I have just finished an outside aerial, 100 ft. 7/22 wire, about 24 ft. high. Results were very disappointing. I can hear fairly well with outside aerial wire and no earth at all, but after countless experiments, all, I believe, unorthodox, I get loud-speaker results by attaching the outside aerial wire to the aerial terminal and the indoor aerial to the earth terminal, ignoring the earth wire altogether. The phones simply shout at me. Is this usual?—H. C. (Palmer's Green).

Other Correspondence Summarised

J. S. W. (Melton Constable) receives Bournemouth (194 miles distant) quite clearly on a crystal set without any amplification whatsoever. London (120 miles distant) comes in quite clearly also, although, of course, not so loud as Bournemouth.

BROWN "A" TYPE HEADPHONES

KING'S BENCH DIVISION

G. E. WARD, trading as the City Accumulator Co., plaintiff, versus S. G. Brown, Ltd., defendants. Judgment was given on the 22nd inst. for the plaintiff, and he was awarded £800 damages and costs in an action which arose out of a statement made in the Press in August, 1922, by defendants that the plaintiff was selling obsolete headphones of defendants' manufacture. Defendants applied to the judge for a stay of execution, which was granted on the usual terms.

CLUB DOINGS

West London Wireless and Experimental Association

Hon. Sec.—H. W. COTTON, 19, Bushey Road, Hayes, Middlesex.

A MEETING was held on Feb. 5 last when Mr. T. W. Hyne-Jones read a paper entitled "A 1½ k.w. Ship's Transmitter." The lecturer illustrated his paper with diagrams drawn on the blackboard, and in the course of his lecture he described most fully various systems of wireless telegraphy.

Hackney and District Radio Society

Hon. Sec.—A. G. PARRY, 66, Ballance Road, E.9.

AT a meeting held on Feb. 14 Mr. L. Robinson, the Hackney Borough electrical engineer, demonstrated his four-valve receiver. Mr. Small also gave an excellent elementary talk on "Wireless" for the benefit of the non-technical public who were present. He dealt very simply with crystal sets and valve receivers.

Bordon and District Radio Society

Hon. Sec.—E. T. MALLEY, 170, Budds Lane, Bordon, Hampshire.

THE above society was inaugurated on Feb. 13, and applications for membership from the surrounding districts will be welcomed by the secretary.

Wimbledon Radio Society

Hon. Sec.—C. G. STOKES, 6, Worple Avenue, Wimbledon, S.W.19.

A VERY successful public meeting of this society was held on Feb. 8 when Mr. J. A. Partridge (2 K F) lectured on "Working with America."

Radio Society of Highgate

Hon. Sec.—J. F. STANLEY, 49, Cholmeley Park, Highgate, N.6.

ON Feb. 7 a most interesting lecture was given by Mr. G. G. Blake on "The Modern View of Electricity and its Relation to Matter." Mr. Blake began by discussing in a simple manner the theory of relativity, and some analogies were given to convey some conception of the smallness of electrons. Although it will never be possible to see electrons, said the lecturer, their existence has been conclusively proved by Sir William Crookes and others. The constitution of solids, liquids and gases was dealt with, and a striking experiment was shown to illustrate the motion of the particles in a liquid. The uses of X-rays to study the constitution of molecules was very clearly explained by means of lantern slides and a number of experiments. The existence and properties of ultra-violet light were also demonstrated. Lantern slides and experiments were also shown illustrating the properties of waves and the action of the thermionic valve.

Liverpool Co-operative Radio Association

Hon. Sec.—J. KEARNS, 107, Walton Breck Road, Anfield, Liverpool.

AT a meeting on Feb. 15 Mr. S. Frith submitted a home-constructed portable receiving set which consisted of a crystal and two valves of pre-war construction, highly efficient, and including headphones, batteries, aerial wire, etc., might be carried in a half of an ordinary-sized attaché case.

Honor Oak Park Radio Society

Hon. Sec.—J. MCVEY, 10, Hengrave Road, S.E.23.

ON Feb. 15 Messrs. Peto-Scott gave a demonstration of the unit system of building wireless sets. Mr. Willis, the lecturer, gave a very clear explanation of the straight circuit receiver, going very fully into the subjects of tuning, reaction, detecting, and low- and high-frequency amplification.

The "Mecaphone" single-valve set is described in a folder sent us by Mann, Egerton and Co., Ltd., of 21-23, King Street, Norwich.

ANNOUNCEMENTS

"Amateur Wireless and Electrics." Edited by Bernard E. Jones. Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. It will be sent 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 the Proprietors, Cassell & Co., 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," La Belle Sauvage, London, E.C.4.

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ACCUMULATORS, 6 v., 40 in box, 26/-. AMMETERS, 15/-. AMPLIFIERS, 3-valve, £4 10s. AERIAL WIRE and Fittings, at wholesale prices. BATTERIES, all sizes. BUZZERS, 2/6. BOXES, 1/6 to 6/6. CABINETS, with ebonite, 10/-. CONDENSERS, 2/- to 27/6. CRYSTALS, 6d. DETECTORS, 1/9. COMPLETE SET, 7/6. EARTH CLIPS, spikes and mats, from 6d. EBONITE, all shapes and sizes, cheap. GRID LEAKS, all values. INSTRUMENTS, the finest collection of all ranges ever seen. INSULATORS, 2d. LOUD SPEAKERS, 7/6. MICROPHONES, 2/6 to 20/-. Fine selection 'PHONES of every kind, from 2/-. PLUGS and SOCKETS from 3d. pair. POTENTIOMETERS, 3/6. RECEIVERS from 1-valve sets, 35/-. RELAYS, 12/6 to 55/-. FIL. RHEO. DIXONSTATS, 3/-. SWITCHES in great variety. SPARK SETS, 17/6. TERMINALS, 4 W.D., double, 2d. TERMINAL LUGS, 4d. doz. TRANSFORMERS, all types, 5/- to £3 10s. TRANSMITTER and RECEIVER combined, Marconi, £5. MK. III 1-VALVE, complete outfit, £7. TUNERS, ex-W.D., 8/- to 40/-. VALVES, all types, low prices. VARIOMETERS, 3/-. SQUARE SECTIONED TINNED COPPER WIRE for PANELS, 3d. for 24 in. WIRE, huge stock all gauges.

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PROOF!

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"WIRELESS WEEKLY," February 6th, 1924.

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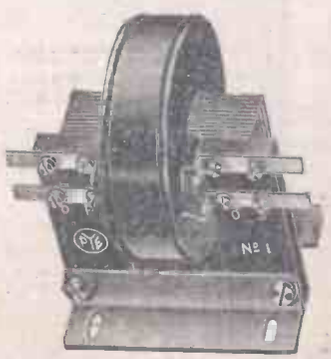

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No. of coil	Minimum Wavelength	Maximum Wavelength	Minimum Wavelength	Maximum Wavelength	PRICE
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30	**235**	**440**	**130**	**425**	**4/10**
35	285	530	160	490	4/10
40	**360**	**675**	**200**	**635**	**4/10**
50	480	850	250	800	5/-
60	**500**	**950**	**295**	**900**	**5/4**
75	600	1,300	360	1,100	5/4
100	820	1,700	500	1,550	6/9
150	965	2,300	700	2,150	7/7
200	1,885	3,200	925	3,000	8/5
250	2,300	3,800	1,100	3,600	8/9
300	2,500	4,600	1,400	4,300	9/2

BOLTS THROUGH TRANSFORMER LAMINATIONS —

A good transformer never has a bolt running through the laminations—some transformers, designed incorrectly or through carelessness or cheapness have as many as 6 bolts running through the laminations! Yet they are sold, because buyers take them, never thinking. If you buy a LISSEN transformer you will never get a bolt running through the laminations. Because of its skilfully balanced design, the LISSEN T3 transformer actually compares with many expensive transformers—it is one of the best light transformers made—AND IT HAS NO BOLT RUNNING THROUGH THE LAMINATIONS . . **16/6**

AERIAL REACTION

is no alternative to LISSEN Radio Frequency Amplification.

It is a mistake to assume that because aerial reaction is used in a receiver there is no need for LISSEN Radio Frequency amplification in the same receiver. If your aim is distance, add one stage of LISSEN REACTANCE (prov. pat.). Its great efficiency, its rapid tuning, has made radio frequency amplification more widely used than previously. One stage LISSEN REACTANCE in every receiver would give far greater range. Complete with switch already mounted — no complications — no soldering — LISSEN ONE HOLE FIXING, OF COURSE. Print with each shows easy connections.

150–10,000 metres **19/6** 150–600 metres **17/6**

To cover distance, every receiver should be fitted with one stage LISSEN REACTANCE — lower in cost than a set of plug-in coils. SELF-TUNED— needs no condenser. Sometimes a vernier is useful, however.

MAKES ELIMINATION EASY—

No difficulty will be experienced in cutting out any nearby broadcasting station. Most morse interference will also be successfully eliminated. There is, however, a certain type of morse interference which calls for greater skill. Even where this interference cannot be entirely got rid of, however, by those who are not sufficiently skilled it can be subdued to the extent that its troublesome features do not spoil the reception of broadcasting programmes. The LISSENCEPTOR (prov. pat.) is a useful thing to add to any receiver. It needs a separate condenser to tune it. Preferably it should be a really *low-loss condenser*, such as the LISSEN Mica Variable Condenser **17/6**

LISSENCEPTOR Mark 1 type for broadcasting **7/6**
" 1 type for 600 metres **7/6**
" 2 type for broadcasting and 600 metres combined, **15/6**. (This mark 2 type has a switch all mounted which makes tuning more flexible.)

YOU JUST GENTLY PULL, & PUSH—

and you hear these little switches "make" with a reassuring click. The contacts do not short when changing over—they are self cleaning—there are no neater or handier switches. They have many uses. LISSEN ONE HOLE FIXING, OF COURSE. Take up hardly any room.

LISSEN two-way Switch (prov. pat.) **2/9** | LISSEN Series-Parallel Switch (prov. pat.) **3/9**

CHOOSING A TUNER—If you do not wish to use plug-in coils there is the LISSEN Tuner, with its simplicity of control, its switch complete, its sharp tuning on all ranges, with full efficiency at every point—negligible H.F. resistance, largest inductance for a given length of wire—LISSEN multi-wound—150 to 4,000 metres range with a .0005 condenser (preferably use the LISSEN Mica Variable Condenser Mark 2 type **17/6**
LISSEN ONE HOLE FIXING, OF COURSE **22/6**

CORRECT GRID POTENTIAL—

LISSEN VARIABLE GRID LEAK (prov. pat.) besides making a receiver sensitive, especially in some circuits, clarifies signals, and an interesting alternative use is across the secondary of a transformer when it will suppress any tendency for the transformer to amplify the higher notes of the musical scale disproportionately to the lower notes. LISSEN ONE HOLE FIXING, OF COURSE—POSITIVE STOPS BOTH WAYS— the unique resistant element cannot be duplicated **2/6**

LISSEN Variable Anode Resistance, same outward appearance as the LISSEN Variable Grid Leak, 20,000 to 250,000 ohms . . . **2/6**

OVERLAP

The Explanation of an Unstable Set.

One of the troubles met with in reaction circuits is that reaction is not even and gradual. For instance, as the coupling is increased the set will suddenly burst into violent oscillation, and as the coupling is decreased the oscillation will continue beyond the point at which it started. This condition is known as "OVERLAP," and IS A VERY BAD FAULT WITH A REACTION COUPLING, as in practice it means that the oscillation point can never be reached without the set becoming unstable. The CONSTANTS of LISSEN REGENERATIVE-REACTANCE (prov. pat.) are so arranged that there is a perfect reaction - coupling over the whole range covered. There is no re-radiation, either. There is no "OVERLAP" (providing the correct values of anode and filament are used). There are other advantages in using the LISSEN REGENERATIVE - REACTANCE—it takes the place of plug-in coils. If plug-in coils are used (instead of LISSEN REGENERATIVE REACTANCE) to provide reaction in the anode circuit, it will only be possible to use one stage of radio frequency amplification, because it is next to impossible to control two stages of radio frequency amplification with plug-in coils. With LISSEN REGENERATIVE REACTANCE, however, other stages of H.F. can be added as desired, and easily controlled, each stage adding immensely to the sensitivity and range of a receiver. Selectivity is also greatly increased when the LISSEN REGENERATIVE-REACTANCE is used—nearby broadcasting stations can be tuned out and the others brought in with full built up strength. Much American telephony has been successfully received on two-valve sets. Then, again, a set of plug-in coils to cover the same wide range would cost more than the LISSEN REGENERATIVE-REACTANCE—no coil holder to buy with the latter, either. This LISSEN part is provided complete with internally connected switch already mounted—no soldering—no complications—blue print with each shows easy connections—LISSEN ONE HOLE FIXING, OF COURSE.

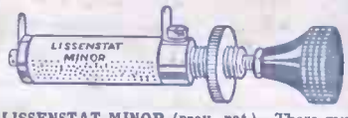
150–4,000 metres **£2/12/6**

(Tune always with a vernier—preferably the LISSEN VERNIER, specially designed for fine tuning in H.F. circuits, price **12/6**

THE LISSENSTAT as an aid to TUNING

In tuning, particularly in long distance work and also where extreme selectivity is desired, there is always one spot which will give the best results. LISSENSTAT control makes it possible to regulate critical electron emission to correspond exactly with the degree necessary for perfect detection. There are three types of LISSENSTAT control —

THE LISSENSTAT (prov. pat.)—this is the super filament control, ideal for dull emmitter and all valves **7/6**



THE LISSENSTAT MINOR (prov. pat.)—There must be many hundreds of thousands of inefficient rheostats in use. This latest development of LISSENSTAT control provides something of the beautiful Lissenstat control at a popular price. For dull emitter and all valves (the Lissenstat is a still better control) . **3/6**

THE LISSENSTAT UNIVERSAL (prov. pat.)—A minimum resistance can be left in circuit to protect expensive dull emmitter valves. Full resistance is 50 ohms **10/6**

To those who make the mistake of thinking that LISSENSTAT control is the same thing as an ordinary rheostat —LET THEM TRY THE DIFFERENCE.

Text Book of LISSEN PARTS—post free 8d. Free to the trade. TO THE TRADE—IT IS WORTH A GOOD DEAL TO THOSE TRADERS WHO ARE KNOWN TO SPECIALISE IN LISSEN PARTS.

LISSEN LIMITED

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BUILD—WITH THE AID OF THE BEST PARTS

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