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CONTENTS

	PAGE
Editorial	2
Distortion in Low Frequency Amplifiers. By S. O. Pearson	3
A Portable Armstrong "Super." By W. Winkler	7
A Compact Two-Valve Receiver. By E. J. Baty, B.Sc.	9
Testing High Frequency Transformers. By Maurice Child	12
Novel Ideas and Inventions	16
Inductance Coils—I. By W. James	18
Wireless Club Reports	22
Notes and News	24
Correspondence	28
Questions and Answers	29

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OUR POLICY.

By THE EDITOR.

EVERY journal, irrespective of the subject with which it deals, must of necessity have some policy which it follows and which serves to guide its Editorial pages so that its readers may have their interests catered for to the fullest extent possible. No journal can, of course, retain year in and year out the same policy, bound by hard and fast rules, uninfluenced by changing conditions. Changes may take place which are so great in the history of the subject dealt with that the Editorial point of view and policy must be revised in deference to these changes which have come about. However, no journal should ever be presented to the public, from which its readers are to be gathered, without first of all some mission to perform and some service to render to its readers, which, in the opinion of those responsible for its production, will ultimately render it indispensable.

Perhaps one may be permitted to criticise an opinion which is so often expressed at the present time by those new to wireless that Broadcasting has created the amateur interest in the science. It is true that Broadcasting has done much to advertise and popularise the science, but that a very real interest was taken in it by the amateur and experimenter long before Broadcasting was introduced is amply demonstrated by the fact that this Journal has flourished for years and has been almost entirely supported by readers who belong to the class of experimenter and amateur. Broadcasting has, of course, opened up the way for a new industry, with many branches, extending even into journalism, but it cannot claim to have originated amateur interest in wireless.

This Journal has, through many years, adopted the policy of meeting the requirements of the amateur and experimenter, and whatever influences have affected the policy have been those produced by what may be termed the "experimental atmosphere" of the moment. That is to say, whenever new ideas or new circuits have been introduced the aim has been to review them from the point of view not of the professional so much as of the amateur, and to endeavour to foresee how each new production could serve the amateur in his investigations.

Thus, if we take the trouble to review the volume just completed and those which preceded it, we confidently believe that the reader will find therein a record of progress which has been achieved through the support and endeavour of those who have established landmarks in amateur history. The opportunity occurs here to express our appreciation to all those whose names appear as contributors in past volumes, for it is to them that we, as producers of the Journal, as well as our readers, are indebted for the co-operative attitude which has prompted them to pass on to others, through the medium of this Journal, the very specialised information which, by experience and long association with experimental work, they have gained. Such appreciation of the work of our contributors can be made with all the more confidence, knowing the high standard and degree of novelty which our readers expect and which it is our aim to maintain.

With this issue we commence upon another volume with the same confidence in our readers and assurance of their support in our endeavours to maintain our policy of furnishing within the pages of the Journal every class of information which the amateur requires, whilst anticipating their needs by describing every new development constituting a further step in the progress of the science of wireless telegraphy and telephony.

DISTORTION IN LOW FREQUENCY AMPLIFIERS

A good deal of poor quality is caused through the incorrect use of a note magnifier. This article deals step by step with each factor which may cause distorted signals.

By S. O. Pearson, B.Sc.

WHEN it is desired to amplify wireless signals or telephony sufficiently for reception on a loud speaking telephone, it is almost essential to employ one or more stages of low frequency amplification after the rectifier. The kind of note magnifier most commonly used is the transformer-coupled type, on account of its relatively large amplification for a given number of thermionic valves. Instruments of this type must be very carefully designed if the received speech is to be free from distortion, and in this instalment the chief causes of distortion, and their effects, are discussed, suggestions being given in each case for the elimination of distortion as far as possible. For reasons given below it will be seen that the transformer-coupled note magnifier can never be *quite* free from distortion, although with careful design very good results can be obtained.

It is quite commonly found that the results given by a set operating a loud speaker are not as clear as those given by a set operating head telephones only, where no note magnifier is used. For this reason it is often assumed that the loud speaker must be at fault, but this is not usually the case. The writer has found that with a carefully designed amplifier the results given by a loud speaker are even more pleasing to listen to than those of head telephones.

The chief causes of distortion in the transformer-coupled type of note magnifier may be classified as follows :—

(1) Operation too near either of the bends in the characteristic curve of a valve.
(2) Saturation of one or more of the valves.
(3) Resonance effects in the transformer windings and circuits.
(4) Presence of high frequency oscillations in various parts of the circuits.
(5) Effect of the iron cored transformers.

These several causes are discussed in turn below, and, where possible, suggestions are given for their elimination.

1.—Operation too near the Bends of the Characteristic Curve.

This is one of the most common causes of distortion and is simply due to faulty adjustment. The vibrations which go to make up speech or music are of a very complex nature, and if oscillations of potential representing in wave form the vibrations of perfect speech are impressed on the grid of a valve, then, in order to get magnified speech without distortion on the output side of the valve, the wave-form of the oscillating component of the plate current must be an exact reproduction of that of the grid potential. This is only possible when the operating portion of the grid voltage/plate current curve is a perfect straight line. Now the valve characteristic curve is usually approximately a straight line over a limited range only, and therefore it is most important to see that the normal grid potential is adjusted to such a value that operation takes place over the straight portion of the curve. The correct grid potential is not fixed for any particular valve, but depends on the value of the plate potential. There is a separate static characteristic curve for each value of the plate potential, and a "family" of such characteristic curves is shown in Fig. 1 for various plate voltages and constant filament current. Varying the filament current simply has the effect of changing the positions of the upper bends of the curves without appreciably affecting the lower portions.

The simplest arrangement is obtained when such a plate voltage is employed that zero grid potential will allow the valve to function at or near the middle point of the straight portion of the characteristic curve,

as in this case no grid battery is needed. This is the most usual arrangement, and the plate potentials recommended for various types of valves by their respective makers are given on the assumption that the normal grid potential in each case, for purposes of amplification, is zero with respect to the negative end of the filament. Modern hard valves which are manufactured in large quantities are fairly uniform, and in general it is quite sufficient to accept the manufacturers' figures. However, one occasionally comes across a valve with peculiar characteristics of its own, and therefore if facilities are available, it is advisable to determine the chief characteristics of all valves in use.

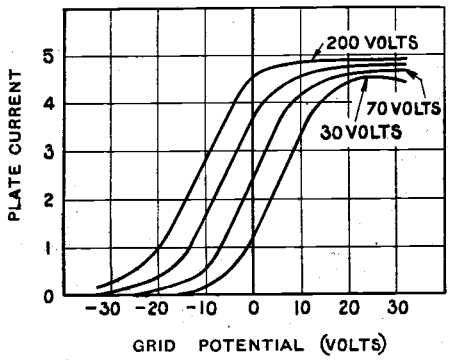


Fig. 1. *A "family" of characteristic curves for various plate voltages and constant filament current.*

The coupling between two valves of a note magnifier constitutes an impedance connected in series with the plate of the first valve, the object being to obtain variations of potential differences across it proportional to the oscillations impressed on the grid of that valve but having been magnified. These magnified oscillations of potential are passed on to the grid of the second valve by transformer action. For satisfactory working the impedance of the intervalve coupling at the lowest note frequency to be dealt with should be at least equal to the plate to filament resistance of the valve. An ordinary power transformer is designed to take as small a no-load current as possible without making the design too expensive, and the conditions in an intervalve transformer are very similar; namely, that for a given amplitude of oscillating potential difference across the primary winding, the oscillating current shall be as small as possible. But in this case it is not the expense which decides the limit but the self capacity of the windings. This is discussed later.

When a very high resistance or a very high impedance is connected in the plate circuit the plate current does not vary, for a given impressed oscillation on the grid, as it would do without any impedance in the plate circuit. The anode impedance is actually placed in the circuit *to prevent the current from varying, i.e.*, to act as a choke, and in so doing to produce an oscillating voltage across the resistance or impedance. Thus we do not get variations of plate current of the order suggested by the ordinary anode characteristic of the valve. This is due to the fact that the plate potential is no longer constant, being at every instant equal to the difference between the voltage of the H.T. battery and the voltage across the primary of the transformer. However, the oscillations across the primary of the transformer will be a fairly exact copy of those impressed on the grid if the valve is operated on the straight portion of the ordinary D.C. characteristic using normal value of H.T. voltage, because the variation of plate current, for fixed grid potential, is nearly proportional to the variation of plate potential. This of course assumes that there is no distortion due to the iron of the transformer.

It is interesting to note what happens on connecting in the plate circuit a choke or transformer primary of infinitely great impedance, but whose resistance is sufficiently low to allow the D.C. component of the plate current to flow and thus maintain the *average* potential of the plate at the normal value. Under these conditions the plate current could contain no oscillating component at all, even though an oscillation is being impressed on the grid. But across the choke there will be an oscillating potential difference of such a value that the plate potential is varied in such a manner as to maintain the plate current constant. Under these conditions the valve gives its greatest possible amplification, and the ratio of the amplitude of the oscillation across the choke to that applied to the grid is equal to the *amplification constant* of the valve. These are really the ideal conditions of operation, but in practice it is impossible to wind a choke or transformer with very large impedance on account of the self

capacity of the windings. With an impedance, at a given frequency, equal to the internal resistance of the valve, the voltage amplification will be just half the amplification constant, but with a step-up transformer this may be multiplied by about three before being applied to the grid of the next valve.

The foregoing remarks have been added because it does not seem to be generally appreciated that the current oscillations in the plate circuit of a valve coupled to another as described above, are suppressed as far as possible, being virtually converted into voltage oscillations. Also, neglecting self-capacity, an intervalve transformer when in operation is really on no-load or open circuit, assuming that the grid of the second valve does not draw any current. Thus it will be seen that the very common statement that the impedance of the intervalve coupling must be equal to the internal impedance of the valve for best results, is rather misleading—the higher the impedance the better is the amplification. The same conditions apply as regards voltage amplification, to the transformer-coupled as to the resistance-coupled amplifier, and in Fig. 2 a curve is shown giving the relation between resistance or impedance in the plate circuit and the voltage amplification. With the transformer, of course, the impedance varies with the frequency, whereas for the ohmic resistance the impedance is practically constant for all frequencies.

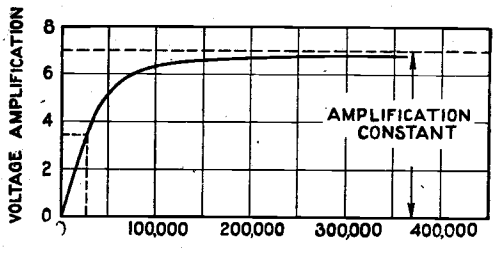


Fig. 2. Curve giving the relation between resistance or impedance in the plate circuit, and the voltage amplification.

The valve for which the curve of Fig. 2 was drawn had an amplification constant of about 7, its internal resistance being 27,000 ohms, and the curve shows that when the impedance in series with the plate is 27,000 ohms the voltage amplification is 3·5 Now since the impedance of a transformer varies in almost direct proportion to the frequency, it follows that the voltage amplification will be different for different frequencies, and the higher frequencies and harmonics will be amplified to a much greater extent than the lower ones. The effect of this is to give the speech a sharp piercing sound, and in the case of music the base notes are almost, if not entirely, swamped by the higher notes. This defect is usually overcome by shunting the primaries of the transformers with small condensers of the order of 0·002 mfd., so as to offer a lower impedance to the higher frequencies, these small capacities not materially affecting the impedance offered to the lower note frequencies. The effect is to give the speech or music a more mellow and pleasing tone.

2.—SATURATION OF ONE OR MORE OF THE VALVES.

When the signals have been amplified up through successive stages to such an extent, and the amplitude of the oscillations applied to the grid of, say, the last valve, are so great that operation takes place right round both bends in the characteristic curve, that valve is said to be saturated. When this occurs, all the peaks of the waves are cut off or flattened out both top and bottom, and very bad distortion is the result. If the valve is only just saturated the trouble can usually be overcome by brightening the filament and using a higher plate potential on the last valve. This has the effect of considerably lengthening the straight portion of the characteristic curve. When a much higher plate voltage is employed it is usually necessary to apply a negative potential to the grid in order to work at the correct point of the new curve. When very loud results are required it becomes necessary to employ a larger valve of the type used for transmitting purposes and capable of giving out a considerable amount of power.

3.—RESONANCE EFFECTS.

It was stated above that the windings of intervalve transformers are never free from self capacity. This capacity and the added capacity across the primary mentioned above, in conjunction with the inductance of the windings of a transformer may constitute a tuned circuit, especially if the resistances of the windings are low. This is usually the case and should the natural

frequency of resonance of the transformer lie within the range of audible frequencies received, "blasting" will take place whenever a note of that frequency occurs, this being one of the faults of cheap transformers wound with insufficient wire. It is usual to shunt the primaries of the intervalve transformers for the reason given above, and this tends to bring the natural frequency down below the audible range. When a cheap transformer with too high a natural frequency is shunted by a condenser sufficiently large to bring the resonant frequency down below audibility, it is usually found that most of the higher harmonics of the speech wave pass through the condenser instead of through the transformer winding, with the result that the speech has a muffled sound. When buying an intervalve transformer it always pays to get a good one.

4.—PRESENCE OF LOCAL OSCILLATIONS.

Sometimes in low frequency amplifiers it is found that continuous oscillations are set up and maintained. Their frequency may lie within the audible range, in which case the set is said to "howl," a phenomenon with which most experimenters are familiar; but on the other hand the frequency of these local oscillations may be above the range of audibility, and will not be heard in the telephones when no speech is being received. Even when speech is being received the high frequency oscillations will not be actually heard, but they have a detrimental effect on the quality of the speech or music, this effect being rather difficult to explain in words. Those who have listened to speech received on an Armstrong super regenerative receiver will have some idea of the quality of the speech received. Apart from the high-pitched whistle there is a strange "edging" or "fuzziness" about the words.

Local oscillations of this nature are, of course, produced by stray coupling between the output and input sides of the amplifier and may be due to faulty laying out and spacing of the connections. The frequency of the oscillation will be at the natural frequency of some part of the circuit, and once having constructed an amplifier which exhibits these phenomena it is no easy matter to locate the trouble and eliminate it. This can only be done by trial, and the remedy usually lies in the reversing of one or more of the intervalve transformer windings.

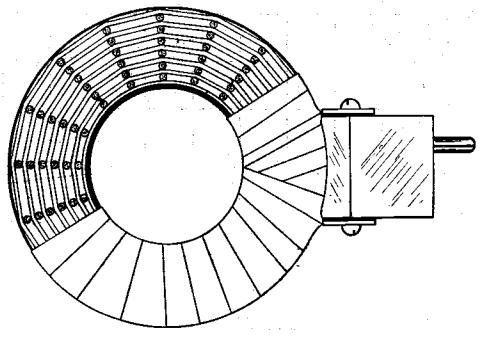
Low frequency oscillations or howling may take two forms, (*a*) ordinary free oscillations as above, and (*b*) the starting and stopping of high frequency oscillations in the detector circuit where the leaky grid-condenser method of rectification is used in conjunction with reaction. Howling is usually due to the latter cause, which is not really a fault in the L.F. amplifier, but rather due to excessive reaction. When the set is made to oscillate a negative potential is accumulated on the grid of the detector and may reach such a high value that the oscillations cease. As soon as the grid has reached a voltage approaching the normal value again, the oscillations re-commence. This process is repeated several hundred times per second with the result that the set howls. When receiving telephony, of course, the set must never be made to oscillate, so that howling from the latter cause would be impossible.

(*To be concluded*).

A NEW RANGE OF TUNING COILS.

Several unique and interesting improvements have been introduced in the construction of the "Atlas" Patent Plug-in Coils, which are manufactured by Messrs. H. Clarke & Co. (Manchester), Ltd., Atlas Works, Old Trafford, Manchester.

The coils are wound with stranded insulated wire, and the layers are spaced. No resin or varnish is used on the winding.



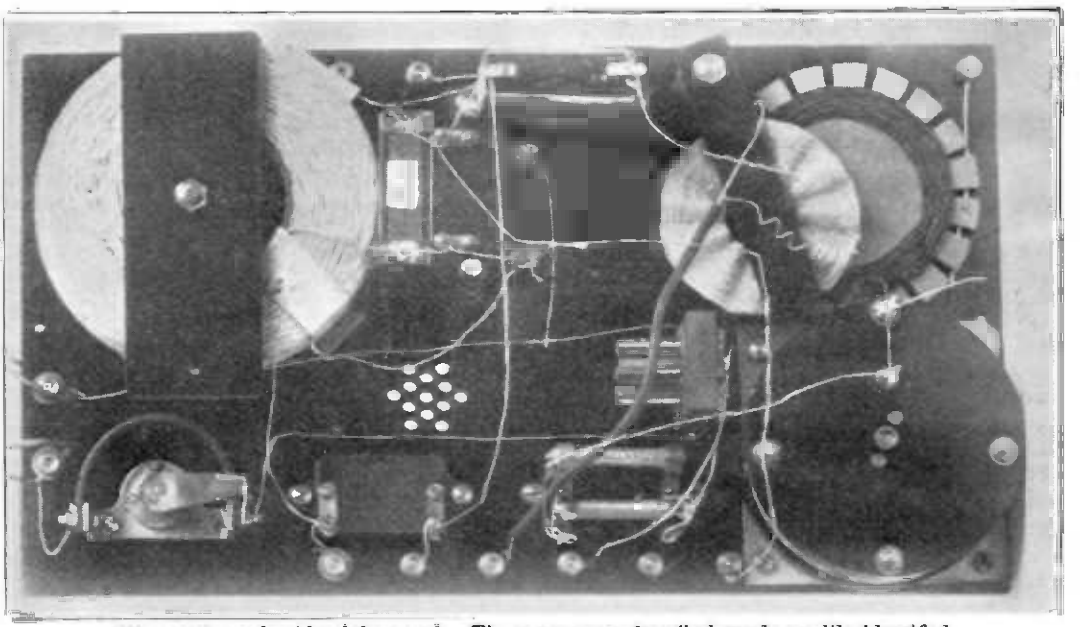
The coils have the standard plug mounting, and are nicely finished throughout.

The complete set comprises sixteen coils, giving a wavelength range of 120 to 26,000 metres when a capacity of 0·001 μF. is used in parallel.

A PORTABLE ARMSTRONG "SUPER."

By W. WINKLER.

THE special merit of the Armstrong receiver is that it lends itself to portable construction. It is possible to include the entire apparatus, together with aerial and, if necessary, batteries, in a small hand case. The following description is of such a receiver built essentially for use when travelling by road, for picnic parties, etc. The design is quite simple, and it is not thought necessary to give detailed constructional data, as most experimenters are acquainted with the general principles of the Armstrong receiver, but a general outline, relative dimensions, and



View of the underside of the panel. The components described can be readily identified.

types of components, will give the beginner confidence in the construction of a receiver of this type.

Looking at the view of the underside of the panel, the following components will be identified :—

Aerial tuning condenser, 0·0001 mfds. maximum.

Aerial tuning inductance (L_1), which is a basket coil built on to a piece of card, 2 ins. inside and 3 ins. outside diameter, wound with No. 26 D.C.C.

A reaction inductance (L_2), (also a basket coil), 1 in. inside diameter and $2\frac{1}{2}$ ins. outside, wound with No. 26 D.C.C., and attached to a movable arm which is operated by a lever on the face of the panel.

A large inductance (L_3) which consists of two 1,250 or 1,500 duolateral coils in series, or one large "slab" coil with a centre tap.

The positions of the contacts "X" and "Y," shown in the circuit diagram overleaf, should be varied for best results, and when found may be kept constant.

The three condensers in the oscillatory circuit may be assembled one over the other by means of two long 4 BA screws. Spacing pieces will be necessary to keep the contacts apart.

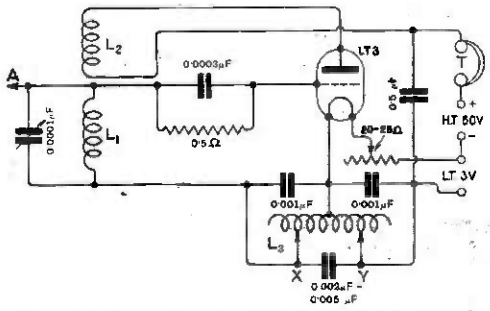
A grid condenser having the usual value of 0·0003 mfds., and a leak of half a megohm.

The H.T. battery is bridged with a condenser having a value of 0·01 mfds.

The filament resistance should be of the value of 20 to 25 ohms if it is intended to use a dull emitter valve.

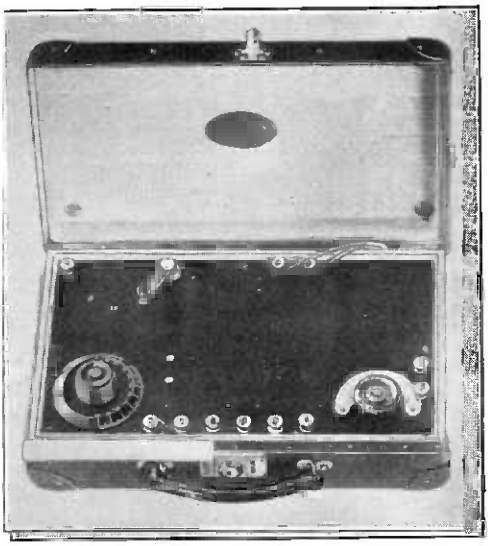
All of these components can be readily identified, and the method of assembling can be left to the ability of the reader.

The relative positions of the various components is of no great importance provided that the leads in the high frequency circuits are arranged to keep the capacity at the absolute minimum.



The circuit employed. Terminal "A" may be connected to a few feet of elevated wire.

In this instance the complete set measures 12 ins. by 7 ins. by 3½ ins., and weighs

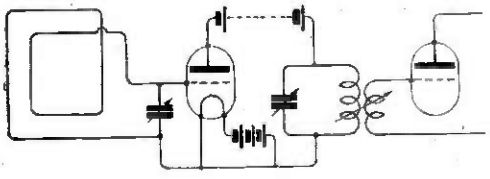


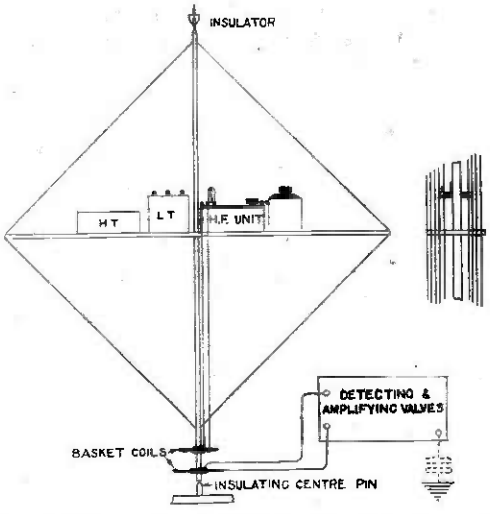
The portable receiver with frame aerial arranged within the lid.

8 lbs. A 60-volt H.T. unit, a pair of high resistance telephone receivers, and a small accumulator of one cell (if a dull emitter valve is used), complete the outfit, which is so easily portable that it can be readily accommodated in a small car, side car, or even kit-bag.

Avoiding Errors in Direction Finding.

A common source of error in direction finding by the frame aerial method is due to the effect of the leads in the high-frequency amplifying and tuning circuits acting as collectors of oscillations irrespective of the setting of the frame. Another trouble often encountered arises from the varying interaction of the frame with the tuning inductances as the frame is moved and the sensitiveness of the receiving circuit subsequently altered. These difficulties may be overcome by supporting the high frequency apparatus on the struts of the frame so that the relative positions of frame and inductances remain constant. A good method of transferring





the signals to the detecting circuit is through coupled inductances concentrically arranged about the spindle of the frame, thus avoiding flexible leads or rubbing contacts. J. F. S.

A COMPACT TWO-VALVE RECEIVER.

By ERNEST J. BATY, B.Sc.

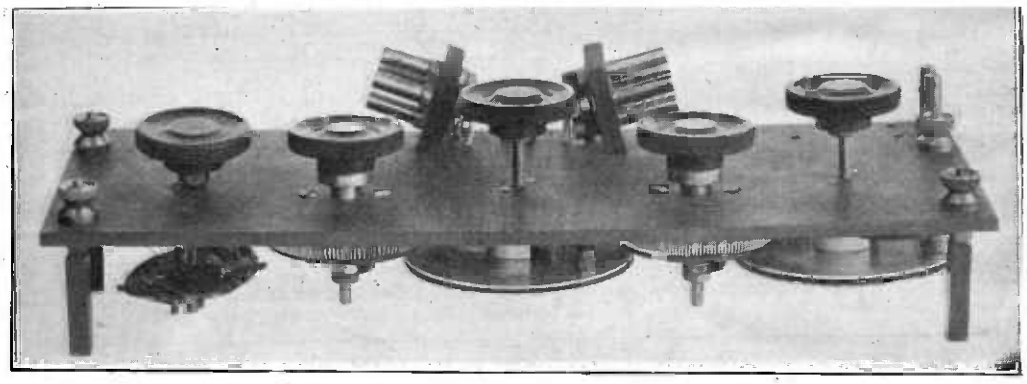
WITH the set here described all the broadcasting stations may be received on a reasonably good aerial 30 miles north-west of London.

The principle behind the design of the aerial circuit is novel so far as I know, an aerial inductance being chosen of such size and its distance from the secondary adjusted to a point at which there is a satisfactory balance between the energy received by the aerial and the energy transferred to the secondary circuit.

It is sometimes found that a tuned aerial used in conjunction with a tuned secondary circuit, owing to the resistance of its coil and the resultant damping, actually passes on to the secondary less energy than does a smaller untuned coil, especially on rather weak signals. After all, there is a very good foundation in theory and practice for the use of different inductance values to fit the strength of signal received. Thus, in winding alternating current transformers we adjust the number of turns to suit both the periodicity, which is the equivalent of the wavelength, and the voltage, which is the equivalent of the signal strength.

For loud signals we thus use a larger aerial coil, say 100 turns, and for distant signals a smaller coil, say 30 turns, connected direct to aerial and earth without any condenser in the primary circuit. The secondary circuit is tuned in the usual way, and the coupling between primary and secondary is variable.

With this system of aerial and secondary, the secondary can oscillate and heterodyne incoming signals without any sign of oscillation in the primary (aerial) circuit. Tightening the coupling both increases the tendency of the primary to oscillate and decreases the oscillations in the secondary circuit, and it is very easy with slow movement of the coupling to strike any point of oscillation desired.



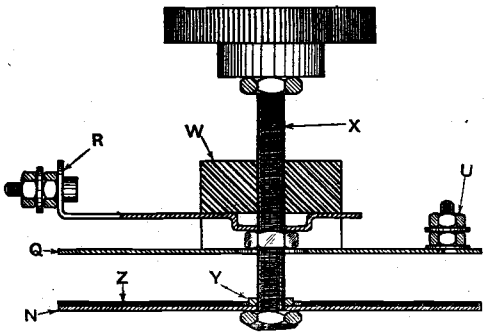
Complete two-valve receiver of particularly simple construction.

The coupler itself consists of two coils on two hubs on the same spindle. The first hub is secured to the panel by two set screws only. Rotation of the spindle causes movement of the second hub which is tapped 2BA to fit the spindle. Rotation of the second hub is prevented by two guides fixed on the first hub, passing through clearance holes in the movable hub.

The set tunes from about 300 to something over 600 metres. All three coils (including

the plate circuit inductance) are uniform and consist of 90 turns of 32 D.C.C. wire.

The condensers are of an unusual type, consisting of two three-inch aluminium discs, one fixed and one movable. The fixed disc is secured to a vulcanite hub which is in turn secured to the panel, the fixing and hub being uniform with those of the aerial and secondary coils.



The variable condensers. Q, N the plates; Z mica and shellac; Y holding-down collar; W insulating mounting piece; X 2BA spindle; R, U terminals. A copper clip, insulated with mica, secured to the strip leading to the terminal R, serves as a grid condenser.

The fixed hub of the condensers is $\frac{3}{4}$ in. in length and there is thus sufficient clearance between the fixed plate of the condenser and the underside of the panel for part of the filament rheostat which can thus be dovetailed in between two three-inch condensers fixed at 4 ins. centres.

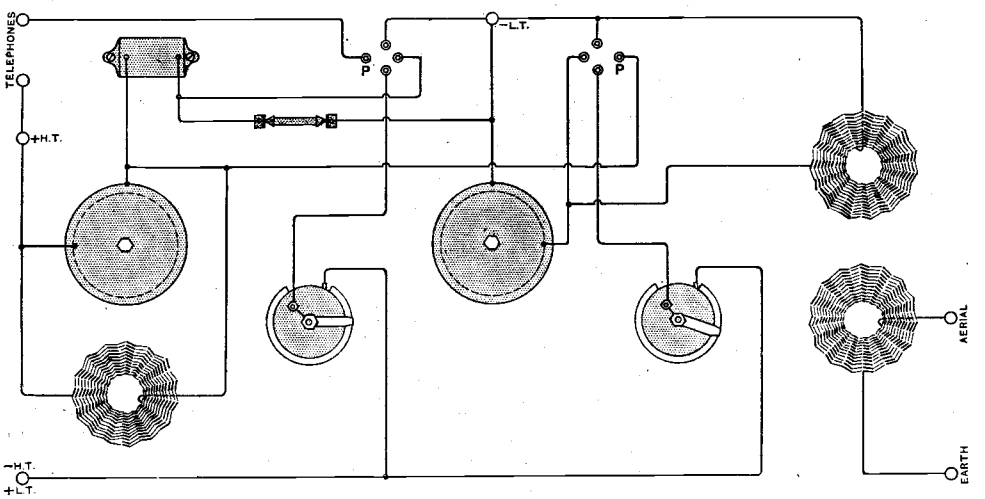
Capacity effects between the fixed condenser plates and the rheostats do not cause ill effects, as the fixed plates of the condensers are connected to the filament and the high tension positive respectively, and the moving plates which are connected to the first and second grids respectively are completely shielded by the fixed plates at all positions.

The coils used are all standard, wound on vulcanite formers and screwed to hubs which can be fitted either to the tuner coupler as fixed or moving coils, or they may be fixed behind the tuned anode condenser between the rheostat and the panel, making a very compact construction. The wavelength and damping of the coil is not appreciably affected so long as the distance between the coil and the condenser plate is at least $\frac{3}{4}$ of an inch.

Variation of the values of the condensers is effected by turning the spindle on which is affixed the moving plate. This spindle is threaded 2BA, and is held firmly between the screwed hub and a lock-nut sunk into the hub with a spring washer between the two to prevent backlash.

The increase of strength of signal when using these condensers is probably due to the small amount of metal used in their construction.

The minimum value of the condensers is very low, enabling a range of wavelengths from 300-700 metres to be obtained by the use of one coil and condenser only.



Practical wiring diagram.

The terminal of the moving plate of the condenser is on an arm of spring copper held between the spring washer and the lock nut, and is for convenience brought out to the edge of the condenser plates.

If a piece of 1 in. copper strip is bent over one of the terminal arms of the condenser with a piece of mica for insulation between the two, a grid condenser will be formed which is both mechanically strong and very efficient. The value of the condenser is small (0·0002 μF), and with "A.R." valves signals may be rather better without a leak on distant signals. The set is, however, more stable when using a leak. There is nothing unusual as regards the connections: no reaction is used.

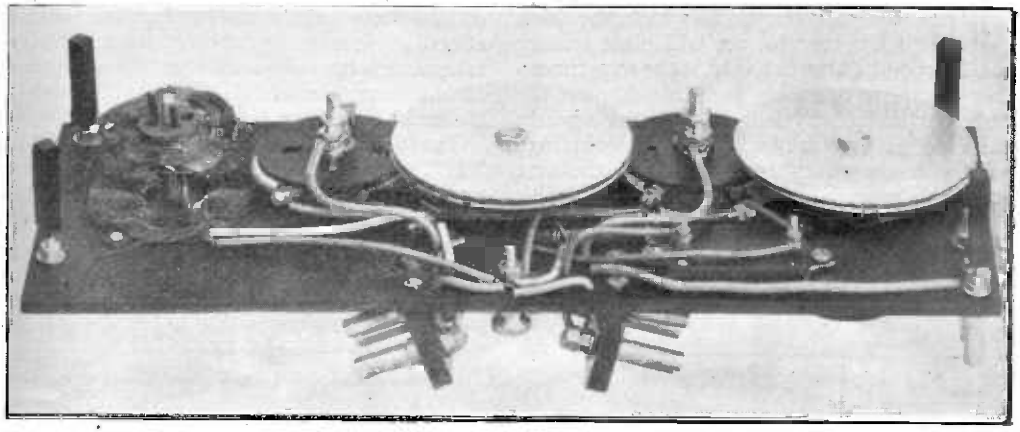
The condensers may be used either with a 90 turn coil as mentioned above, in which case five or six turns are required to cover the whole broadcasting wavelength, or a smaller coil of 50 or 60 turns may be used, in which case the condenser plates are much closer together and the broadcasting range is covered by half a turn, enabling an ordinary dial to be used.

Tuning is a little bit tricky at first, but results are well worth the slight extra trouble.

There are three adjustable features, the coupler between aerial and secondary, the secondary condenser and the tuned anode condenser.

The easiest procedure is as follows:—

Start with loose coupling, say $\frac{1}{2}$ inch between aerial and secondary coils; then screw both condensers up to high values until the click of starting oscillation is heard, making sure that the aerial itself is not oscillating. Then screw down both condensers together, keeping just on the oscillating point until the carrier wave is heard with maximum modulation—not of necessity with maximum strength.



Underside view. The arrangement of the variable coupling between the inductances can be seen, and also the construction of the variable condensers. In this instance a grid condenser of the usual type is employed instead of the insulated clip on the condenser lead.

Then leaving the tuned anode condenser alone, tighten the coupling and alter the secondary condenser until oscillation stops. The position of the secondary condenser is now fixed so long as no alteration is made in the high or low tension volts, the aerial, or the number of telephones in circuit.

Other stations may be tuned in by variation of the coupler and the tuned anode only.

The setting of the tuned anode condenser is constant for any given wavelength, and its dial can consequently be marked off in actual wavelengths.

TESTING HIGH FREQUENCY TRANSFORMERS

SIMPLE TESTS FOR EFFICIENCY AND OPTIMUM WAVELENGTH.

By MAURICE CHILD.

Vice-Chairman of the Radio Society of Great Britain.

The apparatus required is as follows :—

2 "R" valves.
1 Inductance coil (say 25 turns).
1 Low tension battery, 6 volts.
1 High tension battery, 60 volts.
1 Telephone transformer.
1 Pair low resistance telephones.
1 Grid condenser, 0·0003 mfds. (2 megohm leak).
The high frequency transformers to be tested.
1 Buzzer wavemeter.

IN this experiment it is first required to find the wavelength to which the high frequency transformer will most readily respond. Alternatively, if the experimenter desires to make his own transformers for any particular wavelength, it forms a ready method of determining when the windings of the transformer are correct. In the first case the procedure is as follows :—

The apparatus is joined as indicated in Fig. 1. The wavemeter is set up so that it can act inductively on the untuned coil "L"; the object of this coil is to conduct the oscillations generated in the wavemeter to the grid of the first valve, and incidentally to maintain this grid at a normal potential in relation to the filament. This is the usual working circuit when the valve is employed in the reception of signals. The coupling between the wavemeter and the coil "L" should be made so weak that signals are just audible in the telephones. Commencing with a short wavelength setting of the wavemeter, the strength of response should be noted carefully. Increasing the value of the wavemeter condenser (thus bringing up the wavelength) will probably have the effect of increasing the strength in the telephones, thus showing that the efficiency of the transformer (H.F.T.) is somewhat higher at this altered wavelength.

The wavemeter is moved in relation to "L" so that signals become just audible, and the experiment is repeated several times until it will be found that the coupling between the wavemeter and "L" is the minimum for a particular wavelength. As to whether this coupling is sharply defined or not, will depend on the construction of the high frequency transformer. If the latter is designed for short wavelengths the coupling will as a general rule be found to be quite sharply defined, the opposite being the case for long wavelengths.

High frequency transformers of different makes vary considerably in their efficiency, and it is necessary for the experimenter to decide what it is he requires his transformer to do before determining whether one particular type will be more suitable

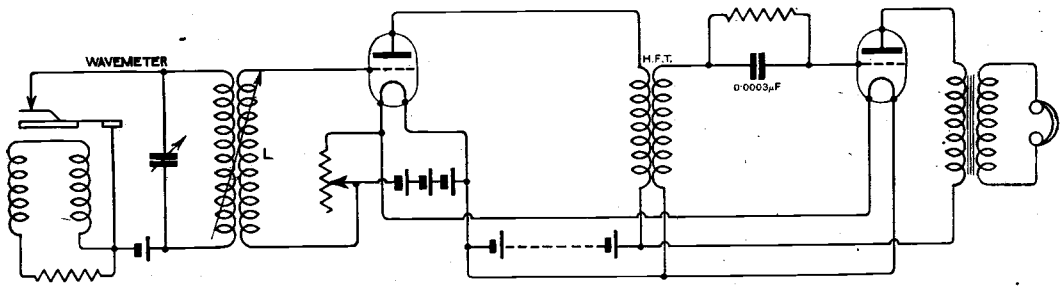


Fig. 1. The wavemeter on the left induces oscillations of the desired wavelength into the inductance "L" and high frequency amplifying circuit, affording a simple method for testing the efficiency of the H.F. transformer.

for his purpose than another. As a general guide it may be stated that high frequency transformers, if designed to give a fairly high efficiency over a broad range of wavelength, will not have a sharply defined maximum efficiency, or, in other words, the wavemeter adjustment in relation to "L" will not be found accurately. On the other hand, some transformers are designed to give a fairly sharp resonance on or close to a particular wavelength, and will give good amplification, but their efficiency will fall off rapidly if the wavelength is slightly changed.

The principal constructional difference between one type of transformer and another in relation to the foregoing remarks lies in the size of wire which is employed in the windings and the closeness of the coils. Transformers designed for broad tuning are usually constructed with a very fine wire offering a considerable resistance to high frequency currents and the primary and secondary are tightly coupled. The

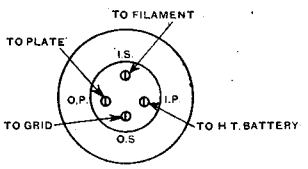


Fig. 2. Usual method of connecting the plug-in type of H.F. transformer.

reverse is the case in transformers designed for high optimum efficiency.

For the guidance of experimenters desirous of building their own high frequency transformers the Fig. 2 is given. This diagram shows the pin connections of the disc type of transformer which is perhaps the most widely employed, and is on the whole as satisfactory as any other. The standard connections of one large manufacturer of transformers of this description are shown. The pins marked "I.P." and "O.P." correspond to the inside and outside primary wires, and those marked "I.S." and "O.S." to the secondary wire. The windings have not all an equal number of turns; it is preferable to have a few extra turns (say 10 per cent.) on the secondary to those on the primary. This is especially the case if the primary winding is to be tuned, as is indicated in Fig. 3, and it is desirable that the size of wire employed should be as large as possible, No. 26 or 28 S.W.G. being suitable.

A variation of the above test may be required in cases where it is desired to tune the primary circuit of the H.F. transformer. In this case the experimenter will require to know the wave range which can be covered by the variable condenser

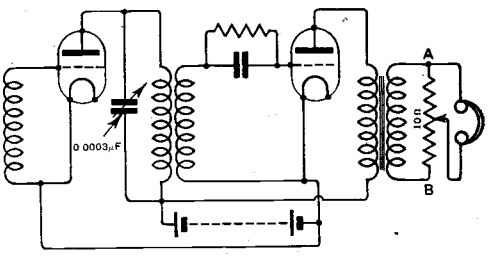


Fig. 3. Tuned H.F. amplifying circuit with an arrangement in the telephone leads for comparing signal strength.

across the primary winding. It is not desirable to have this condenser too large, a suitable value being given in the diagram (Fig. 3), viz. 0·0003 mfds. It will be noticed in this diagram that an alternative method for determining signal strength is shown, and can be applied, if desired, equally well to Fig. 1. In this case the secondary of the telephone transformer is joined to the two ends of a potentiometer of 10 ohms resistance. This can be an ordinary valve filament resistance, if there is difficulty in obtaining or making the proper instrument. The variable contact on the resistance is connected to the telephones, the remaining end of the telephones going to a common end "A" of the transformer. The nearer the variable contact is placed to "A," the weaker become the signals, and therefore an arbitrary measure of signal strength can be given by the use of a simple filament resistance scale. If this potentiometer method is employed, it will not be necessary to vary the position of the wavemeter, and more accurate results will be obtained.

The method of performing this test is first of all to determine the optimum wavelength of the high frequency transformer when the 0·0003 condenser is at its zero position. It can be incidentally noted here that the optimum wavelength will be slightly longer with the condensers connected than if it is completely disconnected or removed, so that when it is desired

to use a receiver employing one or more high frequency transformers which are to have all their primaries tuned, they must be designed accordingly, to allow for the slight minimum capacity of the variable condenser.

The variable condenser can now be set to its maximum position, and the wavemeter condenser readjusted until again the signal strength is the same as before. The two settings of the wavemeter condenser indicate the wave range over which the high frequency transformer will efficiently work. A small variation in wavelength either side of these values will result in a considerable weakening of signals, especially if the high frequency transformers are well designed and constructed.

It may be mentioned that, whilst the above determinations are not suitable for a very high degree of accuracy, they are sufficiently practical to give reliable results, and do not involve any expensive or complicated apparatus.

A more precise method of determining the optimum wavelength, making use of a valve oscillator, is shown in Fig. 4.

It will be seen that the terminals marked AB, CD correspond to the valve socket pins.

On lighting the filament of the valves in H.F. transformer circuit, high frequency oscillations will take place between the terminals CD, and the frequency of

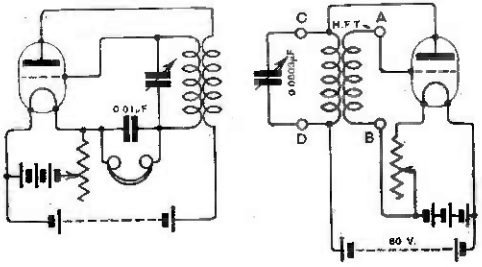
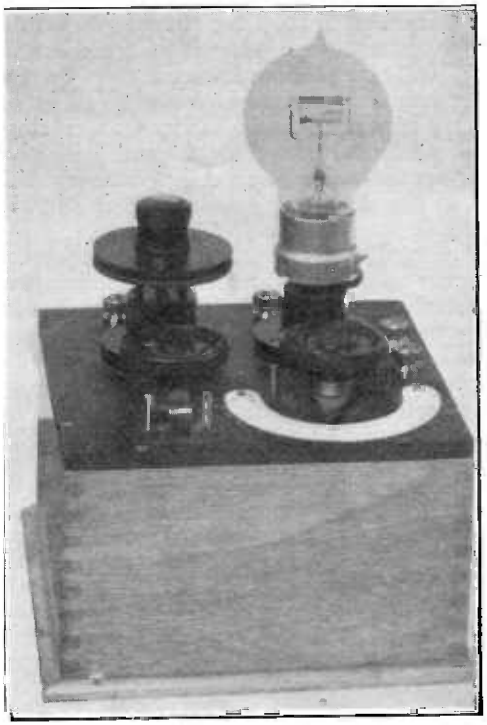


Fig. 4. Heterodyne wavemeter and transformer testing circuit.

these oscillations will be determined by the natural period of the transformer. This period can be altered by adding on the variable condenser and testing its value to produce any frequency within the limits of the transformer inductance values. If now the valve of the heterodyne wavemeter is switched on and the whole instrument is placed so that its



(By courtesy of Messrs. McMichael, Ltd.)

Fig. 5. An instrument specially designed for testing H.F. transformers of the plug-in type for efficiency and optimum wavelength.

own inductance lies fairly close, or in inductive relation to the high frequency transformer, a note will be heard in the telephones of the wavemeter when the latter's condenser is adjusted to a critical value.

The wavelength can be measured directly from the setting of the wavemeter condenser in the usual way, and the range over which the high frequency transformer is tuneable, can, in like manner, also be determined. A number of transformers can be tested very quickly in this way, and before finally soldering the connections to the pins (if the experimenter is making his own), a few turns can be taken off or added to the secondary windings, to bring the transformer up to the particular wavelength required.

Two photographs of an instrument designed on these lines are shown in Figs. 5 and 7, by the courtesy of Messrs. McMichael, Ltd. The experimenter will carefully note

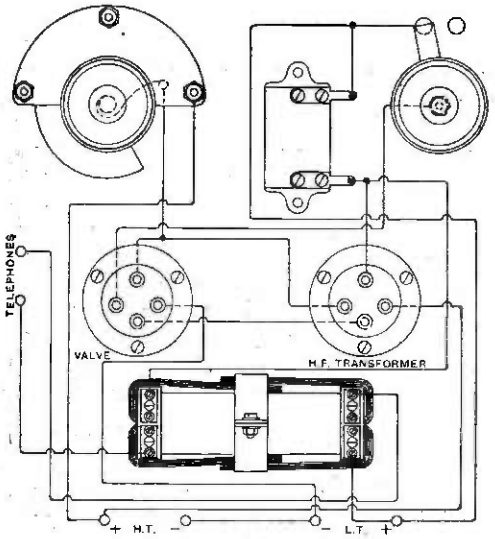
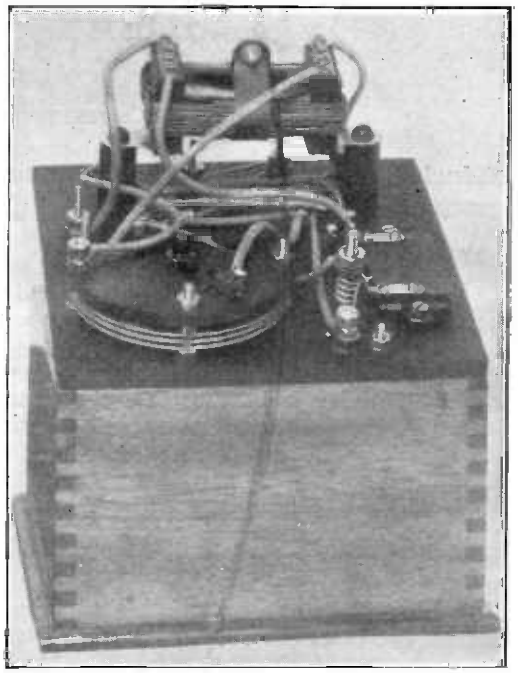


Fig. 6. Connections of the testing instrument.

the internal connections (Fig. 6) in order that he shall make no mistake that the set will oscillate when his high frequency transformer is plugged in.



(By courtesy of Messrs. McMichael, Ltd.)

Fig. 7. View of interior showing arrangement of components.

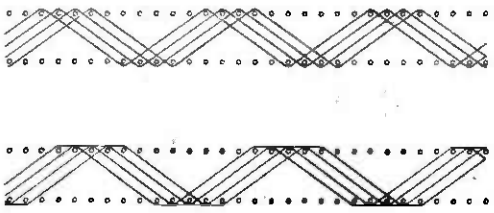
AN IMPROVED HONEYCOMB COIL.

Honeycomb coils wound by hand in the usual manner on formers having two rows of pins, will not have flat sides and a neat appearance unless the pins are very closely spaced.

Flat sides may, however, be obtained by winding round two pins on each side instead of one, as shown in the accompanying diagrams.

The starting pin is No. 1, and the wire is taken round pins Nos. 6 and 7 on the opposite row, then back to 12 and 13 on the starting row, 25 pins being used on each side. The number may be reduced to 13, but in this case the coil may have a little more self-capacity.

An inductance made in this manner takes no more time to wind than the usual



The upper figure shows the usual method of winding, while the lower figure is a suggested improvement for producing flat sides.

pattern of honeycomb coil, and, moreover, bears the neat appearance of the machine-wound article.

S.K.L.

NOVEL IDEAS AND INVENTIONS.

Abstracted by

PHILIP R. COURSEY, B.Sc., F.Inst.P., A.M.I.E.E.

Reducing the Errors of D.F. Apparatus.

WHEN the waves from a radio transmitting station are reflected by the upper layers of the atmosphere it is frequently found that there is a change in the apparent direction of the transmitter as observed by a receiving D.F. station. This effect is greatest when the radiation from the transmitter has a component of the electric force which is inclined to the vertical. The horizontal component of the electric force when reflected, and subsequently recombined with the vertical force produces an effect on the D.F. receiver which can only be neutralised by inclining the loop to the true direction of the station. Thus the indicated bearing becomes in error. Apart from natural causes which may so distort the wave from the transmitter that a horizontal component appears, the shape of the transmitting aerial is of importance in this connection. Only the truly vertical part of the aerial can radiate a wave having the electric force vertical, and any horizontal part of the aerial—such as the top part of an inverted "L" aerial—will cause the radiation of the undesired component.

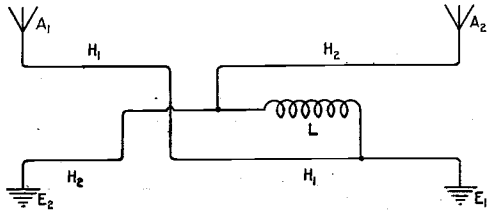


Fig. 1.

In the case where two or more spaced aerials are employed to give a transmission directional in a particular plane, the connecting wires between the transmitting apparatus and the vertical parts of the aerial may cause the undesired radiation unless they are arranged so that the external fields are neutralised.* One way of overcoming this defect is sketched in Fig. 1. In this diagram A_1 and A_2 are the vertical parts of two spaced aerials, while the coil L indicates the position of the transmitting apparatus. The horizontal connections between L and the two aerials are arranged double as sketched, so that the aerial A_1 is earthed at E_1 under the aerial A_2, while A_2 is similarly earthed under A_1. Thus the effects of the currents in the horizontal part H_1 is neutralised by those due to the oppositely flowing currents in the horizontal part H_2.

*British Patent No. 198522, by J. Robinson, H. Crowther and W. H. Deniman.

Sliding Contacts for Tuning Inductances.

The changes in tuning brought about by the uncertain and variable connection made to tuning coils by sliders rubbing on to their turns, are too well known to need emphasis here. These troublesome effects are usually due not so much to defective electrical contact as to the fact that the slider not only makes contact with one turn, but with two or more—the turns under it being short-circuited. The short-circuiting of one or more turns on a coil causes a large change in its effective inductance, and so adversely affects the ease of tuning. If, however, the sliding contact is constructed of two parts—one insulating and one conducting—some at least of these disadvantages can be overcome.* The insulating portion provides the mechanical support for the conducting part, and if made of proper size, prevents the metallic portion of the slider from touching more than one turn at a time. The advantages of a very narrow slider contact are thus secured without the disadvantages that would arise from its use due to the difficulty of preventing it catching in the turns of wire while moving it along the coil.

Another Scheme for Reducing Interference due to Atmospherics.

Most of the methods that have been proposed from time to time for eliminating

*British Patent No. 197572, by E. Mallett and R. Marx.

the effects of atmospherics by balancing out the atmospheric "signals" from two aerials, one of which is tuned to the signal and the other detuned, do not work out in practice owing to the phase difference between the two impulses preventing a proper balance.

Thus a signal, since it affects one aerial only, will get through to the detector, whereas an atmospheric will not get through since it impulses all the aerials equally.

Grid Leaks.

With a view to obtaining constancy in the resistance value of grid leaks and similar resistances used with valve circuits, it has been proposed* to construct the resistance material in the form of a cotton thread impregnated with a solution of copper sulphate. The thread is enclosed in a glass tube provided with contact caps of the conventional type at its ends. For mechanical protection the glass may be enclosed in an external fibre tube.

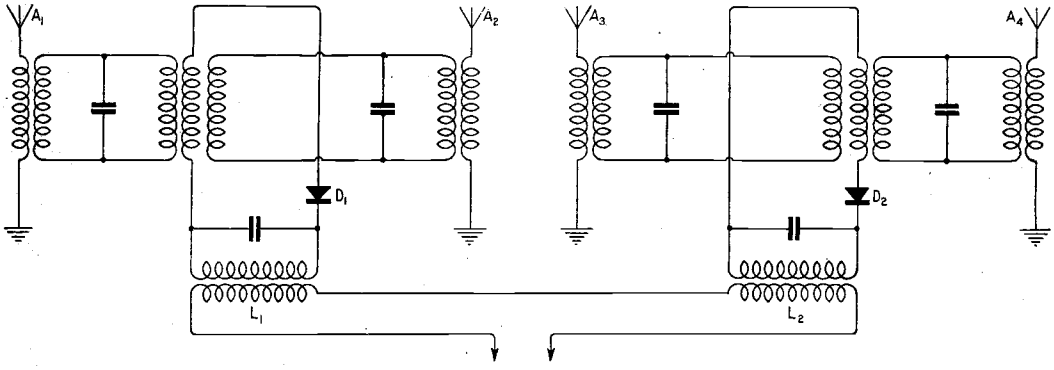


Fig. 2.

The growth in the use of C.W. has brought increased familiarity with beat effects between two oscillations of nearly the same wavelength, and by an application of this principle to the problems of interference reduction the prospect of a greater measure of success is increased. A proposed scheme* consists in the use of four aerials, A_1, A_2, A_3 and A_4 (Fig. 2), one only, A_1, being tuned to the frequency of the desired signals. The second, third and fourth aerials are detuned from the signal frequency, the tunings being so adjusted that the frequency difference between A_1 and A_2 is exactly the same as that between A_3 and A_4. The tuned circuits associated with each of the aerials must have low decrements, so that oscillations due to atmospheric and other disturbances will tend to persist.

Thus if the frequency difference between A_1 and A_2 is suitable, beats will be set up in the rectifier circuit D_1; and beats of similar frequency will likewise be set up in the second rectifier circuit D_2, since the frequency difference between A_3 and A_4 is the same as that between A_1 and A_2.

These two beat currents being of identical frequency and phase can be cancelled out in the common detector circuit L_1 L_2.

* British Patent No. 198428, by H. J. Round.

Simultaneous Transmission and Reception.

Simultaneous transmission and reception of C.W. signals may be effected by using two aerials—one for the transmitter and one for the receiver—using slightly different wavelengths for the transmissions in opposite directions. These two wavelengths should be so chosen that the two waves heterodyne each other, thus eliminating the need for a separate heterodyne arrangement at the receiver. The transmitter is arranged to be continuously in operation so that it can heterodyne the received signals at all times.†

* British Patent No. 198189, by W. Ede E. W. Scanmell and S. H. Van Abbott. (Radio Manufacturing Company).

† British Patent No. 197098, by H. J. Warner and T. H. Kinman.

INSTRUCTIONAL ARTICLE FOR THE LISTENER-IN AND EXPERIMENTER.

INDUCTANCE COILS—I.

The articles entitled Wireless Theory which appeared in the last volume will be completed in this section of the journal. Below we continue with inductance coil design.

By W. JAMES.

A TYPE of coil which is rather different in construction to those previously described* is illustrated in Fig. 1. This coil has two distinct windings which are connected in series. Each consists of a flat spiral, that is, they are only one turn thick. The windings are held in place with separators specially treated to keep the losses low.

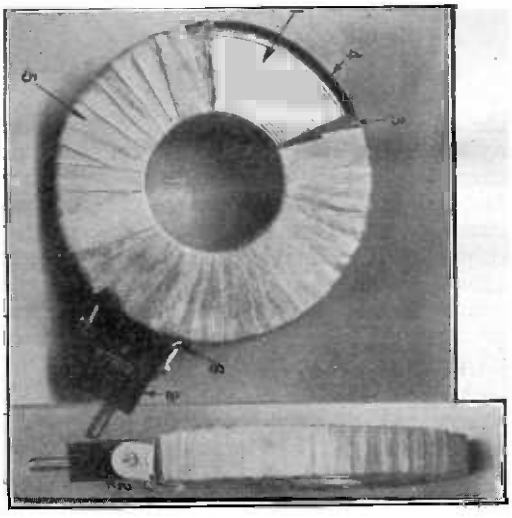


Fig. 1. *Photograph showing construction of a Rimar plug-in coil.*

Referring to the figure: 1 is one of the windings; 2, the ebonite plug carrying contacts joined with the ends of the coil; 3, a separator and an outer covering; 5, the outer tape covering; and 6 is one of the ends of the coil. Winding coils in this way ensures a small internal capacity. The voltage between any two points where the turns touch is that due to two layers only, consequently the power loss is low.

* Vol. XII, No. 215. Wireless Theory XXVI.

An improved coil, manufactured by the same company* is illustrated in Fig. 2. Here the layers are spaced apart by the corrugated separators. In those coils which are used to tune to the lower wavelengths, *i.e.*, the higher frequencies, the turns in the layers are spaced. These coils are therefore electrically better than those with larger inductances, which are wound with the turns closer together, and with finer wire, in order to keep the dimensions reasonable. The material used in the coil construction is treated to make it non-porous.

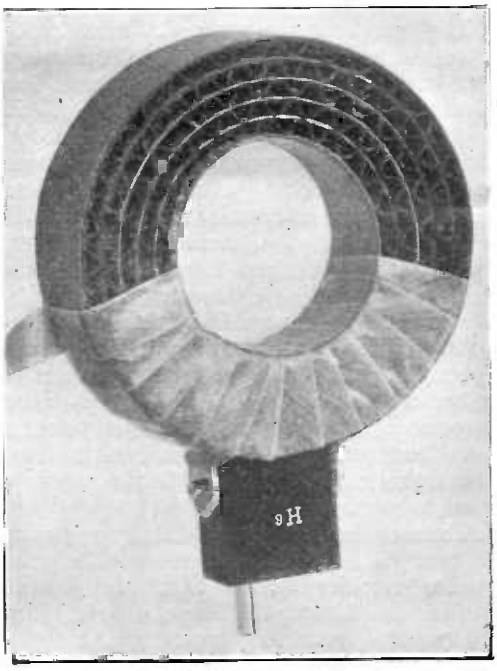


Fig. 2. *This is another form of plug-in coil. The layers are spaced with corrugated separators.*

The Honeycomb Coil.

It is clear that if we can eliminate the separators used in the construction of many

* The Rimar Coil Manufacturing Co.

coils which have been described, probably, for a given inductance, the losses will be lower. There is no great advantage in spacing turns more than a distance about equal to the wire thickness, because the capacity between parallel wires falls off in proportion to the logarithm of the ratio of the distance between the centres of the turns and the wire diameter.

Consequently the aim should be to wind the coil so that :—the turns are spaced: the layers are spaced: those turns which touch have only a fraction of the coil voltage between them: and if possible, the turns in one layer do not run parallel with those

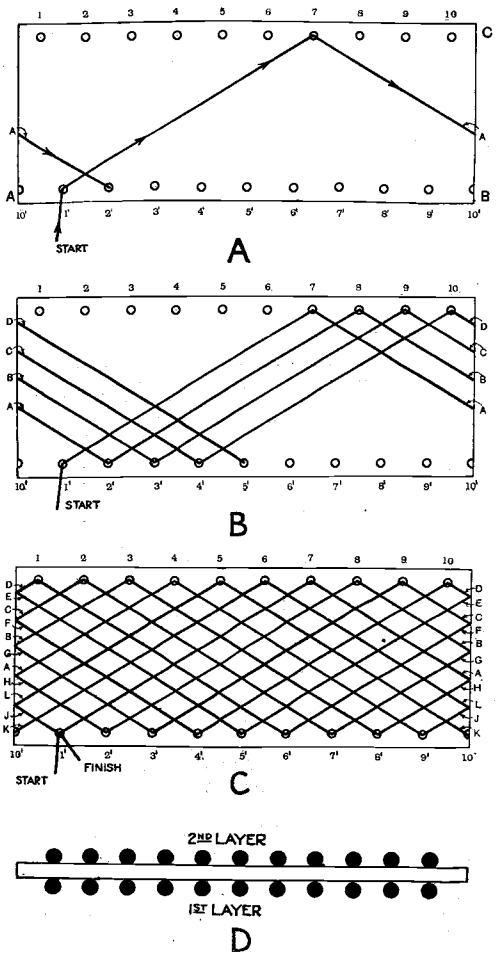


Fig. 3. *Method of winding a simple* **honeycomb coil**. *A shows a single turn ; B several turns ; and C a complete layer. Follow out the winding with the aid of the figures and letters to learn the formation. D is a section, showing two layers. The turns in adjacent layers lie above each other, but separated by the wire thickness.*

in the layer beneath. Further, the construction should be such that the coils may be machine wound, for then they will be cheap, and the electrical properties consistent.

The term *honeycomb coil* applies to those coils the winding of which has a cellular appearance. In this type of coil, the turns are not wound round and round a cylindrical former as in the case of the ordinary single layer winding, but the wire passes round the circumference of the former in a zig-zag fashion, reaching the starting point again after making one complete turn plus a fractional part of a turn. The winding is best explained with figures. Suppose we have a cylindrical former around the circumference of which are arranged two rows of pegs; the distance between the rows being the width of the required coil, the pegs in one row being opposite the spaces in the other. If there are ten pegs in each row, and we imagine the surface to be laid out flat, the length AB, Fig. 3, will represent the length of the circumference, and BC the width.

Then, if the wire is wound from 1′ to 7, 7 to 2′, Fig. 3A, it will be noticed we have completed one turn plus a fraction of one turn. Just before the wire reaches 2′ it passes over the wire leaving 1′. The cross over is made at an angle, and the voltage here is that of a single turn.

Continue, from 2′ to 8, 8 to 3′, and so on, Fig. 3B. Notice the points at which turns cross over each other. It is clear the more turns per layer, the greater the number of cross overs, and the higher the possible voltage between turns which touch. Therefore it is better, when a low capacity coil is required, to use fewer turns per layer.

Fig. 3C shows the position of the turns when one complete layer of ten turns is wound. The end of the wire is exactly over the beginning of the first turn. Therefore the turns of the second layer lie parallel with and directly over those of the first layer, but spaced by the thickness of the wire as shown in Fig. 3D.

The characteristic of this style of winding is that the wire crosses from one side to the other every $\frac{N}{2} + 1$ pegs, N being the number of pegs in one row. Thus, in the winding considered there are ten pegs in one row, so that the wire passes round the $\left(\frac{10}{2} + 1\right)$

sixth peg on the other side. The number of turns per layer is equal to the number of pegs in one row.

If a coil with 20 turns per layer is required, use 20 pegs in each row (40 altogether), and the wire will start at peg 1′ in one row, pass round the eleventh peg along in the opposite row, back to peg 2′, and so on.

Any even number of pegs may be used. It will be seen that the choice of a suitable number of pegs to wind a coil with the required number of turns per layer is a very simple matter; and no difficulty should be experienced in determining the correct pegs to which the wire crosses.

The Duolateral Winding.

In the simple honeycomb winding commencing at peg 1′ the wire, in passing right round the former to peg 2′, makes a complete revolution plus a fractional part equal to $\frac{1}{N}$ N being the number of turns per layer (and also the number of pegs in one row)

If the number of pegs is so chosen that the wire at the end of the first layer is not

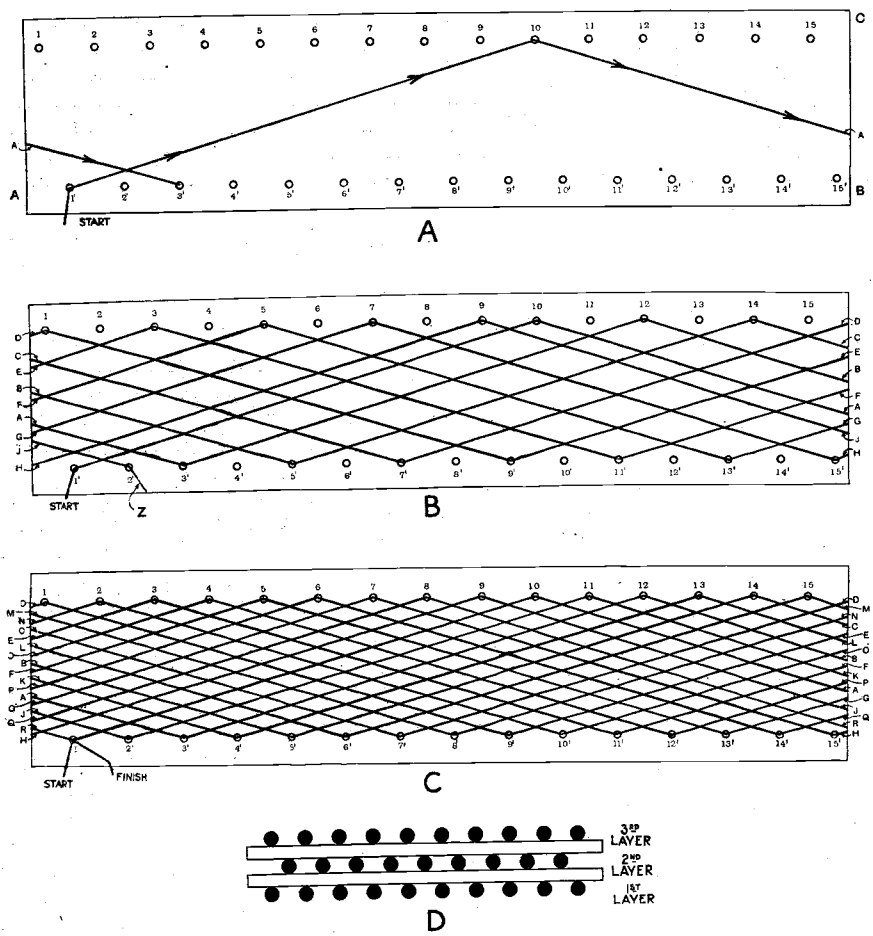


Fig. 4. Method of winding a **duolateral coil.** *A shows a single turn. Notice the end* 1 *lies two pegs ahead of the commencement of the turn. B gives the appearance of a complete layer plus one turn of the second, and C shows two complete layers. Notice the beginning of the second layer lies over the spaces of the first, while the third layer lies directly over the first. D is a section which shows the position of the wires in the coil.*

directly over the beginning of the first turn in the first layer, but lies in between the first and second turns we have a duolateral winding. This may be expressed by saying that the beginning of the second layer is $\frac{1}{2N+1}$ of a revolution in advance of the first turn of the first layer. Then the beginning of the third layer will be this amount ahead of the commencement of the second layer; in other words, the third layer lies directly over the first. The second lies in the spaces of the first.

This is shown in Fig. 4. The advantage of this style of winding over the plain honeycomb lies in the reduced capacity and high frequency resistance. Compare the sections of the two windings shown in Fig. 3D and Fig. 4D. In the duolateral winding the turns of the second layer, instead of lying directly over those of the first, lie in the spaces of the first layer. There is thus a much bigger air space between the turns of adjacent layers.

It is a simple matter to find how many pegs are required when a coil with a definite number of turns per layer is required. Suppose we wish to wind 20 turns to a layer. The number of pegs on each side of the former required is $2N + 1$, where N is the number of turns per layer. In this case $N = 20$, therefore we need $(2 \times 20) + 1 = 41$ pegs on each side. If 30 turns are required, use 61 pegs; if only 10 turns are wanted per layer, use 21 pegs.

The method of winding is clearly shown in Fig. 4. The number of turns per layer required is 7. Therefore 15 pegs are needed. Fig. 4A shows one complete turn. Fig. 4B shows one complete layer plus the first turn of the second layer. Notice the beginning of the second layer, Z, is right between the beginning of the first and second turns of the first layer.

Fig. 4C shows two complete layers. Notice the finish of the third layer is directly above the start of the first.

It is easy to find to which peg the wire must be taken when winding the first turn. One way is to sketch out the first layer, and see that it complies with the requirements of this form of winding, but a simpler way is to count $N + 2$ pegs round on the opposite ide of the former and take the wire round hat peg. In the case drawn out as an example, the wire passes round 9 pegs along on the back face of the former. If there were 20 turns, we should be using 41 pegs on each face, and the wire would be passed round 22 pegs along on the back face of the former.

The honeycomb and duolateral coils are easily machine wound, and are manufactured by the Igranic Co. in this country. For an excellent description of the method of machine winding these coils the reader is referred to Vol. XII, No. 208, pages 620 to 624.

Home-made coils of this description may be wound on a small machine, and provided

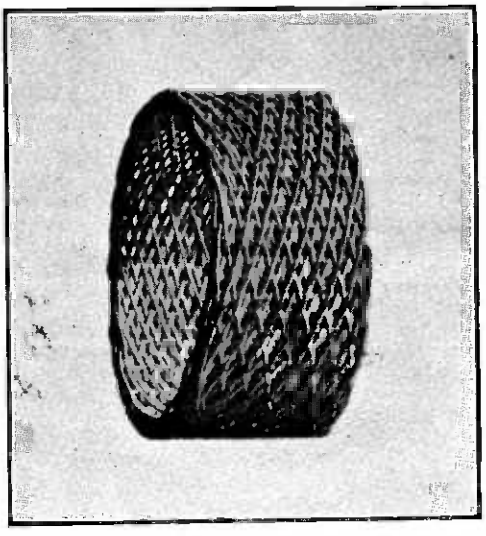


Fig. 5. A machine-wound duolateral coil of three layers.

large coils are not required, the method is satisfactory. The winding of large coils by hand is tedious, but with patience and care good results may be obtained.

There is a large number of methods of constructing these coils, and several have been described in this journal; consequently the reader is referred to them.*

A photograph of a machine-wound duolateral coil, which has three layers, is given in Fig. 5. Notice the air spaces, and the position of the wires in the different layers.

(To be continued.)

* *Wireless World and Radio Review*, Vol. XII., No. 215.

Wireless Club Reports.

Contributions to this section are welcomed. Reports should be as concise as possible and should record the most interesting features of each meeting. The Editor reserves the right to edit the reports when necessary. **Papers read before Societies will receive special consideration with a view to publication.**

An Asterisk denotes affiliation with the Radio Society of Great Britain.

The Southampton and District Radio Society.*

On September 20th, at the Y.M.C.A., Mr. J. Wansbrough gave a very instructive lecture on the construction, care and maintenance of accumulators, and showed how they could be charged at home. An instructive discussion ensued.

Hon. Sec., P. Sawyer, 55, Waterloo Road, Southampton.

Hackney and District Radio Society.*

At the weekly meeting on Thursday, September 20th, Mr. Skinderviken, the inventor of the famous microphone button bearing his name, explained in detail the latest type and gave several very interesting demonstrations. The ticking of a small enclosed watch was heard some twenty yards away on a five-ohm receiver as loud as (according to one member) an express train crossing a bridge. Much amusement was caused by suggestions received by Mr. Skinderviken in a competition for the most novel use to which the button could be applied. One gentleman stated that he attached it to the weight at the end of his fishing rod and could thus hear when a fish was near or biting. Undoubtedly a great field of experiment is opened by this invention both in regard to its application to wireless and to other sciences. The Society is greatly indebted to Mr. Skinderviken for his lecture.

Hon. Sec., 247, Evering Road, Upper Clapton, E.5.

Finchley and District Wireless Society.*

The first meeting of the new session was held on Thursday, September 20th, when the election of officers was proceeded with. The Hon. Treasurer and Hon. Secretary were re-elected.

Mr. W. J. Jones, B.Sc., A.M.I.E.E., of the Cossor Valve Company, then gave a most interesting illustrated lecture on the manufacture of the "Cossor" valve. The evolution of the thermionic valve from the earliest days was well covered, the lecture concluding with a study of the curves of the various types of valves.

New members are urgently needed, and full particulars can be obtained from the Hon. Sec., A. E. Field, 28, Holmwood Gardens, Finchley, N.3.

Ipswich and District Radio Society.*

The Society recently spent a very interesting and instructive afternoon in visiting the Parkeston Wireless Station, by the permission of the L.N.E.R. authorities.

The operator in charge demonstrated in detail to an enthusiastic party, and afterwards, by the permission of Captain Neilson, the party was enabled to visit the Danish steamer *Bornstorff*, where intense interest was taken in the latest type of C.W. transmitter. The capabilities of the apparatus were ably explained by the operator (Mr. Miller).

Hon. Sec., H. E. Barbrook, 46, Foundation Street, Ipswich.

South Shields and District Radio Club.*

The first meeting of the Club since the summer vacation was held on September 19th, when an address was given by Mr. A. A. Hawks, who dwelt on the history and aims of the Club.

A programme of lectures and visits has been arranged for the coming session, particulars of which can be obtained from the Secretary. A Morse practice night will be held every Friday evening, commencing at 7.30.

All those in the district interested in wireless are cordially invited to the lectures, which will be held every alternate Wednesday at 7.30 p.m., commencing on October 3rd.

Full particulars are obtainable from the Hon. Sec., W. Smith, High Dock House, South Shields.

The Wireless Society of Hull and District.*

This Society has just concluded an interesting summer programme, and the members are now looking forward to a busy winter session.

Members were asked some time ago to answer a number of questions contained in a circular letter sent out by the Committee with regard to the future policy of the Society, and that body has been giving careful consideration to the replies sent in.

A Townsend wavemeter has just been purchased by the Society, and it is to be loaned out to members at a small charge.

Several new members have joined lately, and others will be welcomed at any of the meetings which are now held each Friday evening at the Co-operative Social Institute, in Jarratt Street, at 7.30 p.m.

Hon. Sec., H. Nightscales, "Glen Avon," Cottingham Road, Hull.

Sydenham and Forest Hill Radio Society.*

An interesting lecture was given by Mr. R. J. Stanley before the Society, on Monday, September 10th, on "Inductance and Capacity," various mechanical analogies being used for demonstration purposes.

An instructive discussion followed, from which it was apparent that the lecture had been followed with great interest.

Hon. Sec., M. E. Hampshire, 139, Sydenham Road, S.E.26.

Guildford and District Wireless Society.*

Successful underground experiments were carried out by the Society on Wednesday, September 12th, in some ancient caves which exist under the town.

The approximate distance from **2 LO** was 30 miles and the depth below the surface was estimated at about 100 ft., the soil being composed of chalk. Using a double magnification circuit with six pairs of headphones, **2 LO** was heard very distinctly. The aerial was about 50 ft. long, suspended along a passage about 5 ft. in height. Another set, a one valve and crystal, double magnification circuit, also gave quite good results. Several morse stations were also heard on both sets.

The winter lectures will shortly commence, and all amateurs in the Guildford district are cordially invited to attend.

All particulars can be obtained from Rowland T. Bailey, Hon. Sec., 148, High Street, Guildford.

The Leeds Radio Society.*

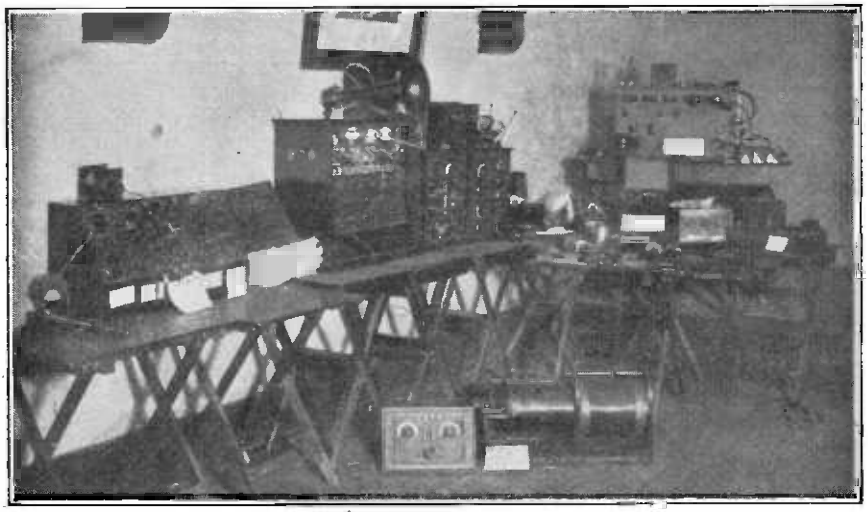
The third annual general meeting was held at the Headquarters, The Woodhouse Lane U.M. Church Schools, on September 21st, Mr. A. M. Bage (President) being in the chair. According to the annual report nineteen general and eighteen instructional meetings were held, at which thirty-nine papers, etc., were given. An exhibition of apparatus was held at which fifty-three members exhibited apparatus, and an annual social was held. The Society visited the Telegraph Department of the G.P.O., Leeds. Experimental apparatus has been acquired, the P.M.G.'s authority to conduct experiments with sending and receiving apparatus having been obtained. The transmitting permit authorises the use of a 10-watt, C.W., T.T., R.T., and spark set, on wavelengths of 150 to 200 metres inclusive, to be operated at the headquarters, using the call sign **6 UM**. 95 per cent. of the membership have receiving equipment, and the following calls are allocated to certain members: **2 LA, 2 LB, 2 LL, 2 LK, 2 QQ, 2 TJ, 2 UZ, 5 PR, 5 SL, 5 SY, 5 US, 6 DP, 6 MD, 6 MK,** and **6 SS**. At the fourth annual conference of the Affiliated Societies, the Society was fully represented by letter. The honorary membership of the Society has been conferred upon G. P. Kendall, Esq., B.Sc., and H. F. Yardley, Esq., M.I.R.E. The membership of the Society is 159.

The report of the Hon. Treasurer and statement of accounts was approved.

The following elections were made:—President, A. M. Bage, Esq.; Vice-President, A. F. Carter, Esq., A.M.I.E.E.; Hon Secretary, D. E. Pettigrew; Hon. Treasurer, R. E. Timms; and a Committee of members.

The name of the Society was altered from "The Leeds and District Amateur Wireless Society" to "The Leeds Radio Society."

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



Our photo shows some of the apparatus on view at the recent exhibition conducted by the Walthamstow Amateur Radio Society.

Ryton-on-Tyne and District Radio Society.

The first meeting of the above Society will be held in the Hedgefield Schools on Friday evening, September 28th, at 7.30 p.m., when the enrolment of members will take place. Afterwards a "Demonstration in Wireless Telephony" will be given.

Hon. Sec., Mr. R. G. Wilson, A.M.I.E.E., 16, St. Mary's Terrace, Ryton-on-Tyne.

Radio Society of Bradford-on-Avon.

The members of the above Society spent a very interesting and instructive evening on Thursday, September 13th, when they visited the Devizes Wireless Station, **GKU**.

The Acting O.C. (Mr. Hicks), escorted the party through the various rooms of the station, and answered many questions.

Hon. Sec., Mr. H. Helps, 4, Ivy Terrace, Bradford-on-Avon.

Notes and News

Warsaw Begins Testing.

Readers will be interested to learn that, according to a Danish correspondent, the new high power station at Warsaw, AXL, has begun testing with America on a wavelength of 19,500 metres. Mr. James Steffensen, our informant, states that the signals of the new station exactly resemble those of St. Assise, UFT.

R.A.F. and Wireless Telephony.

During the recent military manœuvres in Sussex, experiments with wireless telephony "in action" were carried out by the Royal Air Force. The equipment used was mounted in a specially built motor van and extreme dexterity was shown in the manipulation of the apparatus. Indeed, the operators claimed to be able, in less than three minutes, to erect an aerial and establish communication with aeroplanes on reconnaissance work.

Broadcasting for Australia.

The Postmaster-General of the Commonwealth of Australia recently called together a Wireless Convention to prepare regulations covering Broadcasting in Australia. This Convention has now been placed before the Postmaster-General for approval. We shall shortly hear, therefore, of the final regulations which will be adopted, and a broadcasting service will no doubt follow at an early date.

In order to demonstrate the possibilities of wireless broadcasting in Australia, most interesting experiments were recently carried out on the occasion of the recent State Conference at Hawkesbury College, Sydney, New South Wales. The Amalgamated Wireless Australia, Ltd., transmitted a complete musical programme, the Acting Premier of the States and other officials speaking a few words. The receiving end was organised by The British General Electric Co., Ltd., a "Gecophone" listening-in set being installed. The results obtained were highly satisfactory, and the demonstration was undoubtedly one of the most interesting held in Australia.

Mr. Edward Hirst, managing director of the General Electric Co., Ltd., broadcast an inspiring message predicting a bright and prosperous future for broadcasting in Australia.

B.S.A. WIRELESS CLUB EXHIBITION.

The display at the Club's first exhibition on September 1st. All the apparatus shown was constructed by the members, with the exception of the Burndept "Ethophone V" on the left, and the two-valve panel in the top centre.

Transatlantic Reception.

The approach of autumn has been characterised by the widespread reception in this country of American Broadcasting, and, in not a few cases, of American amateurs.

A particularly noteworthy fact is that these results have in many cases been obtained with astonishingly simple receivers, more than one case of reception of American amateurs with one valve being reported. Such achievements augur well for the success of the Transatlantic Tests during the coming winter.

The American station most widely received has been **WGY**, the broadcasting station of the General Electric Co., at Schenectady, New York, though, as the following results show, several other stations have been heard.

At the time of going to press the following receptions have been reported :—

WGY (G.E.C., Schenectady) :

Mr. H. Bacon, Chesterfield (2-valve Gecophone).

Mr. A. H. Brackensey, Finchley, London, N. (3 H.F., Det., 2 L.F.).

Mr. H. C. Broxup, Croydon (Det., 1 L.F.).

Mr. H. Constable, Shepherd's Bush, London (1 H.F., Det., on loud speaker).

Mr. F. Storey, Patricroft, Lancs. (1 H.F., Det.).

Mr. J. Ridley, South Norwood, London (single valve super).

Mr. E. J. Pearcey, Birmingham (1 H.F., Det., 1 L.F.).

Mr. D. C. W. Howard, B.A., B.Sc., Sutton, Surrey (single valve).

Mr. R. W. Galpin, Herne Bay (Det., 1 L.F.).

Mr. Frederic L. Hogg, Highgate, London (1 H.F., Det.).

Mr. F. R. Neill, Co. Antrim (2 H.F., Det., 2 L.F.).

Mr. A. H. Robinson, Tyldesley, Manchester (1 H.F., Det.).

Mr. T. G. Bowles, Shepherd's Bush, London (single valve).

Mr. R. H. J. McCue, Clapham, London (single valve and frame aerial).

Mr. J. W. G. Thompson, Edinburgh (single valve Armstrong and earth connection only).

Mr. A. P. MacGrory, Kintyre (Marconiphone V2).

Mr. W. Preston, Manchester (1 H.F., Det., 1 L.F., with loud speaker).

Mr. A. J. Short, Diss, Norfolk (single valve with reaction).

Mr. A. C. Simons, Mablethorpe, Lincs. (1 H.F., Det., 2 L.F.).

WOR (Newark, N.J.).

Mr. W. E. Meldrum, Wembley, Middlesex (1 H.F., Det., 1 L.F.).

WDAR (Philadelphia).

Mr. A. P. MacGrory, Kintyre (Marconiphone V2).

WDAP (Chicago).

Mr. A. H. Brackensey, Finchley, London (3 H.F., Det., 2 L.F.).

Mr. A. P. MacGrory, Kintyre (Marconiphone V2).

WMAL (Trenton, N.J.).

Mr. C. Mervwyn-Cole, Bedford (1 H.F., Det., 1 L.F.).

WDAF (Kansas, Mo.).

Mr. J. Ridley, South Norwood, London (single valve super).

WMAF (Dartmouth, Mass.).

Mr. J. L. Mitchell, Mauchline, Ayrshire (1 H.F., dual valve and crystal).

Mr. A. H. Brackensey, Finchley, London (3 H.F., Det., 2 L.F.).

Mr. J. J. McLachlan, Levershulme, Lancs.

Mr. Marcus G. Scroggie, Edinburgh.

WLAS (Hutchinson, Kans.).

Mr. Ernest C. Dorling, Wandsworth, London (single valve detector).

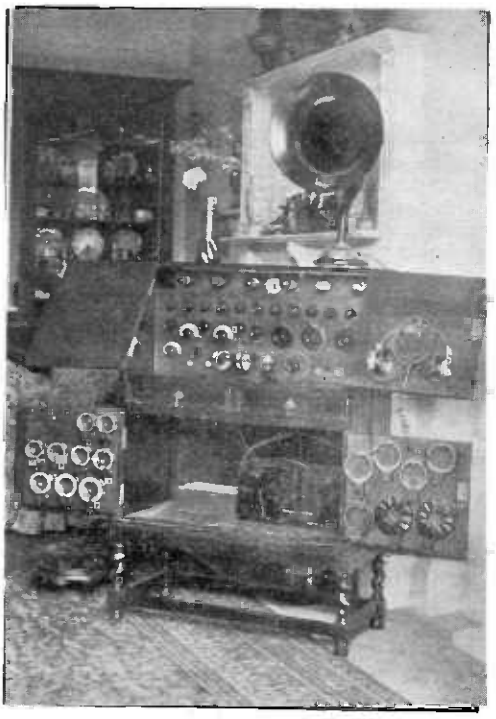
WEAF (New York, N.Y.).

Mr. J. H. Brittain, Patricroft, Lancs. (single valve detector).

KDKA (Pittsburg, Pa.).

Mr. J. H. Brittain, Patricroft, Lancs. (single valve detector).

Mr. J. Ridley, South Norwood, London (single valve super).



Our photograph shows the receiving apparatus of Mr. A. H. Brackensey, of Finchley, who has been very successful in the reception of American stations.

WHAD (Milwaukee, Wisc.).

Mr. J. H. Brittain, Patricroft, Lancs. (single valve detector).

WHAZ (Troy, N.Y.).

Mr. A. H. Brackensey, Finchley (3 H.F., Det.; 2 L.F.).

WPAD (Chicago, Ill.).

Mr. A. P. MacGrory, Kintyre (Marconiphone V2).

WJZ (Newark, N.J.).

Mr. F. Storey, Patricroft, Lancs. (1 H.F., Det.).

To Save Sore Ears.

An interesting device, called a "Radio Kap," is being marketed by the Sorbo Rubber-Sponge

Products, Ltd., for fitting on any standard pair of head telephones. The invention aims at increasing the comfort of wearing the telephones for prolonged periods, and should prove extremely useful to those who have suffered in the past from the effects of tight-gripping 'phones. It is claimed also that telephones fitted with this new Sorbo product can be used in a noisy room without interruption to the listener.

The Neon Tube.

In view of the enormous interest being taken in the employment of the Neon tube for wireless purposes, it is interesting to note that the General Electric Co., Ltd., is now supplying Neon tubes in a form specially suited for the work. These should prove particularly useful in connection with the experiments recently described by Mr. Coursey before the Radio Society of Great Britain, and those dealt with from time to time in this journal.

A Switching Arrangement.

With reference to the article entitled "A Switching Arrangement," by R. J. Sawbridge, A.M.I.R.E., appearing on page 839 of our issue of August 19th, we have been advised that the author is in error in claiming the connections shown in Fig. 1 as of his own design.

It appears that the inventor of the arrangement is Mr. Eugene R. Webber, and that a description of such a switching apparatus has been published in the United States of America.

The Formo Company.

The manufacturers of "Formo" Radio components advise us that imitations of their products are now on sale. The public are particularly asked to note that every genuine "Formo" article is clearly marked as such.

FORTHCOMING EVENTS.

WEDNESDAY, OCTOBER 3rd.

East Ham and District Radio Society. At 8 p.m. At Church Army Social Centre, Barking Road, E.6. Public Demonstration.
North Middlesex Wireless Club. Sale of Apparatus by Auction.

THURSDAY, OCTOBER 4th.

Stoke-on-Trent Wireless and Experimental Society. Address by President (Mr. F. E. Wenger): "The Construction of an Experimental Receiver."
Liverpool Wireless Society. At 7.30 p.m. At the Liverpool Royal Institution, Colquhitt Street. Lecture: "Dual Amplification." By Mr. J. C. Hall.
Hackney and District Radio Society. At the Y.M.C.A., Mare Street. Lecture: "The Cossor Valve." With lantern illustrations. By Mr. W. J. Jones, B.Sc.
Derby Wireless Club. Lecture: "Amplification." By Mr. A. T. Lee.
Ilford and District Radio Society. Lecture: "Insulators." By Mr. J. E. Nickless.

FRIDAY, OCTOBER 5th.

Wireless Society of Hull and District. At 7.30 p.m. At the Co-operative Social Institute, Jarratt Street. Lecture: "Reaction, its Use and Abuse." By Mr. W. Johnson.
The Leeds Radio Society. At 7.30 p.m. Lecture: "The Elementary Theory of the Valve." By Mr. D. E. Pettigrew (Hon. Secretary).

TUESDAY, OCTOBER 9th.

Plymouth Wireless and Scientific Society. Wavemeter Demonstration. By Mr. Heal.

WEDNESDAY, OCTOBER 10th.

East Ham and District Radio Society. Informal Meeting.
Tottenham Wireless Society. At 8 p.m. At the Institute, 10, Bruce Grove, N.17. Lecture by Prof. A. M. Low (President).

"THE RADIO TIMES."

The latest recruit to the ranks of wireless journalism is "The Radio Times," the official organ of the B.B.C.

Primarily the new publication deals with the forthcoming programmes from the various broadcasting stations, but to this information is added a fund of very readable articles and bright illustrations of general interest to the listener-in. The first number, which embraces the programmes for the week commencing Sunday, September 30th, contains a special "Message to Listeners" from Lord Gainford, besides articles by "Uncle Arthur" (Mr Arthur R. Burrows), Capt. P. P. Eckersley and many others well known in connection with the latest form of public entertainment.

In one respect at least the "Radio Times" stands alone, inasmuch as the proprietors have no intention of dealing with the technical aspect of the subject. The purely popular side of broadcasting will form the paper's main theme and in this particular department we feel that the British Broadcasting Company meets a distinct need.

Books Received.

Time and Weather by Wireless. By W. G. W. Mitchell, B.Sc., F.R.A.S., F.R.Met.S. (London: The Wireless Press, Limited, 10-13, Henrietta Street, W.C.2. 125 pages, 66 figures. Price 3/6 net.)

Wireless Telephony: A Simplified Explanation. By R. D. Bangay. (London: The Wireless Press, Limited, 12-13, Henrietta Street, W.C.2. 134 pages, 79 figures. Price 2/6 net.)

The Wireless Amateur's Diary and Notebook, 1924. (London: The Wireless Press, Ltd., 12-13, Henrietta Street, W.C.2. Price 1s.)

The "Radiolog" Wireless Record Book. (Leicester: Pallett Brothers, 29, Silver Street. 2s.).

This little book should prove highly useful to the experimenter who desires to keep a record of calls heard. Full facilities are provided by means of ruled columns for the insertion of all practical details.

Radio Research Board: Special Report No. 1. A discussion of the Practical Systems of Direction-Finding by Reception. (H. M. Stationery Office. Price 9d. net.).

Broadcasting Topics.

Aberdeen.

With the definite announcement that the Aberdeen Broadcasting Station will open on October 10th, many inhabitants of the far north will be seriously considering the installation of receiving equipment. The new station is to have the call letters **2 BD**, and will transmit on a wavelength of 360 metres.

The station director will be Mr. R. E. Jeffrey, who is well known in Glasgow in connection with the Public Speakers' Club and the production of several successful plays.

Bournemouth.

6 BM is the call sign allotted to the new Bournemouth station, to be opened a week later than Aberdeen. The wavelength is to be 410 metres.

Broadcasting in Ireland.

No time is being lost in the Emerald Isle in the matter of broadcasting, and at least six companies are now negotiating with the Post Office for a share in the scheme. It is regarded as likely that these firms will be included in a broadcasting company.

Not less than £30,000 is guaranteed, and it is stated that a broadcasting station will shortly be erected in Dublin with possibly relay stations at Cork and Limerick.

REGULAR PROGRAMMES ARE BROADCAST FROM THE FOLLOWING EUROPEAN STATIONS:

GREAT BRITAIN.

LONDON 2 LO, 369 metres; **MANCHESTER, 2 ZY,** 385 metres; **BIRMINGHAM, 5 IT,** 420 metres; **CARDIFF, 5 WA,** 353 metres; **NEWCASTLE, 5 NO,** 400 metres; **GLASGOW, 5 SC,** 415 metres. Regular morning and evening programmes, particulars of which appear in the daily press, are conducted from these stations by the British Broadcasting Company. The usual times of transmission are:—Weekdays, 11.30 a.m. to 12.30 p.m. (**2 LO** only), 3.30 to 4.30 p.m., 5 to 10.30 p.m. Sundays, 3 p.m. (**2 LO** only), 8.30 to 10.30 p.m.

FRANCE.

PARIS (Eiffel Tower), **FL,** 2,600 metres. Daily, 6.40 a.m., Meteorological Forecast; 11.15 p.m., Meteorological Report and Forecast; 2.30 p.m., Financial Bulletin (Paris Bourse); 5.10 p.m., Concert; 6.20 p.m., Meteorological Forecast; 10.15 p.m., Meteorological Report and Forecast. Sundays, 5.20 p.m., Concert and Meteorological Report.

PARIS (Compagnie Francaise de Radiophonie Emissions "Radiola"), 1,780 metres. Daily, 11.30 a.m. Exchange News, 11.45 a.m. News and Concert, 3.45 p.m. Commercial Intelligence, 4 p.m. Concert 7.30 p.m. News, 8 p.m. Concert, Tuesday and Friday, 4 to 5 p.m., Dance Music. Thursday and Sunday, 9 to 9.45 p.m., Dance Music.

ECOLE SUPERIEURE des Postes et Telegraphes, 450 metres, Tuesday and Thursday, 7.30 p.m., Concert. Saturday, 5.30 to 6.30 p.m., Concert.

LYONS, YN, 3,100 metres. Weekdays, 9.45 to 10.15 a.m., Gramophone records.

DENMARK.

LYNGBY OXE, 2,400 metres. 9.30 a.m., 3.30 p.m., and 8.45 p.m. Meteorological Report in Danish. 7.30 p.m. to 8.45 p.m., Concert (Sundays excepted).

HOLLAND.

THE HAGUE, PCGG, 1,050 metres. Sundays, 2.40 to 5.40 p.m., Concert. Mondays, 8.40 to 9.40 p.m., Concert. Thursdays, 8.10 to 10.10, Concert (temporarily suspended).

THE HAGUE (Heussen Laboratory), PCUU, 1,050 metres. Sundays 40 to 10.40 a.m., Concert. Tuesdays, 7.40 to 9.40 p.m., Concert.

THE HAGUE (Velthuisen), PCKK, 1,050 metres. Fridays, 8.40 to 9.40 p.m., Miscellaneous.

IJMUIDEN (Middelraad), PCMM, 1,050 metres. Saturdays, 8.10 to 9.40, Concert.

AMSTERDAM, PA5, 1,050 metres. Wednesdays, 7.40 to 9.40 p.m Concert.

AMSTERDAM, PCFF (News Office Vas Daiz), 2,000 metres. Daily, except Sundays, 7.50 to 8.10 a.m., 9.40 to 9.55 a.m., 11.10 to 11.15 a.m., 11.25 to 11.35 a.m., 11.55 to 12.10 p.m., 12.45 to 1 p.m., 2.40 to 3.10 p.m., 3.55 to 4.10 p.m., News and Market Reports. 1.10 p.m., 1.25 p.m., 1.40 p.m., 1.55 p.m., 2.10 p.m., 2.25 p.m., Stock and Bond Quotations.

BELGIUM.

BRUSSELS, BAV, 1,100 metres. Working days, 12 noon, Meteorological Bulletin. Daily, 4.50 p.m., Meteorological Bulletin. Tuesday and Thursday, 9 p.m., Concert. Sunday, 6 p.m., Concert.

GERMANY.

BERLIN (Koenigswusterhausen), LP, Sunday, 4,000 metres, 10 a.m. to 11 a.m., music and speech; 2,700 metres, 11 a.m. to 12 noon, music and speech; Daily, 4,000 metres, 6 to 7 a.m., 11 a.m. to 12.30 p.m., 4 to 4.30 p.m., Financial and other news.

EBERSWALDE (2,930 metres), Daily, 12 noon to 1 p.m., 7 to 8 p.m. Tuesday and Saturday, 5.30 to 6.30 p.m., Concert.

CZECHO-SLOVAKIA.

PRAGUE, PRG, 1,800 metres, 7 a.m., 11 a.m. and 3 p.m., Meteorological Bulletin and News. 4,500 metres, 9 a.m., 2 p.m. and 9 p.m., Concert.

KBEL (near Prague), 1,000 metres. Daily, 6.20 p.m. Concert Meteorological Report and News.

SWITZERLAND.

GENEVA, HB 1 (Radio Club de Genève, 1,100 metres. Thursdays, 8.30 to 9.15 p.m., Concert (temporarily suspended).

LAUSANNE, HB 2, 1,100 metres, Tuesdays, Thursdays and Saturdays, 4 p.m., Concert. Monday, Wednesday, Friday and Sunday, 7 p.m., Concert.

Calls Heard.

Peckham, S.E.15.

2 AH, 2 AJ, 2 AN, 2 AU, 2 BT, 2 BZ, 2 DF, 2 DP, 2 FP, 2 FQ, 2 FU, 2 KF, 2 KT, 2 KV, 2 KZ, 2 LT, 2 MF, 2 NM, 2 OM, 2 ON, 2 PA, 2 PB, 2 PX, 2 QD, 2 QQ, 2 QS, 2 SF, 2 SZ, 2 TI, 2 TQ, 2 TU, 2 UV, 2 VJ, 2 VK, 2 VS, 2 VT, 2 VW, 2 WJ, 2 XB, 2 XL, 2 XR, 2 XZ, 2 YL, 2 ZO, 5 AC, 5 AD, 5 AT, 5 BT, 5 BV, 5 BW, 5 CB, 5 CP, 5 DB, 5 DK, 5 DT, 5 DW, 5 FM, 5 FR, 5 HD, 5 HI, 5 HY, 5 IO, 5 IS, 5 IT, 5 LF, 5 LP, 5 MA, 5 MY, 5 OP, 5 OS, 5 OX, 5 PB, 5 PU, 5 PZ, 5 SC, 5 SU, 5 UO, 5 VB, 5 VD, 5 VM, 5 VR, 5 VU, 5 WN, 5 XN, 5 ZZ, 6 AI, 6 HD, 6 IM.

(V. det.) (E. A. Smith.)

Bourgneuf-Val-d'Or, Saone-et-Loire.

2 FN, 2 JF, 2 LZ, 2 NA, 2 NM, 2 OD, 2 OM, 5 CX, 5 DN, 5 KO, 5 MU, 6 NI, 8 AQ, 8 AW, 8 BN, 8 BU, 8 BW, 8 CF, 8 CS, 8 CZ, 8 DA, 8 XX.

(Reinartz single valve.) (Léon Deloy.)

Newark-on-Trent.

2 AW, 2 CZ, 2 DU, 2 FN, 2 FZ, 2 GJ, 2 HA, 2 HF, 2 IQ, 2 IX, 2 KB, 2 KO, 2 KQ, 2 LX, 2 MZ, 2 NP, 2 NV, 2 PV, 2 SF, 2 SZ, 2 TV, 2 UG, 2 UY, 2 VQ, 2 VC, 2 WD, 2 WM, 2 YV, 2 YX, 5 CK, 5 CZ, 5 FU, 5 GL, 5 HL, 5 JZ, 5 KY, 5 OD, 5 OZ, 5 PU, 5 PX, 5 RI, 5 SU, 5 TW, 5 VR, 5 YX, 5 ZV, 6 IM, 8 AB.

(Geo. T. Sindall.)

Walsall.

2 AK, 2 DQ, 2 FH, 2 FN, 2 HF, 2 HV, 2 IQ, 2 KO, 2 KQ, 2 KR, 2 LG, 2 MY, 2 NA, 2 NO, 2 NP, 2 NV, 2 OF, 2 OM, 2 OX, 2 PD 2 PV, 2 RD, 2 RG, 2 SY, 2 TE, 2 TN, 2 TV, 2 UX, 2 UY, 2 VC 2 VI, 2 WB, 2 WQ, 2 YV, 2 YX, 2 YZ, 2 ZB, 2 ZK, 5 BL, 5 CW, 5 DG, 5 FH, 5 FI, 5 HF, 5 HN, 5 KG, 5 KO, 5 KY, 5 LC, 5 LK, 5 LT, 5 NH, 5 NX, 5 OF, 5 PX, 5 RI, 5 TX, 5 UW, 6 CS, 6 HV, 8 AB, 8 BM.

(1 H.F., V. det., 2 L.F.) (L. B. Parkes, **(6 NQ).**

S. Tottenham, London N.15.*

2 BZ, 2 FF(?), 2 FG, 2 FQ, 2 KF, 2 KT, 2 OM, 2 ON 2 PX, 2 QQ, 2 SH, 2 TA, 2 TQ, 2 VW, 2 WJ, 2 XB, 2 XI, 2 XR, 5 AC, 5 CB, 5 HY, 5 IO, 5 LP, 5 PU, 5 SU, 5 VD, 5 VR, 6 IM

* Crystal Reception only. (J. Boarder).

Chesterfield.

2 AW, 2 CH, 2 CK, 2 GV, 2 HF, 2 IN, 2 IQ, 2 LX, 2 OM, 2 TN, 2 UF, 2 UG, 2 UK, 2 VC, 2 WD, 2 WM, 2 ZK, 5 LO, 5 SR, 6 MK, 6 NI.

(C. F. Peck).

" Strandhuset," Fakse Ladeplads, Denmark.

2 GW, 2 IJ, 5 CX, 8 BE, 8 BW, 8 CZ, 8 XX, 3 OL*, 4 AA.*

(James Steffensen).

* On 1,200 metres. Who are they?

Coventry.

2 AK, 2 AQ, 2 AR, 2 DU, 2 FQ, 2 FZ, 2 GG, 2 HF, 2 HV, 2 JJ, 2 KO, 2 KQ, 2 KR, 2 LQ, 2 LX, 2 ML, 2 NA, 2 ND, 2 NO, 2 NP, 2 NV, 2 OM, 2 OX, 2 PV, 2 RG, 2 SQ, 2 TN, 2 TV, 2 US, 2 UY, 2 VC, 2 VQ, 2 YX, 2 ZD, 5 BM, 5 FI, 5 GL, 5 KY, 5 LP, 5 NH, 5 PX, 5 RI, 5 TW, 5 YF.

(J. Hanson).

Wimbledon.

2 AH, 2 AJ, 2 AN, 2 AQ, 2 BZ, 2 DC, 2 DF, 2 DS, 2 FJ, 2 FP, 2 FQ, 2 FU, 2 ID, 2 JM, 2 JX, 2 KF, 2 KT, 2 KV, 2 KZ, 2 LM, 2 LP, 2 LW, 2 MF, 2 MI, 2 MK, 2 MO, 2 NM, 2 OM, 2 ON, 2 PA, 2 PX, 2 QD, 2 QQ, 2 QS, 2 SF, 2 ST, 2 SX, 2 SZ, 2 TI, 2 UV, 2 VB, 2 VH, 2 VJ, 2 VS, 2 VW, 2 WJ, 2 WP, 2 XB, 2 XL, 2 XI, 2 XO, 2 XZ, 2 YH, 2 YL, 2 YR, 2 ZO, 2 ZT, 2 ZX, 2 QI, 5 AC, 5 AQ, 5 AR, 5 BN, 5 BT, 5 BV, 5 BW, 5 CB, 5 CP, 5 DB, 5 DK, 5 DT, 5 FR, 5 GP, 5 HI, 5 HY, 5 IO, 5 IS, 5 LF, 5 LP, 5 LS, 5 MA, 5 NN, 5 OB, 5 OP, 5 OX, 5 OY, 5 PD, 5 PU, 5 RZ, 5 SR, 5 SU, 5 TR, 5 UO, 5 VD, 5 VJ, 5 VM, 5 VP, 5 VR, 5 XX, 6 HD, 6 IM, 6 LI, 6 PS, 6 KI. (V det. also V det. and 1 L.F.). (A. E. Robinson .

Shepherd's Bush, London.

2 BZ, 2 DF 2 FG, 2 FJ, 2 GM, 2 IG, 2 KZ, 2 JD, 2 MD, 2 MF, 2 MK, 2 OM, 2 OS, 2 PA, 2 QQ, 2 SH, 2 SF, 2 SZ, 2 TV, 2 WD, 2 XB, 2 XO, 2 XR, 2 XZ, 2 YR, 2 ZO, 2 ZZ, 5 BT, 5 CB, 5 CP, 5 DB, 5 DK, 5 IO, 5 KF, 5 LK, 5 LP, 5 LF, 5 MF, 5 MY, 5 OB, 5 OV, 5 PU, 5 SK, 5 SR, 5 SQ, 5 SU, 5 VD, 5 VR, 5 HK, 6 HD, 6 IM, 6 IY, 6 KI, 6 LG, 6 LY, 6 OY, 6 MF, 6 TM, 8 FS. (V. det., 1 and 2 L.F.). (T. G. Bowles).

6 MG.

As the above call sign is being misused, Mr. B. W. D. Lacey, of 33, Woodbridge Road, Moseley, Birmingham, would greatly appreciate the receipt of any particulars of reception by our readers, particularly by those with direction-finding aerials, to assist in the detection of the culprit.

Change of Address.

Mr. R. J. Harrison (**5 CV**) to "Blacklands" Sidney Road, Walton-on-Thames.

CORRESPONDENCE

Faults in Telephone Windings.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—In an article entitled "A Common Fallacy," appearing in a recent issue, the writer states that signals can be obtained when the diaphragm of a telephone receiver has been removed. Some time ago I investigated this matter, the coils of the telephone being securely fixed by means of shellac painted over each separate layer during winding. The wire used was 48 S.W.G. enamelled and single silk covered. One receiver was treated as described, the other wound in the usual way without a dressing of shellac. The signals in each case were of exactly the same strength when the diaphragm was removed. The receivers were of course tested in the usual way for sound output before removing the diaphragms. I think that the experiment was worth the time and trouble involved because it cleared up a matter about which no two amateurs would agree. Personally I believe that the sound obtained from a diaphragmless telephone is caused by the vibration of the molecules in the iron pole pieces.

I am interested to hear from anybody who has experimented along these lines.

Yours faithfully,

RICHARD A. N. PLUMMER.

Leicester.

Ebonite.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—With reference to the note by Mr. H. Adshead on "Ebonite," on page 711, of the August 22nd issue, there seems to be a little lack of proportion in his remarks and one might gather that a tinfoil exterior is nearly as terrible as a tintack-filled interior.

When the plastic rubber mass is ready for conversion into ebonite it has to be laid out on something flat and smooth and generally this support is an iron tray from which the ebonite mix is separated by a layer of tin foil.

Tin foil has been chosen specially for this purpose because, though expensive, the compound which the sulphur forms with it during the curing process damages the surface of the ebonite far less deeply than would the sulphides of certain other metals which might possibly be used.

To raise a claim that a certain ebonite is vastly superior in that it has not been cured on tinfoil is not necessarily a recommendation at all, not impossibly it might be the very reverse.

The sulphur during the reactions which take place in curing is in a highly active state and will form sulphides of most metals which may come into contact with it, and this activity is enhanced by the presence of various catalysts which shorten the curing time.

In the case of good ebonite the tin sulphide surface can be readily removed by matting the surface with powdered pumice powder applied with a wet wad and elbow grease, or by well polishing with rottenstone and tallow applied to a felt-faced revolving lathe faceplate.

One could wish that a practice would grow up amongst the manufacturers of really good British ebonite of plentifully stamping one side of their sheets all over with their registered trade marks, like the bottoms of certain makes of chocolate, and then there would be no need to ask a salesman to speak, concerning the origin, those things which may not be true.

In any case it is doubtful if the worst ebonite has ever descended to the level of some of the rubbish moulded compounds now made up into knobs, etc., which have been found to contain quantities of coke dust as a filler.

As a professional user of ebonite of the highest grade I can assure the amateur that it is produced in London in large quantities by several firms of world-wide reputation and further that it is *not* appreciably more expensive than poor stuff.

"6 LM"

London.

Broadcasting from the House of Commons.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—I believe that I am voicing the views of many radio users when I say that it is much to be deplored that such events as the broadcasting of the proceedings of the House of Commons, although presenting no technical difficulties, have been prevented through obstruction in certain quarters.

I believe, however, that a united effort on the part of your readers would soon remedy this, and that the British Broadcasting Company would be able to carry out a work which would not only be of the greatest interest to the general public, but of immense national value.

May I suggest that every reader writes a letter in triplicate on the lines of the draft shown below, and sends—

One copy to the Prime Minister, 10 Downing Street.

One copy to the Speaker, Rt. Hon. J. H. Whitley, M.P., Speaker's House, Westminster, S.W.1.,

One copy to his or her local Member of Parliament.

Yours faithfully,

CECIL L'ESTRANGE MALONE.

Proposed Letter.

DEAR SIR,—I write to urge that steps be taken to ensure that when the House of Commons reassembles, the necessary arrangements are made to broadcast important and interesting portions of the proceedings.

Yours faithfully,

American Telephony as Loud as Manchester —using 3-Valve Set only

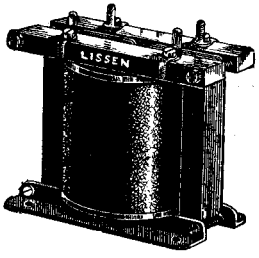
—but all LISSEN PARTS

" You will be pleased to note that we received WGY concert last Sunday fortnight (i.e. Sept. 2nd) on a 3-valve set using all LISSEN parts, with LISSEN REGENERATIVE-REACTANCE for the H.F.. Stage. Reception was equal to Manchester, and would have been audible on a loud speaker."—Messrs. Knight Bros. & Philpott, Landgate House, Rye.

LISSEN PARTS INCLUDE EVERYTHING YOU NEED TO GO BEHIND YOUR PANEL

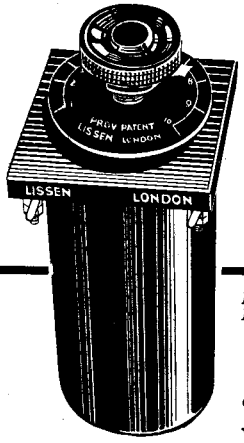
An excellent LIGHT TRANSFORMER

One of the best light transformers made is the LISSEN T3. May be used for all stages of audio frequency. Actually compares with many expensive transformers because of its skilfully balanced design. **16/6**



HOW LISSENSTAT CONTROL (Prov. pat.) improves detection.

" After fitting one of these excellent controls to my detector valve, the results are simply ideal. It enables me to get Newcastle (from Southampton) on my detector valve alone, bringing in music and speech quite plainly, a result quite impossible with a so-called Vernier rheostat that was fitted to my detector before I purchased your LISSENSTAT." Lissenstats are sold at **7/6**



FOR DISTANCE AND SELECTIVITY — LISSEN Regenerative Reactance

cuts out **2 LO** from close in, and tunes in the other stations with full built up strength—Continental stations come in easily. 150-4,000 metres. **£2 12 6**

Correct Grid Potential

LISSEN Variable Grid Leak.

Positive Stops at Minimum and Maximum Resistance. Length 3¼"— pencil thickness— LISSEN ONE HOLE FIXING. Note the price for a Genuine Lissen Part. **2/6**

LISSEN PARTS GO TOGETHER EASILY—THEY INCLUDE EVERYTHING YOU NEED TO GO BEHIND YOUR PANEL.

DEALERS.—Claim your liberal stocking discount—ALL RADIO, MOTOR, ELECTRICAL, and HARDWARE FACTORS sell LISSEN PARTS—or send direct.

LISSEN COMPANY

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N.B.—Close to Goldhawk Rd. (Met.) Station, Shepherd's Bush (Central London) or Hammersmith Tube. 'Phone: Hammersmith 1072.

LISSEN PARTS ARE SOLD EVERYWHERE — SEND DIRECT IF ANY DIFFICULTY

BUILD—WITH LISSEN PARTS.

QUESTIONS AND ANSWERS

"R.H.B." (Portland) *submits details of certain items of a musical programme he has heard in London, and asks* (1) *For the identity of the transmitting station.*

It is difficult to say, from the information given, where the transmissions originated, but we think it may have been an amateur station.

"A.L." (Stavanger) *asks* (1) *Is it advisable to use a six-volt accumulator with valves which he describes.* (2) *Will we give a diagram of a four-valve receiver suitable for reception of British broadcast transmissions in Norway, including a rejector circuit to eliminate jamming from a near-by high power station.*

(1) It is advisable to use a 6-volt accumulator when using the valves mentioned. (2) The diagram is given in Fig. 1. A filter circuit is provided, the coil of which is coupled to a small coil in the aerial circuit. The filter circuit coil may be honeycomb wound with No. 30 D.S.C. wire, having 80 turns on a former 1½" in diameter. The coil in the aerial circuit to which it is coupled may have from 5 to 10 turns of No. 20 or 22 D.C.C. wire. In operation, the filter circuit is tuned to the wavelength of the interfering station.

"ROBIN" (Swindon) *asks* (1) *How is it possible to use scrap ebonite for moulding in this material.* (2) *How is it possible to obtain a high polish on ebonite.* (3) *What are the reasons for limiting the length of an outdoor aerial.* (4) *Why will a L.F. transformer operate satisfactorily with one secondary terminal disconnected from L.T.*

(1) It is not possible for the average experimenter to do successful moulding of ebonite with the equipment usually at his command. (2) See recent issues of this journal. (3) One reason is to limit interference caused through improper handling of receivers. (4) Probably through the capacity of the windings.

"E.S.E." (Middlesex) *asks* (1) *For a diagram of a seven-valve receiver, employing three H.F. valves, crystal or valve as rectifier, and three L.F. valves with switches to enable any combination to be used as desired. The receiver is required for use on all wavelengths.* (2) *Will a crystal detector operate satisfactorily in this receiver.* (3) *Which Igranic*

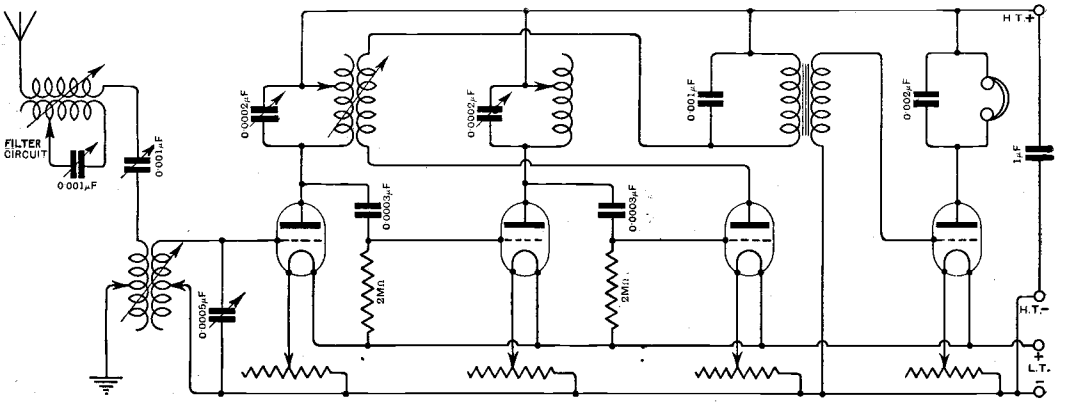

Fig. 1. **"A.L." (Stavanger).** *Receiver with two H.F. (tuned anode) rectifier and note magnifier. A filter is connected in the aerial circuit.*

"R.D." (Manchester) *submits a diagram of a receiver employing one H.F. valve, with crystal rectifier. Variometer tuning and H.F. coupling is used. He asks* (1) *What are suitable windings for both the variometers.* (2) *Which terminals of the H.T. and L.T. battery are connected together.* (3) *How may reaction be introduced in this circuit.* (4) *Would the receiver be improved by including fixed condensers across the telephones and H.T. battery.*

(1) The aerial tuning variometer may have 25 turns of No. 26 D.C.C. wire on both rotor and stator. The H.F. coupling variometer should be wound with 60 turns of the same wire on the rotor, and 120 turns on the stator. (2) It is usual to connect together the negative terminal of each battery. (3) Reaction may be introduced by including a variometer in the plate circuit of the valve. (4) The condensers will be an improvement.

coils will be required to cover the whole band of wavelengths at present in use. (4) *How is it possible to determine the correct coils to be used in the receiver for reception on any given wavelength.*

(1) The diagram is given in Fig. 2. (2) The crystal detector will be quite satisfactory. (3) It would be advisable to obtain two complete sets of Igranic coils. (4) The correct coil for use in the closed circuit of the tuner may readily be selected with the aid of the chart prepared by the manufacturers of these coils. In general the aerial circuit coil will be a slightly larger one than the closed circuit coil when the aerial condenser is in series with it. The anode coil will be the next size larger than the closed circuit coil, and the reaction coil slightly larger than this.

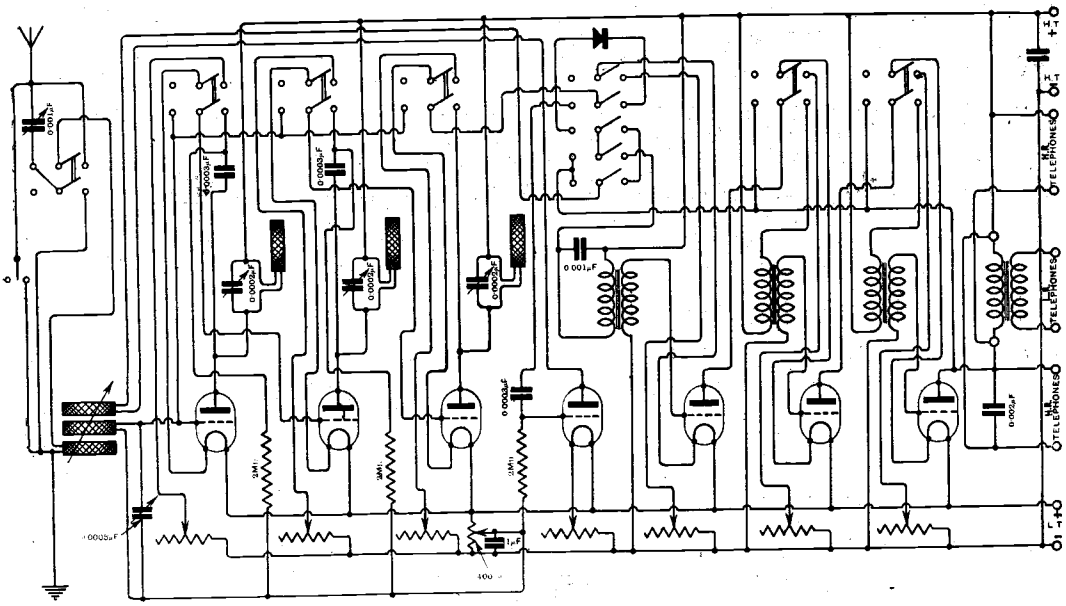

Fig. 2. **"E.S.E." (Middlesex).** *A seven-valve receiver with three H.F., valve or crystal rectifier, and three note magnifiers.*

"T.D.P." (Birmingham) *submits a diagram of a two-valve receiver, one H.F. and detector, and asks* (1) *Would it be possible to tune out* **5IT** *and receive from* **2 LO** *with this receiver.* (2) *What are suitable windings for a vario-coupler to be employed as anode inductance and reaction coil.* (3) *What are the maximum and minimum wavelengths of his receiver.*

(1) It will be difficult to tune out **5 IT** and receive from **2 LO** with this receiver, unless you alter the tuner from the single circuit to the loose-coupled type. (2) The stator of the vario-coupler may consist of a winding of No. 26 D.C.C. wire on a former 4″ in diameter and 3″ long. Ten tappings should be taken, the first from the 20th turn, and the next equally spaced along the coil. This winding will form the anode inductance and a 0·0002 μF variable condenser should be used in parallel with it. The rotor may consist of a winding of No. 30 S.S.C. wire on a former 2½″ in diameter and 2½″ long. (3) The approximate wavelength range of this receiver will be from 250 to 600 metres.

"A.R.A." (Victoria Park, E.9) *asks* (1) *For a diagram of a dual amplification receiver, employing one valve and crystal.*

(1) A diagram is given in Fig. 3.

"H.R.L." (Canonbury) *asks* (1) *For a suitable value of the resistance required in the filament circuit of a three-valve set, when using a 6-volt accumulator, and ordinary valves.*

(1) The resistance should have a value of 3 or 4 ohms.

"H.C.A." (Croydon) *asks* (1) *For particulars to enable him to construct the variable resistances used in the Flewelling circuit described in the issue of this journal of April 21st.*

(1) A good variable resistance was described in the issue of July 28th, 1923.

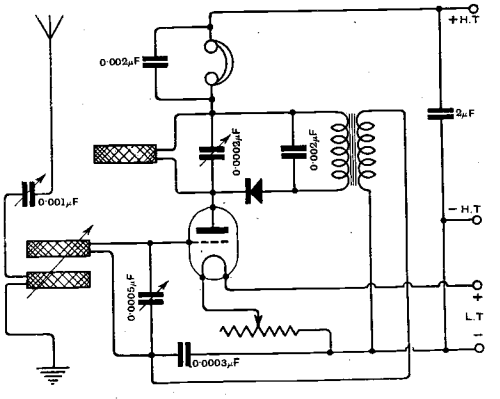

Fig. 3. **"A.R.A." (Victoria Park, E.9.)** *Simple dual amplification receiver.*

"AERIAL" (Reigate) *submits a diagram of a two-valve double magnification receiver, and asks* (1) *Is the diagram correct.* (2) *Will the receiver be stable.* (3) *Will there be more distortion with this type of receiver than with the ordinary three-valves single magnification type.*

(1) The diagram is correct. (2) This depends on the values of the components, and the manner in which the receiver is handled. See replies to other correspondents. (3) There should be no increase in distortion.

"A.C." (Halifax) *asks* (1) *What are suitable values for the variable resistances in the Flewelling circuit.* (2) *and* (3) *For particulars to enable him to construct two fixed condensers.*

(1) The resistance across the bank of condensers should have a value varying from 0·5 to 2 megohms. The grid leak should be variable between 1 and 1·5 megohms. (2) and (3) We would refer you to the article on the construction of condensers in the issue of this journal of June 9th, 1923.

"D.P." (Eliot Park, S.E.13) *asks* (1) *For a diagram of a receiver employing two H.F. valves with crystal detector, having series-parallel and stand-by tune switches, and a switch for cutting out one valve. Tuned anode H.F. coupling is to be employed.* (2) *What are suitable valves for the condensers and Igranic coils, when it is desired to receive the Radiola and Eiffel Tower transmissions.* (3) *For criticism of the proposed receiver.* (4) *Which of two suggested methods of obtaining reaction will be more effective in a receiver having one H.F. valve with crystal as rectifier.*

(1) The diagram is given in Fig. 4. (2) Suitable values for the condensers are given. See the special note in these pags. (3) The receiver will be satistactory. (4) The method shown in sketch (B) will be more satisafctory.

"D.M." (Belgium) *submits a diagram of a three-valve receiver and asks* (1) *Is the diagram correct.* (2) *Where is it possible to obtain H.F. transformers suitable for the construction of the Neutrodyne receiver described in this journal in the issue of April 21st, 1923.* (3) *How may reaction be introduced in this receiver.* (4) *How may a H.F. valve be added to the Reinartz receiver.*

(1) The diagram is correct. (2) We do not know where suitable transformers may be purchased ready made. We suggest you construct these yourself. (3) The method of employing reaction in this receiver is fully described in the article referred to. (4) A diagram of the Reinartz receiver with one H.F. valve is given in Fig. 5. The L.F. choke coil may consist of an L.F. transformer with the windings joined in series in the absence of a simple choke coil.

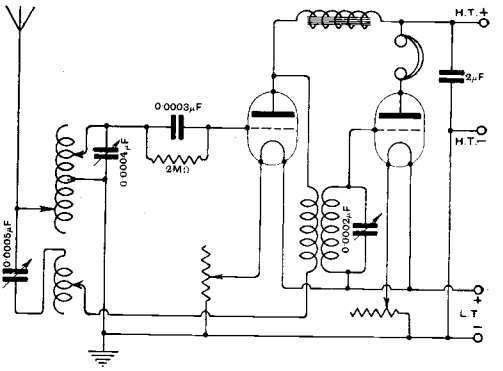

Fig. 5. **"D.M." (Belgium).** *Connections of a Reinartz receiver with one stage of H.F. amplification.*

"C.P.E." (Edgbaston) *asks* (1) *With reference to Fig. 1, page 329 of the issue of June 9th, 1923, will this circuit be selective.* (1) *What type of H.F. transformer is recommended.* (3) *What is the*

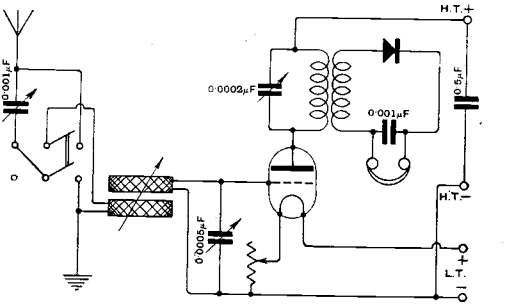

Fig. 6. **"C.P.E." (Edgbaston).** *A single valve amplifier with crystal rectifier.*

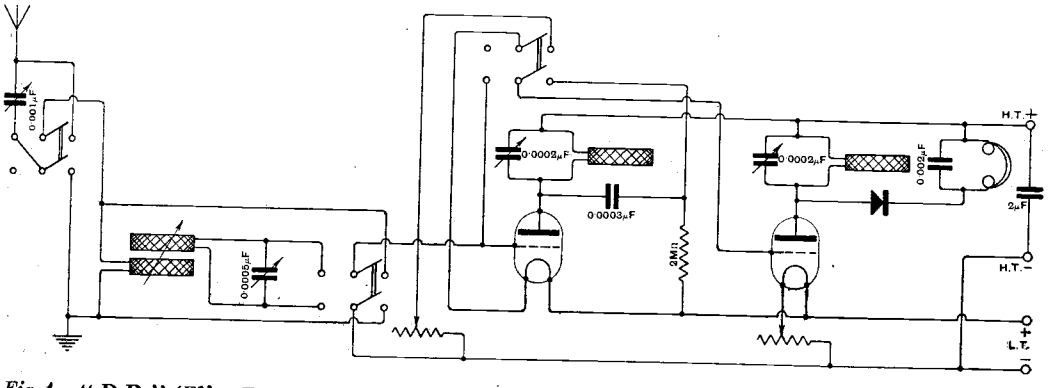

Fig. 4. **"D.P." (Eliot Park, S.E.13).** *Receiver with two stages of H.F. (tuned anode) amplification with crystal rectifier. There is a series-parallel and a tune-stand-by switch connected. The other is for switching the first valve circuit.*

approximate wavelength range of this circuit. (4) *For a diagram of a receiver employing one H.F. valve followed by a crystal detector.*

(1) The diagram referred to represents a very selective form of receiver. Whether it will achieve the results you desire, is very largely a matter for experiment. (2) The plug pin type is to be recommended. (3) The receiver will be suitable for all wavelengths up to about 3,000 metres. (4) The diagram is given in Fig. 6.

"B. Mc.C." (Ilkley) *submits a diagram of a receiver which he has constructed and asks* (1) *Why are no results obtainable with it.*

(1) The diagram is not correct. In Fig. 7 we give a diagram of the correct wiring for this receiver.

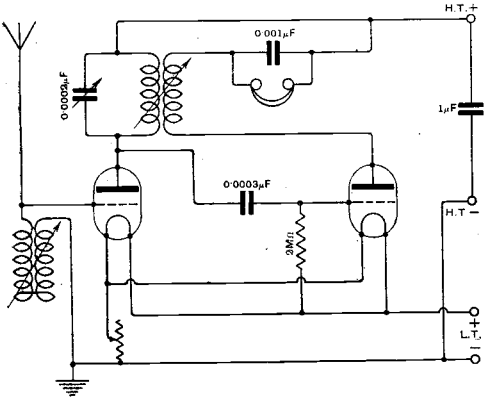

Fig. 7. **"B. Mc.C." (Ilkley).** *A receiver with one stage of H.F. amplification (tuned anode) and valve rectifier. The reaction coil is coupled with the anode coil.*

"AMATEUR" (Wells) *asks* (1) *What is a blocking condenser used for.* (2) *For the capacity of a certain fixed condenser which he describes.*

(1) If you refer to the small fixed condenser across the telephone terminals of your crystal set, this is for the purpose of improving the strength and quality of reception. (2) We would refer you to the issue of this journal of June 9th, 1923, in which full particulars for calculation of the capacity of small fixed condensers are given. We cannot calculate the capacity from the particulars furnished.

A number of readers enquire which honeycomb plug-in coils should be used in a receiver to tune-in signals with given wavelengths. The following data is reprinted from a leaflet supplied by the Igranic Electric Co., Ltd.

Honeycomb Inductance Coils (Plug Type).

The undermentioned stations may be received by using the following combinations of coils with a P.M.G. standard aerial, the primary shunted by a condenser of 0·001 mfd. capacity, and the tuned anode and secondary by one of 0·0005 mfd.

Broadcasting Station.	Primary.	Secondary or Tuned Anode.	Reaction.
British Broadcasting—			
Lower Wavelength ..	25	50	75
Higher Wavelength	35	75	100
Radiola 1,780metres	150	200	150
Hague 1,050 ,,	75	150	100
Eiffel Tower 2,600 ,,	200	300	200
Koenigswusterhausen 2,800 ,,	200	300	200

When the primary is shunted by 0·0005 mfd. and the tuned anode by one of 0·0002 mfd., the following coils will be required.

British Broadcasting—			
Lower Wavelength ..	35	75	100
Higher Wavelength	50	75	100
Radiola 1,780metres	200	400	150
Hague 1,050 ,,	100	250	150
Eiffel Tower 2,600 ,,	300	500	200
Koenigswusterhausen 2,800 ,,	300	500	200

The above figures will be found correct in almost all cases, though local and other conditions may cause some slight variations therefrom.

NOTE.—*This section of the magazine is placed at the disposal of all readers who wish to receive advice and information on matters pertaining to both the technical and non-technical sides of wireless work. Readers should comply with the following rules:*—(1) *Each question should be numbered and written on a separate sheet on one side of the paper, and addressed "Questions and Answers," Editor,* **The Wireless World and Radio Review,** 12/13, *Henrietta Street, London, W.C.2. Queries should be clear and concise.* (2) *Before sending in their questions, readers are advised to search recent numbers to see whether the same queries have not been dealt with before.* (3) *All questions will be answered through the post. Those of general interest will also be published.* (4) *Every question, except those under* (5) *below, should be accompanied by a postal order for* 1*s.*, *or* 3*s.* 6*d. for a maximum of four questions, and also the coupon taken from the advertisement pages of the current issue.* (5) *For the benefit of those readers who would rather not pay the charges, a free Questions and Answers Coupon will be placed in the advertisement pages of the first issue of every month. This coupon should accompany the question submitted, together with a stamped addressed envelope. The free coupon is valid for the current week only.* (6) *In view of the fact that a large proportion of the circuits and apparatus described in these answers are covered by patents, readers are advised, before making use of them, to satisfy themselves that they would not be infringing patents.* (7) *Four questions is the maximum which may be sent in at one time.*

THE WIRELESS WORLD AND RADIO REVIEW

THE OFFICIAL ORGAN OF THE RADIO SOCIETY OF GREAT BRITAIN

No. 217. (No. 2 Vol. XIII.) OCTOBER 10th, 1923. WEEKLY

CONTENTS

	PAGE
Editorial	34
Distortionless Telephony Reception. By F. H. Haynes	35
A Simple Method of Coil Calibration. By Gerald R. Garratt	38
Distortion in Low Frequency Amplifiers (*concluded*). By S. O. Pearson, B.Sc.	40
Inductance Coils—II. By W. James	45
The Amateur's Part in Wireless Development. By W. H. Eccles, F.R.S., D.Sc.	50
The Broadcasting Committee	55
Wireless Club Reports	58
Notes and News	60
Questions and Answers	63

THE EDITOR will be glad to consider articles and illustrations dealing with subjects within the scope of the Journal. Illustrations should preferably be confined to photographs and rough drawings. The greatest care will be taken to return all illustrations and manuscripts not required for publication if these are accompanied by stamps to pay return postage. All manuscripts and illustrations are sent at the Author's risk and the Editor cannot accept responsibility for their safe custody or return. Contributions should be addressed to the Editor, "The Wireless World and Radio Review," 12 and 13, Henrietta Street, Strand, London, W.C.2.

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THE BROADCASTING COMPROMISE

By THE EDITOR.

THE Report of the Broadcasting Committee has now been made public, and has already been discussed at considerable length in the daily Press. Elsewhere in this issue we reprint from the published report the summary of conclusions and recommendations arrived at by the Committee, and also the statement issued by the Postmaster-General respecting the immediate action which he proposes to take as a result of the recommendations of the Broadcasting Committee.

Anyone who read these two documents—the Broadcasting Committee's Report and the statement issued by the Postmaster-General—unless he has been following carefully the trend of events, and has taken into account the conflicting interests associated with the introduction of Broadcasting, would, we feel sure, be astonished at the fact that the Postmaster-General has found it possible to adopt so few of the recommendations of the Broadcasting Committee; but to understand the reason for this, one must remember that the Broadcasting Committee have prepared their report, as they state in their own words, "on ideal lines," and put forward what they consider to be the best and most adequate organisation for the conduct of broadcasting in the most satisfactory manner possible. The tone of the Report indicates all through that the Committee realised that some of their suggestions would be extremely difficult for the Postmaster-General to put into effect forthwith, on account of the existing agreement with the British Broadcasting Company. We cannot help, however, referring to the new regulations as "The Broadcasting Compromise," for, in every sense of the word, it certainly is a compromise fitting in between the various interests affected.

It will be remembered that when the Committee was set up, the Radio Society of Great Britain was invited to provide one member for the Committee to take charge of the interests of amateur users of wireless, and Dr. W. H. Eccles, F.R.S., President of the Society, undertook to serve in this capacity.

When one reads through the report in detail, it is to realise how Dr. Eccles has truly served the interests of the amateur and upheld his rights throughout the preparation of the report. It is his influence undoubtedly which has obtained for the public the right to construct apparatus and has maintained the freedom of the experimenter. Again, the same influence is apparent where paragraph 53 of the Report has been prepared. This paragraph, which relates to the draft of the Wireless Telegraphy and Signalling Bill to amend the Wireless Act of 1904, draws attention to Clause 2(1) of the Wireless Telegraphy Act 1904, which provides that where the applicant can prove to the satisfaction of the Postmaster-General that his sole object is to conduct experiments in wireless telegraphy, a licence for that purpose "*shall* be granted." The draft for the new Bill withdraws this special provision and provides that experimental licences, like all other wireless licences, *may* be granted by the Postmaster-General subject to any regulations which he may prescribe. In the paragraph above referred to, the Broadcasting Committee state that, in their opinion, some alterations should be made to the new Bill to preserve the experimenter's statutory right to the grant of a licence they at present enjoy under the 1904 Act.

Taken altogether, the report of the Committee, coupled with the statement as to the regulations which the Postmaster-General will bring into force immediately, must be taken as a satisfactory solution of the immediate difficulties, and cannot fail to be accepted with appreciation by almost every interested party.

We feel that the amateur will desire to express his appreciation of the work which the Broadcasting Committee has done, bearing in mind particularly the work of Dr. Eccles, who served on the Committee as the representative of the Radio Society of Great Britain and of Affiliated Societies, thereby voicing the views of the amateur and experimenter throughout the United Kingdom. Also we must not forget the valuable services rendered by Mr. A. A. Campbell Swinton, F.R.S., who gave evidence on behalf of the amateur before the Committee.

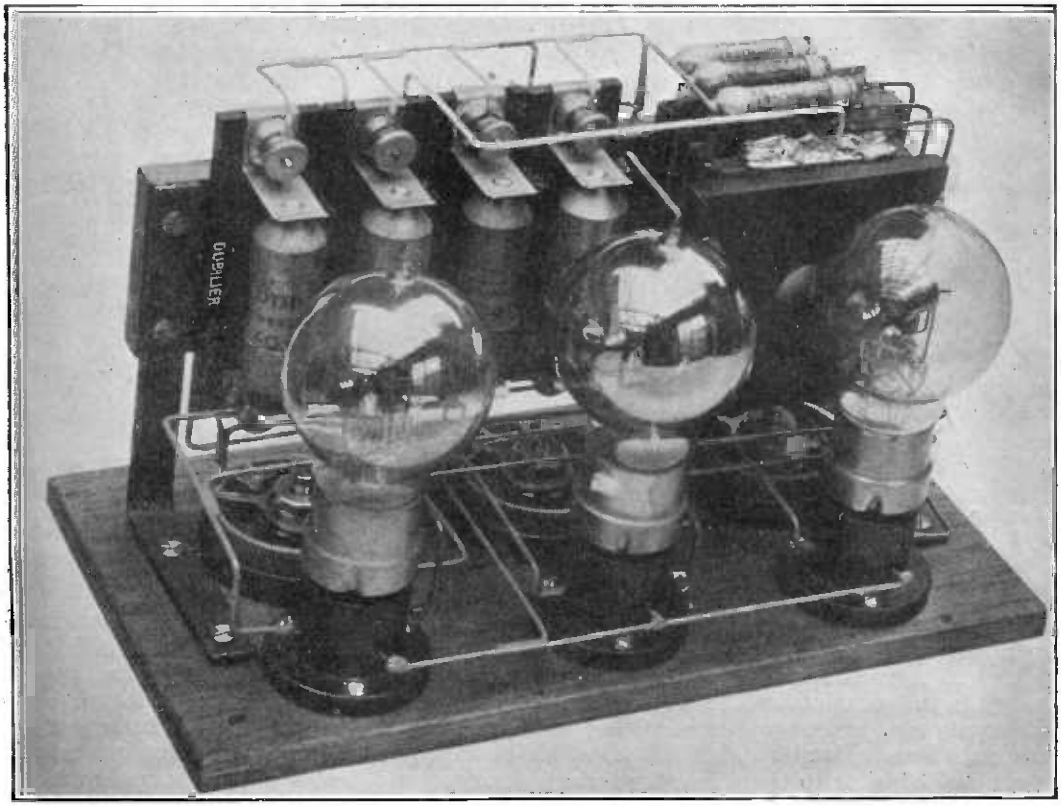
Distortionless Telephony Reception

Design for a Resistance Coupled Low Frequency Amplifier.

To those unacquainted with the quality of telephony obtainable with a transformerless arrangement of low frequency amplification, this article should especially appeal. The merits of the method of amplification described, together with the robust design and the unique yet simple construction given, should tempt many readers to build this instrument. There is little doubt that, before long, the use of closed iron-core intervalve transformers will be abandoned in telephony amplification circuits.

By F. H. HAYNES.

THE methods adopted for low frequency amplification applicable to the increase in volume of Morse signals must no longer be regarded as satisfactory for the pu pose of reproducing telephony with loud-speaking apparatus. The amplification of signals after detection is customarily carried out by means of valve amplifying circuits, inter-coupled by means of iron core transformers. The employment of iron core transformers in telephony circuits, both land-line and wireless, has for many years been standard practice, but it must be admitted that such circuits introduce considerable distortion. It will readily be admitted that speech as repro-



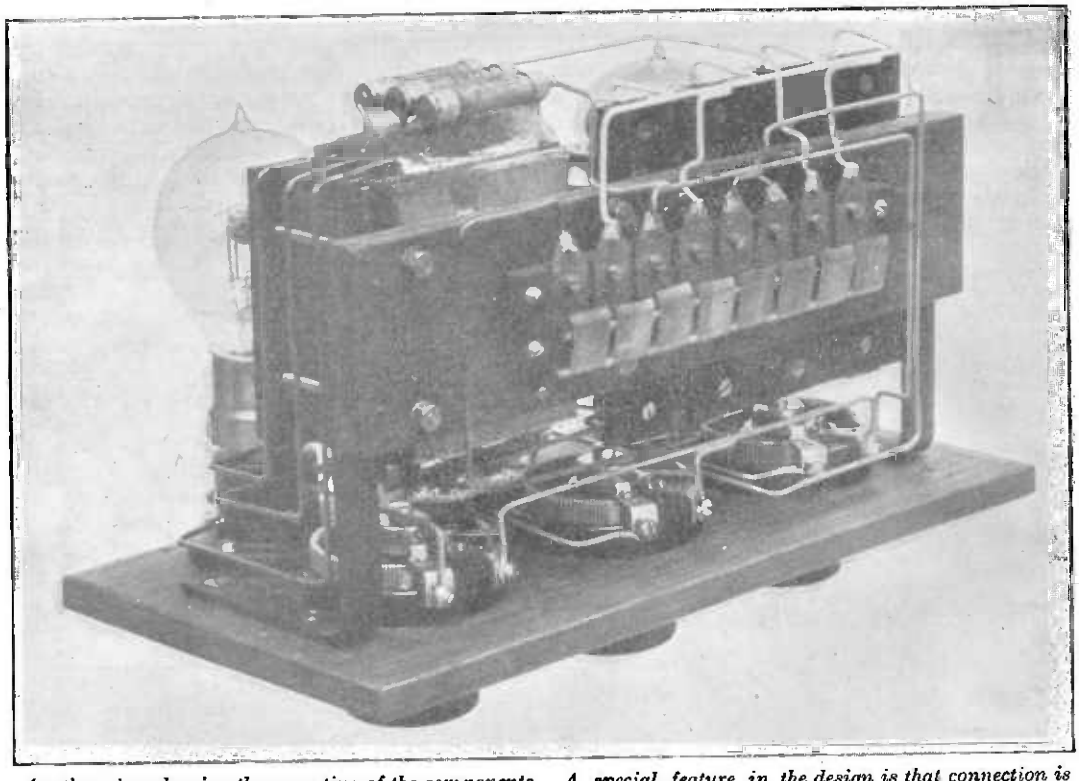
The interior of the Resistance Coupled Low Frequency Amplifier. The instrument is lifted from the containing case and inverted. It should be noted that the use of ebonite mounting panels is avoided, wood being employed and perfect insulation maintained. Filament brightness can be observed through the gratings in one side of the case.

duced by the ordinary land-line telephone circuit, with its complication of choke coils, condensers and indicators, is very considerably distorted; so much so that a certain amount of experience is required to use the apparatus, and such distortion is very marked if it is applied to loud-speaking apparatus.

Now, in low frequency amplifying circuits, apart from the introduction of distortion by incorrect filament current, grid potential or plate potential, the adoption of iron core inductances, such as the winding of inter-valve L.F. transformers, is disastrous if purity is to be maintained. The distortion so commonly present in broadcasting as rendered from a loud speaker has done a great deal of harm to the wireless industry, and unfortunately the wireless enthusiast can rarely detect the lack of purity, as he has unconsciously become expert in the interpretation of distorted signals.

In the instrument under description, the valves are coupled by means of resistances, and the fluctuating potentials set up across their ends by the varying plate currents, are fed to the grids of successive valves through condensers, while leaks are connected to the grids to dissipate the charges acquired by the condensers and maintain the grid potentials at suitable values.

The accompanying circuit diagram shows the arrangement of connections adopted, and the values are indicated. The resistance preceding the first valve is given as 60,000 ohms. A greater resistance value might produce greater amplification, but unless an excessively high voltage H.T. battery is to be employed it will be found that insufficient current will be passed to cause reaction effects when a reaction coil is made use of in the plate circuit of the detector valve. No connection is made to the terminal marked "1," when the detector valve is operated

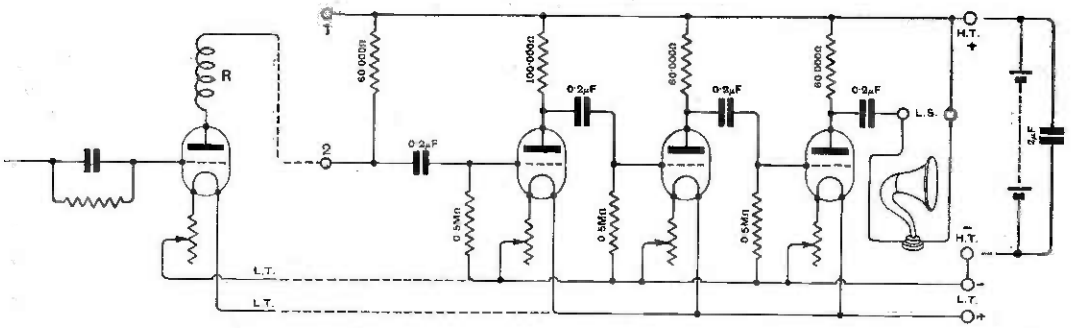


Another view showing the mounting of the components. A special feature in the design is that connection is picked up with the stems of the terminals by means of a strip of contact springs, permitting of the withdrawal of the instrument from the case without the entanglement of flexible leads, and at the same time disconnecting battery and other leads.

from an H.T. battery, which is common also to the L.F. amplifier. When amplifying from a crystal receiver, terminals "1" and "2" are connected to the telephone terminals. A resistance of 100,000 ohms is connected in plate circuit of the first valve of the amplifier, in order to get the highest possible potential built up, while the subsequent plate circuit resistances are lower in value in view of the greater current fluctuations available. The capacities of the grid condensers and the loud speaker feed condenser are not critical, and values between 1/3rd and 1/10th of a microfarad are satisfactory.

Leak resistances of 0·5 megohms or slightly lower suitably dissipated the condenser charges, and here, too, the values are not critical.

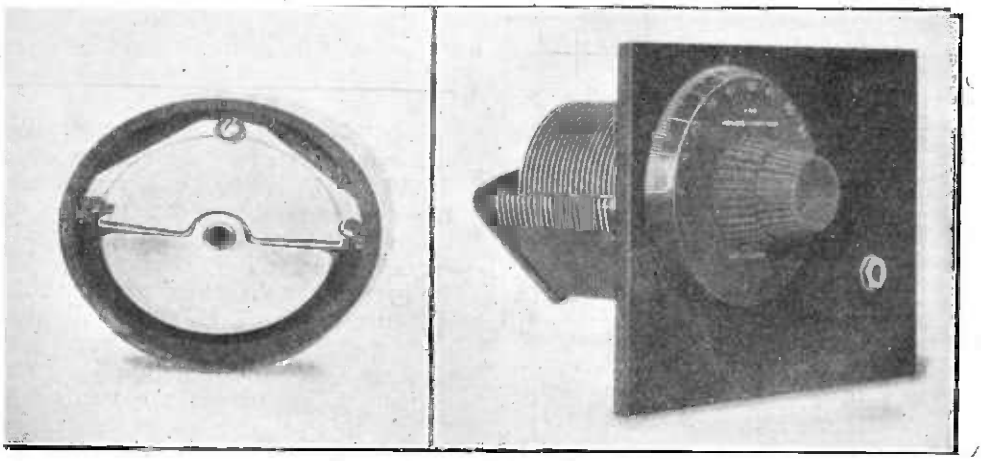
The degree of amplification obtainable with the method is not so great as when transformers are employed, and consequently three valves, instead of two, are made use of.



Circuit of the three-valve resistance coupled low frequency amplifier.

(*Full scale drawings and constructional details will be given in next issue.*)

COMPACT VERNIER CONDENSER.



A vernier condenser of compact construction and with concentric knob operation, which can readily be accommodated beneath the calibrated dial. The design shown above is of American origin.

A SIMPLE METHOD OF COIL CALIBRATION.

By GERALD R. GARRATT. (5 CS).

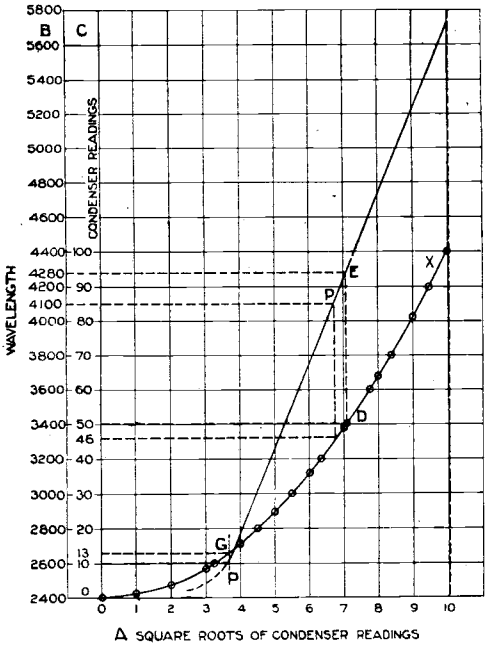
THE method to be described is very simple, and it is quite easy to calibrate a coil for wavelength if two stations of known wavelength can be heard upon it.

It is essential that the tuning condenser should have some form of scale. Most condensers are now fitted with scales marked in degrees from 0-180, but some are marked from 0-100. It does not matter how the scale is marked, so long as there is some form of regular scale.

Take a piece of graph paper, and, using the short edge as the bottom, number each vertical line from 0-10 or 0-14. These figures represent the square root of the condenser readings; thus if the condenser scale is marked 0-100 the figures along the bottom will be 0-10, but if the scale is marked 0-180 the figures will be 0-14. (The square root of 180 being 13·42).

A rough estimate of the wavelengths to which the coil will tune must now be formed. For an example let us say that the rough estimate is 2,500-5,700 metres. Then along the left-hand side of the paper mark off each horizontal line from 2,400-5,800 metres in steps of 200 metres. In the adjacent column mark off the same thick lines from 0-100 (or 0-180 depending on the scale of the condenser). It need hardly be stated that the scale 2,400-5,800 and the scale 0-100 do not "correspond." Let "A" denote the scale 0-10, "B" the scale 2,400-5,800 and "C" the scale 0-100.

Now using the scales "A" and "C," plot the curve of the square roots of scale "C" against scale "A." In order to save readers the trouble of working out a number of square roots the following table is given. Quite a number of square roots of numbers between 0 and 180 are known to everyone, for instance 81, which is 9. About 15 or 20 points are needed to get an accurate curve.



Number.	Square root.	Number.	Square root.
10	3·162	100	10·0
20	4·472	110	10·49
30	5·477	120	10·95
40	6·325	130	11·4
50	7·071	140	11·83
60	7·746	150	12·25
70	8·367	160	12·65
80	8·944	170	13·04
90	9·487	180	13·42

Let "X" denote this curve. We will suppose that we hear a station whose wavelength we know to be 2,600 metres with the tuning condenser at 13 and another whose wavelength is 4,100 metres with the condenser at 46. Look down scale "C" for 13 and then draw an imaginary horizontal line to cut curve "X" at "G." At "G" draw a short vertical line. Look for 2,600 on scale "B" and draw another imaginary horizontal line to cut the vertical line at "P." Repeat the performance for the second station heard and join "PP" by a straight line. It is necessary to produce "PP" upward to a position vertically over

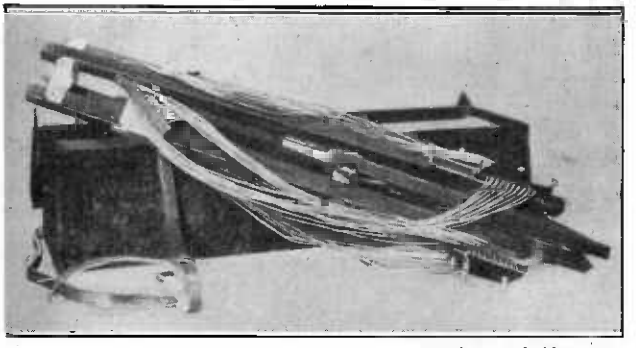
the square root of the maximum condenser on scale "A" (in this case 10), but downwards it should not be produced below the level of the 9 or 10 in scale "C." The reason for this is that the line "PP" bends to the left a little near its lower end due to the fact that even at minimum the capacity of the condenser is not zero. As a matter of fact my first reading of 2,600 metres is liable to have a small error on this account. The calibration is now complete.

Suppose now a station is heard with the condenser at 50. Find 50 on scale "C" and draw an imaginary horizontal line to cut curve "X" at "D." At "D" draw an imaginary vertical line to cut "PP" at "E," and from "E" draw a horizontal line to scale "B," where we read off the wavelength of the station heard, 4,280.

After a little practice it will be found quite easy to calibrate coils and read off the wavelengths from the chart. There are quite a number of stations which are easily distinguished even by anyone not knowing morse, which send out transmissions suitable for calibration.

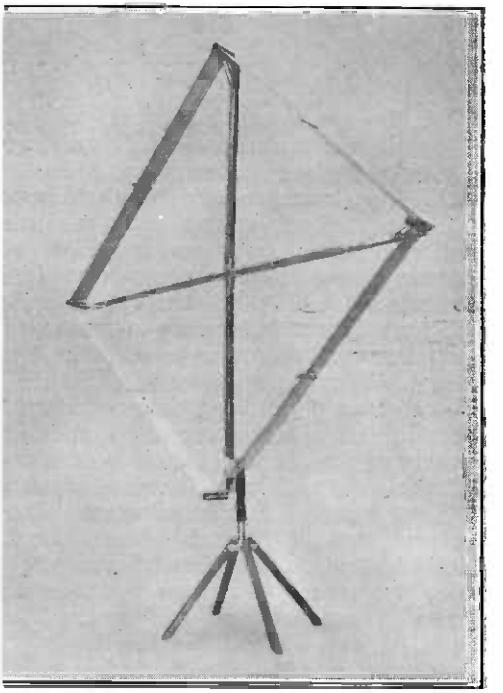
350-460	Broadcasting Stations.
900	Air Stations, Croydon, etc.
1,400	Air Ministry (GFA).
1,680	Air Ministry (GFA).
2,600	Eiffel Tower (FL).
4,100	Air Ministry (GFA).
5,000	Eiffel Tower (FL).
7,000	Eiffel Tower (FL).
10,000	Lyons (YN).
15,000	Lyons (YN).

In calibrating from C.W. signals care should be taken to take the reading of the condenser at the silent point of the beat note. This is especially important on the long waves because the beat note can be heard over a range of 1,000 metres or more and an error of 1,000 metres is a little out of place in a calibration chart!



"Wireless World" photo.

The dismantled aerial with carrying case.



"Wireless World" photo.

When fitted up the frame is well balanced and can be rotated.

New Frame Aerial.

The accompanying illustrations show the general construction of a new type of collapsible frame aerial designed by Holworthy Patents, Ltd. It is easily dismantled and closes into very little space, making it readily portable. Substantially built in mahogany with cast brass fittings and special braided aerial wire, it is both robust and durable. The sides measure approximately three feet in length and the winding consists of ten turns, spaced about $\frac{1}{4}$ in. apart. It is perfect electrically and is one of the first really high-grade frame aerials of British manufacture.

DISTORTION IN LOW FREQUENCY AMPLIFIERS

By S. O. PEARSON, B.Sc.

(*Concluded from page 6 of previous issue.*)

IN the preceding instalment of this article, the distortion in L.F. amplifiers due to faulty adjustment was discussed. We now come to the consideration of the various effects arising from the iron-cored intervalve transformers which are commonly used in note magnifiers. It is not intended here to go into the design of such transformers but rather to discuss the chief causes of distortion inherent in iron-cored transformers.

It has been pointed out that considerable distortion may be produced by the self-capacity of the windings if this is excessive, but as a rule most of the trouble arises in the iron cores of the transformers. Even the best iron alloy which is used for the cores of low frequency transformers possesses properties which tend to cause distortion in various ways, chief among them being (a) non-uniform permeability; (b) hysteresis effects and (c) eddy current effects. A brief consideration of the chief magnetic properties of iron will be helpful in enabling the reader to see exactly how distortion occurs.

5.—NON-UNIFORM PERMEABILITY OF THE IRON.

The permeability is defined as the ratio of the flux density B (lines per sq. cm.) in the iron to the *magnetic force* H producing it. The magnetic force is numerically equal to the strength of the field which would be produced in air under the same conditions and is proportional to the number of ampere-turns per centimetre acting on the magnetic circuit and therefore to the magnetising current. Thus permeability $\mu = \frac{B}{H}$. For iron the magnetic flux density produced is not proportional to the magnetising force, so that μ is not constant. In Fig. 3 a curve is plotted showing the relation between B and H for iron when H is gradually increased from zero, there being initially no residual magnetism in the iron. It will be noted that for high induction densities in the iron the curve tends to become horizontal, *i.e.*, further increase in H does not raise the value of B to any extent and the iron is said to be *saturated*.

In an ordinary power transformer the current through the primary winding is purely alternating and the flux is completely reversed every half cycle, whereas in the case of an intervalve transformer connected in the ordinary way with the primary in the plate circuit of a valve, there is present not only the pulsating or alternating current representing the signals, but also the D.C. component of the plate current. Now the instantaneous value of the plate current can obviously never reverse, so that the magnetic flux in the iron core is never reversed, but merely varied in value over a certain range determined by the amplitude of the current oscillations, the mean value of the flux being determined by the value of the D.C. component of the plate current.

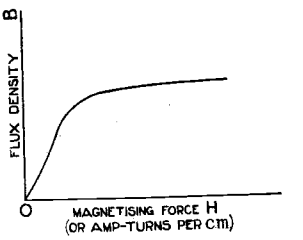


Fig. 3.

Obviously the distortion will be a minimum when operation takes place over the straight portion of the curve of Fig. 1, Vol. XII, No. 216, page 789, from which it follows that the transformer must be designed to suit the particular type of valve on which it is to be used. A valve which takes a very heavy plate current when working on the straight portion of its own characteristic would be sure to saturate

the magnetic circuit of a transformer designed for use with valves which take a small plate current.

It must be remembered that the oscillating component of the plate current is very small as a rule since the transformer is virtually on no-load, the grid of the next valve taking practically no power when adjusted to the right potential. It is merely the current necessary to produce the oscillating component of the magnetic flux and to supply the various losses.

6.—HYSTERESIS EFFECTS.

It was stated that the curve of Fig. 3 was obtained by gradually increasing the value of H from zero with no initial magnetism in the iron. The same curve is repeated in Fig. 4. Suppose that after increasing

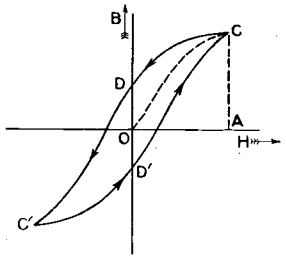


Fig. 4.

the magnetising force from zero up to the value OA, it is gradually reduced again to zero and the values of B are plotted against the decreasing values of H. It will be found that a new curve CD is obtained above the original one OC, *i.e.*, the flux density has higher values for descending values of H than for ascending values. Even when the current has been switched off altogether, a considerable amount of magnetism (represented by OD) remains in the iron and is known as the *residual magnetism*. If now the magnetising current is gradually increased from zero in the opposite direction to give negative values of H, the curve CD is continuous downwards to C^1 when H is equal to OA^1. On increasing H from OA^1 to OA again, the flux density passes through successive values represented by the curve C^1D^1C and we obtain a closed loop CDC^1D^1 known as the *hysteresis loop*.

When the magnetising force is obtained from an alternating current, the magnetic flux is completely reversed every half cycle and passes through all the values represented by the hysteresis loop once every cycle. This hysteresis effect represents a loss of energy and it can be shown that the area enclosed by the loop is directly proportional to the energy lost per cycle. The hysteresis loss in iron is roughly proportional to the 1/6th power of the maximum flux density and for this reason it is necessary to work a transformer at fairly low densities if good efficiency is to be obtained. This is particularly important in intervalve transformers because the hysteresis is equivalent in effect to shunting the primary of the transformer by a resistance, thus by-passing the signal oscillation. This imaginary resistance shunt is a variable one and serious distortion results when the transformer is worked with excessive maximum flux densities.

The hysteresis loop for the iron of an intervalve transformer operating under normal conditions is not exactly the same as that shown in Fig. 4 since the primary magnetising current is never reversed but simply varied in value at the frequency of the signal oscillations. The loop obtained under these conditions is shown in Fig. 5,

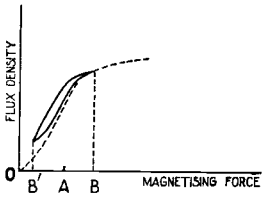


Fig. 5.

OA being the mean value of the plate current and AB (or AB^1) the amplitude of the A.C. component. In this instance the loop is not quite symmetrical as in the previous case.

The graphical construction given in Fig. 6 will serve to show how distortion arises as a result of hysteresis and non-uniform permeability. For simplicity, first of all consider a transformer with a sine wave of alternating pressure applied to the primary and neglect any resistance which might be present in the winding. Since there is no resistance, the back E.M.F. generated in the winding must be at every instant equal and opposite to the applied pressure and is therefore a sine wave also. Now a sine wave of E.M.F. can only be generated

by a magnetic flux varying according to the sine law. Let the curve ϕ represent this flux and let CC^1 be the corresponding hysteresis loop with magnetic flux plotted vertically and *magnetising current* plotted horizontally. Take any point P on the flux curve (say on the rising portion), draw PQS horizontally to cut the loop at Q (also on the rising portion); then the current at that instant is equal to SQ. Make NM equal to SQ; then M is a point on the current curve plotted to the same time base as ϕ.

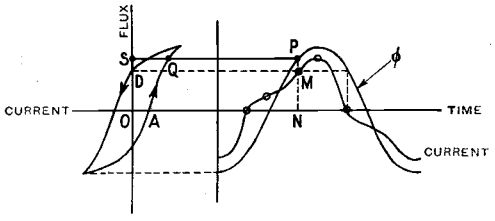


Fig. 6.

Proceeding in this way for various points along the flux curve we are able to get a series of points on the current curve as shown by the crosses. Note that the current and flux both pass through their maximum values at the same time but pass through their zero values at different times. When the current is zero and decreasing, the flux has a value OD. On drawing a curve through the points so obtained we get a current curve which is far from being a sine wave; in fact it contains a very pronounced third harmonic.

In this case of a transformer without any resistance in series or in the windings, the distorted current wave would have no effect on the secondary voltage because, since the flux wave is sinusoidal, the E.M.F. generated in the secondary must also be sinusoidal. However, when we come to the actual case of an intervalve transformer in operation, we have a large resistance in the primary winding and also the very large plate-to-filament resistance of the valve connected in series. Across the combined resistance there will be a drop of potential exactly proportional to the current flowing at any instant and when this current is distorted by the iron of the transformer in the manner described above, the useful voltage applied to the primary will contain a third harmonic and become badly distorted, this distorted E.M.F. being passed on to the next valve.

For fairly low flux densities operation takes place over the straight part of the B-H curve (Fig. 3) and the hysteresis loop becomes very narrow, having a negligible area, and distortion is reduced to a minimum.

It was seen in the previous instalment that in order to obtain a fairly high voltage amplification the impedance of the transformer should be as large as possible. It occurs to one at once that large impedances can be obtained by winding the transformers with a large number of turns, taking special care to eliminate self-capacity as far as possible. But this may introduce trouble in another direction, namely, magnetic saturation, with the ill effects discussed above. The number of ampere-turns on the primary under operating conditions must be designed to suit the iron core. A transformer with a large iron core and not too many turns gives the best results as regards quality of speech on account of the large impedance obtained, together with low flux densities. This accounts for the great superiority of the larger and more expensive types of intervalve transformers on the market. There are many makes which are designed for cheapness, containing very little iron and having windings with excessive self-capacity. These should be avoided. When very loud results are required it becomes necessary not only to use valves of sufficient capacity but also to employ intervalve transformers sufficiently large to deal with the comparatively large amount of power without saturation setting in. This applies particularly to the telephone transformer if one is used between the last valve and the loud speaker.

In certain types of transformer with an extra large number of turns on the primary, an airgap is introduced in the magnetic circuit in order to limit the flux density to the best value for low iron losses and distortionless amplification. This can only be done in transformers with cores of large cross section. The airgap has the further advantage of improving the proportionality between the magnetic flux and the magnetising current, giving a B-H curve which is fairly straight over a very wide range. With some transformers it is possible to vary the length of the air-gap whilst in operation in order to get the best results.

7.—EDDY CURRENTS.

The rapidly varying flux through the core of a transformer induces alternating E.M.F.'s in the iron itself, with the result that currents are set up in the iron, these currents being known as *eddy currents*. If the core were solid, these eddy currents would be quite large and cause excessive losses—they would virtually constitute a short circuited secondary winding. For these reasons the core of a transformer is always built up of laminations of iron alloy of high specific resistance, the individual laminations being insulated from one another by a coating of varnish or a thin sheet of paper on one side of each. Sometimes the coating of oxide on the metal is relied upon to furnish the insulation between the laminations, but this is not sufficient in the case of an intervalve transformer for the following reason: When a signal is passing, varying magnetic forces are set up between the adjacent laminations, and if these are not very securely clamped they will chatter mechanically when the signals are very strong. This can be heard on almost any power transformer in operation. In any case, whether they chatter or not, there is a variable pressure between the laminations and if the insulation is indifferent, eddy currents will pass from one plate to the next in varying degrees according to the pressure between the plates and the number of points which come into contact intermittently. The result is that loud extraneous noises are mingled with the signal.

Even in a well designed transformer the eddy currents are not negligible but cause a certain loss of energy which lowers the output voltage of the secondary winding. The eddy current losses are proportional to the square of the frequency and the square of the flux density. Thus the higher frequencies are damped out to a greater extent than the lower ones and low flux densities are essential.

8.—SECONDARY LOADING OF INTERVALVE TRANSFORMER.

Theoretically the secondary of an intervalve transformer does not supply any current, a valve being a potentially operated device when working under normal conditions; but in practice the secondary winding is loaded by its own self-capacity to an extent depending on the number of turns and their spacing. When the self-capacity is excessive it not only damps out the higher note frequencies to a greater extent than the lower ones, but reduces the effective step-up ratio of the transformer as a whole. The ratio of secondary to primary turns has not been found to be practicable above 4 to 1 on this account, and the writer has found lower ratios than this preferable.

The secondary winding of an intervalve transformer is usually connected between the grid and the negative end of the filament. Now when receiving a signal, the grid will have its potential varied so that it is sometimes positive and sometimes negative with respect to the negative end of the filament. Since grid current flows for all potentials above zero and not for those below, we see that during the positive halves of the waves the transformer will be loaded to a greater extent than during the negative halves, with the result that the positive halves suffer much more damping than the negative ones, especially when the secondary winding has a great number of turns of thin wire. This is another source of distortion which is very often overlooked. To obviate it a grid battery of 4 or 5 volts should be employed to give the grid permanent negative potential, and a somewhat higher plate potential should be used to ensure working at the proper point on the characteristic curve of the valve.

9.—INSULATION.

Noise is often produced by faulty insulation between the windings of a transformer and is a common defect in cheap transformers. The disturbance is very similar to that obtained from a H.T. battery which is nearly run out, and there is no cure for it.

10.—TELEPHONE TRANSFORMERS.

A telephone transformer operates under conditions quite different from those of an intervalve transformer. Whereas the latter is a potentially operated device, working virtually on no-load, the former is an energy operated device with a definite load on the secondary. Now the energy output from a valve is greatest when a *pure resistance* equal to the internal resistance of the valve is connected in the plate circuit. The loaded telephone transformer does not constitute a pure resistance load, but an

inductive one, on the valve. However, very nearly the greatest output will be obtained if the effective impedance (at say 800 cycles per sec.) of the loaded transformer is as nearly as possible equal to the internal resistance of the valve. It is usual for the primary winding of a telephone transformer, for use with a valve, to have a resistance of about 8,000 ohms.

The same conditions regarding the effects of iron apply to the telephone as to the intervalve transformer; but on account of the lower impedance necessary as compared with intervalve transformers, telephone transformers are often wound on open cores composed of a bunch of iron wires, distortion being almost entirely eliminated because more than half of the magnetic circuit is through the air. Open core type telephone transformers are greatly superior to the closed core type although they are more bulky. Open core intervalve transformers are not practical, partly on account of their size and weight and partly on account of the mutual inductive effect obtained where open cores are used. It would be practically impossible to construct a multivalve amplifier with open core intervalve transformers unless each were completely enclosed in an iron box.

MUTUAL RADIO.

By J. R. HOULT.

THERE is a development of broadcasting which, up to the present, does not appear to have been touched upon. In all our cities and towns, and in fact almost everywhere, there are houses in rows which are entirely suitable for the erection of aerials along the roofs. By mutual arrangement a very decent aerial could be erected, and one of the houses, in which would live the local Radio man, could be used as the receiving station.

The next step is to wire a series of loud speakers, or headphones if required, through all the houses in the row whose owners or tenants desire to avail themselves of the joys and utility of the local broadcast. Such an arrangement makes the possibility of bringing the transmissions to the most humble home not only simple but relatively cheap from every point of view. The technical details connected with such a scheme are not insurmountable and the more material side of the question—remuneration—is one which could be fixed between the Radio man and the customer by an agreement covering installation for a minimum period of, say, one year. To take actual figures, let us assume that the customer pays 1s. or 1s. 6d. per week for the service, and that he pays 10s. for initial installation of his loud speaker. He agrees to pay for the service for a minimum period of a year, so that if twelve customers require the service, the income for the first year would be £52 16s., and for the second year £46 16s. if the rate of 1s. 6d. per week is agreed upon.

Allowing £20 for making a suitable receiver and power amplifier, and say £30 for the loud speakers and wiring, the service would commence to show a profit after the first year. With the experience gained during the first year of working, the cost for renewals of valves, repairs and charging of accumulators, etc., could be accurately determined and a revision of the weekly rate might be necessary in one way or the other. Perhaps the figures are on the low side for a start, but it should be remembered that with present developments in radio, such applications as dual amplification and the like would tend to reduce the cost of the set itself.

Such a service would be a boon to those who are not keen enough or have not the necessary knowledge or money to make the equipment for themselves.

If no experimenter is available in the row in which the service is required, the local dealer would be called upon to instal the service and maintain it. The actual receiver would be placed in the house where the occupants are not all away at once, or alternatively, it would be a simple matter to carry a controlling switch into the house next door.

INSTRUCTIONAL ARTICLE FOR THE LISTENER-IN AND EXPERIMENTER.

INDUCTANCE COILS—II.

The articles entitled Wireless Theory which appeared in the last volume will be completed in this section of the journal. Below we continue with inductance coil design.

By W. JAMES.

The Best Shape of Coil.

There is naturally one shape of coil which gives the maximum inductance for a given length of wire. The cross-section of a coil is given in Fig. 6. If the winding cross section is square, that is if $b = c$, the coil has a maximum inductance for a given length of wire when the mean diameter is

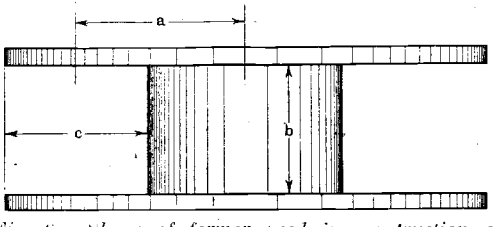


Fig. 6. Shape of former used in construction of certain multilayer coils. Honeycomb or duolateral coils have this cross section.

three times the coil width; or, when $a = 1{\cdot}5b = 1{\cdot}5c$. Writing this in another way, when $c/b = 1$ the inductance is a maximum for a given length of wire, when $\frac{c}{a} = \frac{2}{3}$.

The inductance is greater for coils of square cross section than for any other ratio of depth (c) to width (b). Therefore the most efficient coil will have a square cross section, with a mean diameter three times the side of the square. This would also give a coil with minimum resistance, but it should be remembered at high frequencies the effective resistance depends upon the method of winding the turns, and insulation losses.

The Inductance of Multilayer Coils.

There is no formula which gives very accurately the inductance of multilayer coils (such as the duolateral), but the inductance may be calculated as accurately in most cases as it is possible to measure the dimensions of the coil.

One formula which may be used is as follows:—

$$L = \frac{31{\cdot}9\ N^2a^2}{{\cdot}23a + {\cdot}44b + {\cdot}39c} \times \frac{1}{1{,}000}$$

where L = inductance in microhenries, μH.
N = the total number of turns.
a = the mean radius in inches.
b = length of the coil in inches.
c = the coil depth in inches.

The number of turns

$$N = \sqrt{\frac{L({\cdot}23a + {\cdot}44b + {\cdot}39c \times 1{,}000}{31{\cdot}9a^2}}$$

Probably a better formula is the following:—

$$L = \frac{0{\cdot}0395a^2n^2K}{b} - \frac{0{\cdot}0126n^2ac}{b}\ (0{\cdot}693 + E)$$

microhenries.

where a = the mean radius in centimetres.
N = the total number of turns in the winding.
K = a factor depending on the ratio $\frac{\text{diameter}}{\text{length}}\left(\frac{2a}{b}\right)$.
c = the depth of the winding in cms.
b = the width of the winding in cms.
E = a constant.

The value of K may be taken from the curves of Fig. 126, Vol. XII, No. 214, page 833. Values of E are given below.

$\frac{b}{c}$	E
1	0·000
2	0·120
3	0·175
4	0·208
5	0·229
6	0·245
7	0·256
8	0·266
9	0·273
10	0·279

The result will not be absolutely correct on account of no allowance being made for the spacing of the wires, nor the method of winding the turns.

An example will make things clear.

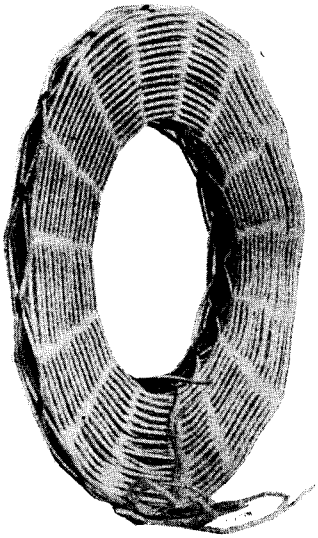


Fig. 7. A simple basket coil.

Example.—A machine-wound duolateral coil, which has a rectangular cross section, has the following dimensions:—

Depth (c) = 2·15 cms; width (b) = 2·8 cms.; mean diameter, 7·25 cms., and mean radius (a) 3·625 cms. Total number of turns = 1,500.

Then, inductance

$$L = \frac{0{\cdot}0395\ a^2n^2K}{b} - \frac{0{\cdot}0126n^2ac}{b}(0{\cdot}693 + E)$$

microhenries.

Substituting the values given (K for $\frac{\text{diameter}}{\text{length}} = \frac{7{\cdot}25}{2{\cdot}8}$ is 0·4625, and E from the table = 0·036),

$$L = \frac{0{\cdot}0395 \times 3{\cdot}625^2 \times 1{,}500^2 \times 0{\cdot}4625}{2{\cdot}8} - \frac{0{\cdot}0126 \times 1{,}500^2 \times 3{\cdot}625 \times 2{\cdot}15}{2{\cdot}8}(0{\cdot}693 + 0{\cdot}036).$$

$$L = 192{,}898 - 57{,}448$$
$$= 135{,}450\mu H.$$

The actual inductance of this coil is 136,400 μH. The error is therefore quite small, in this case about 1 part in 130, although we cannot expect the results to be any more accurate than one or two per cent. In the case of smaller coils, where the error in measuring the dimensions is likely to be several per cent., the results obtained will be as close to the truth as the measurements of the coil.

The inductance obtained using the simpler formula

$$L = \frac{0{\cdot}0319N^2a^2}{0{\cdot}23a + 0{\cdot}44b + 0{\cdot}39c}$$ is 128,300μH.

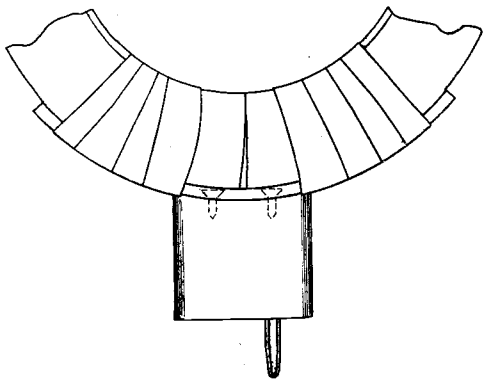
which is probably accurate enough for most practical purposes.

Pancake Coils.

A. A simple pancake coil is illustrated in Fig. 7. It is wound by winding the wire in a suitable way on a former. The former consists of a cylinder of metal or wood, with an odd number of pegs arranged around the circumference in a single row. In the simplest construction the wire is wound round the back of one peg, the front of the next, the back of the next, and so on.

When the coil is wound it is t ed with cotton, the pegs removed, and the coil slipped off the cylinder.

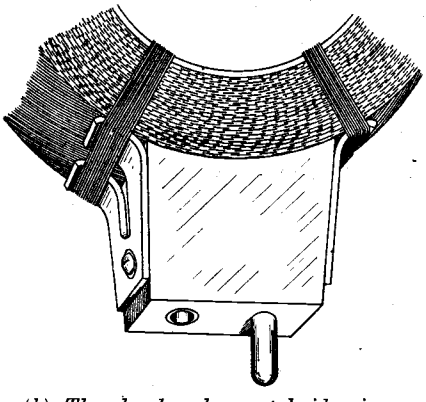
The self-capacity is very low. It will be noticed the turns only touch where they cross each other in the spaces between the pegs, and the angle at which they cross is large.



(a) A simple method of fixing the plug to the coil. A strip of fibre is held with screws to the plug, and the fibre is secured with tape to the coil.

Instead of a peg former, a disc of material such as cardboard, treated to prevent absorption, and cut so that there are a number of slots around the edge is often

used. The advantage lies in the robust construction, and the ease of properly mounting such coils. Such coils have been described elsewhere in this journal.

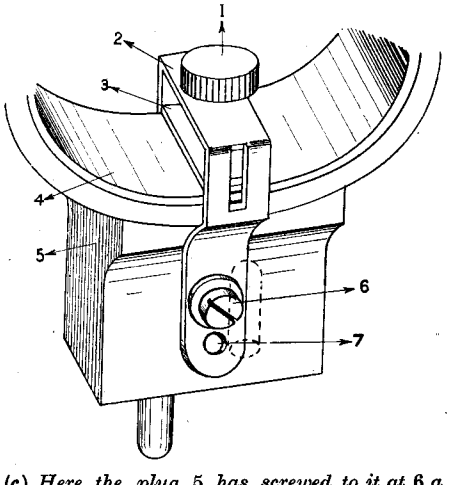


(b) The plug here has metal side-pieces which are tied to the coil with cord.

It is possible to wind the wire in a large number of different ways, using a simple former as described, with the possibility of coils of different inductance, but with the same outside and inside measurements.

B. The inductance may be calculated with the aid of the formula for single layer coils, provided the terms of the formula are properly interpreted. The formula is explained in Vol. XII, No. 210, page 696, and is as follows :—

$$L\mu H = \pi^2 n^2 d^2 lk \div 1{,}000\mu H.$$



(c) Here the plug 5 has screwed to it at 6 a metal strap 2, which carries a screw 1. By turning the screw, the metal strip 3 is held tightly against the coil 4. The hole 7 is provided so that the arrangement may be fitted to larger coils.

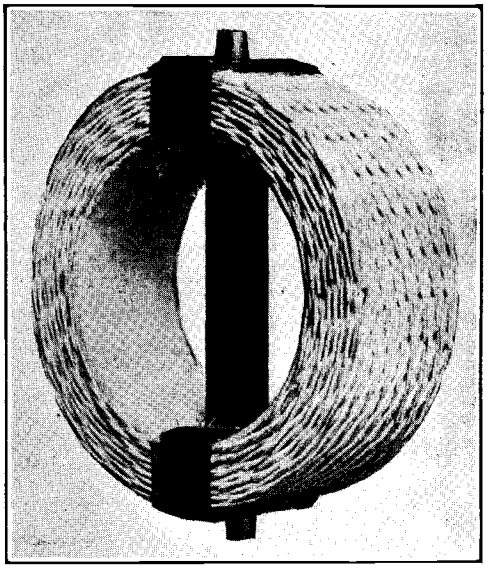


Fig. 8. This is probably the best method of joining the ends of a coil.

When applied to basket coils—

d = the mean diameter, in cms.
l = the depth of the coil, in cms.
n = the number of turns per cm.
π = 3·1416.
K = a factor depending on the ratio $\frac{\text{diamet r,}}{\text{length}}$ which may be taken from he curves on page 833, No. 214.

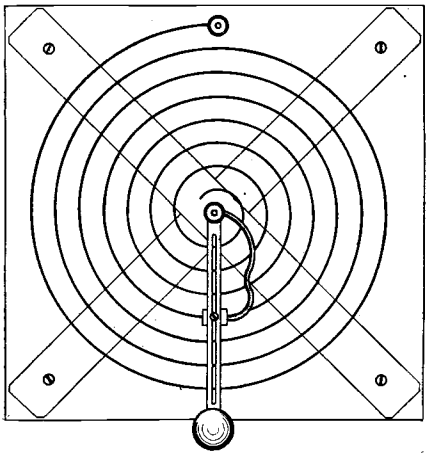


Fig. 9. A spiral inductance, as used in some types of transmitter. The amount of inductance in circuit is varied by shifting the clip.

In counting the number of turns per cm. it is best to find the total number in the coil, and to then divide this number by the coil depth in cms. In the simple basket coil, the number of turns is, of course, the number counted on one face times two.

Perhaps a simpler method is to use the curve which accompanies the inductance formula for finding the inductance of *spiral* coils below.

C. There are so many varieties of this type of coil that *the best shape* for one may not be that for another. However, the inside diameter should not be too small. The inside turns only have a small inductance compared with those near the outside, but they are the cause of a considerable part of the high-frequency resistance.

A good arrangement is to make the mean diameter about three times the depth.

The diameter of the inside of the coil will then be almost twice the depth of winding.

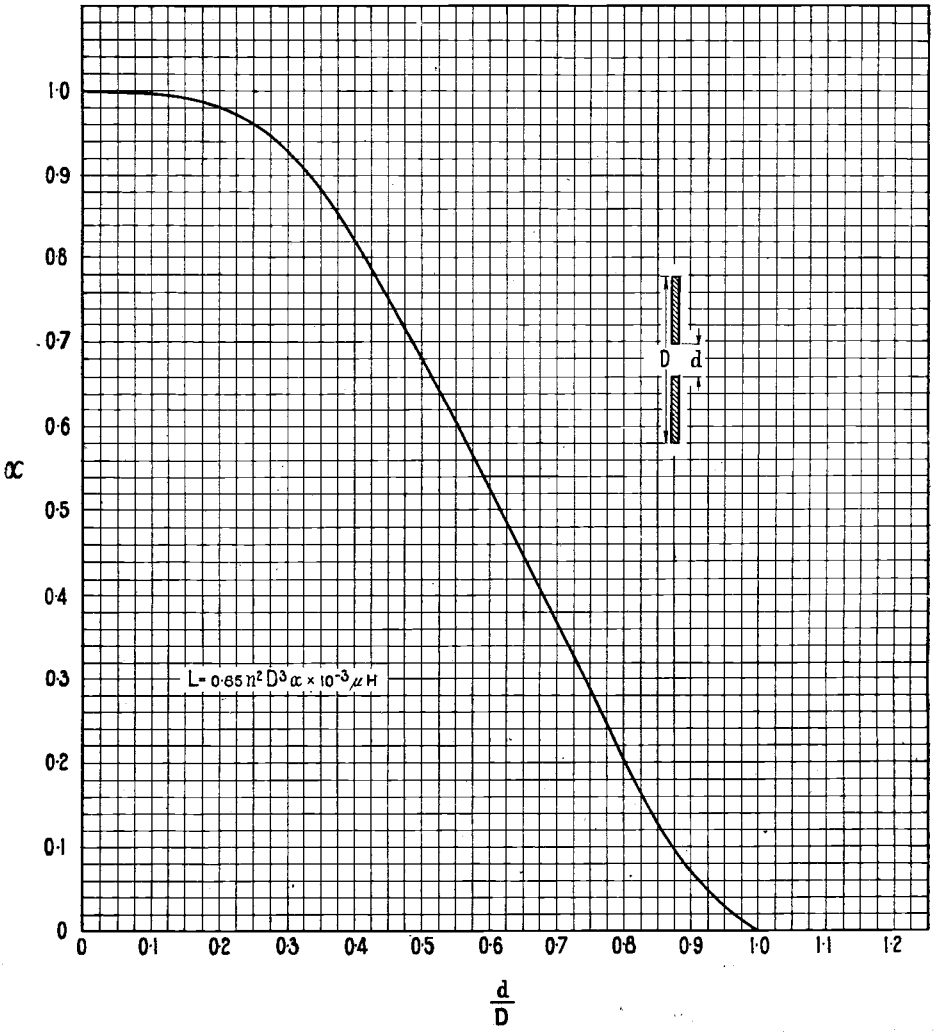


Fig. 10. *The inductance of basket or spiral coils may be calculated with the formula* $L = 0{\cdot}85n^2D^3\alpha \times 10^{-3}\mu H$. *Values of* α *corresponding with values of the ratio* $\frac{d}{D}$ *are obtained from the curve above.*

Mounting Plug-in Coils.

There are several methods of mounting these coils. The aim should be to keep the two ends as far apart as possible, otherwise the capacity of the coil due to the ends may be unnecessarily increased. For uniformity, plug connectors generally have one socket, and one peg, for contacts. These should be secured in a good quality insulator, to prevent power loss.

Probably it is better, at least from the electrical point of view, to make the coil connections to contacts secured on opposite sides of the coil. As an illustration there is the Gimbal mounting, illustrated in Fig. 8.

The other accompanying figures show good methods of fastening the plugs to the coils. It is *not* recommended to strap the coil and plug together, using a strap which passes right round the coil circumference.

The Flat Spiral Coil.

A. This form of inductance is largely used in transmitters. A flat copper strip is wound to give a spaced coil as in Fig. 9. The coil illustrated is provided with a sliding contact for the purpose of varying the inductance included in a circuit.

B. The inductance may be calculated from a knowledge of the outside and inside diameters, the number of turns per cm. and the formula—

$$L = 0{\cdot}85 n^2 D^3 \alpha \times 10^{-3} \text{ microhenries.}$$

where n = the number of turns per cm.
D = the outside diameter.
α = a quantity depending upon the ratio of $\frac{\text{outside diameter } D}{\text{inside diameter } d}$ and is taken from the curve of Fig. 10.

The formula is best explained with an example.

Example.—A spiral has 38 turns; inside diameter 10·3 cms., outside diameter 40 cms. The spacing is 0·4 cms., then n = is $2\frac{1}{2}$ turns per cm. From the curve, for $\frac{d}{D} = \frac{10{\cdot}3}{40}$ we find $\alpha = 0{\cdot}96$.

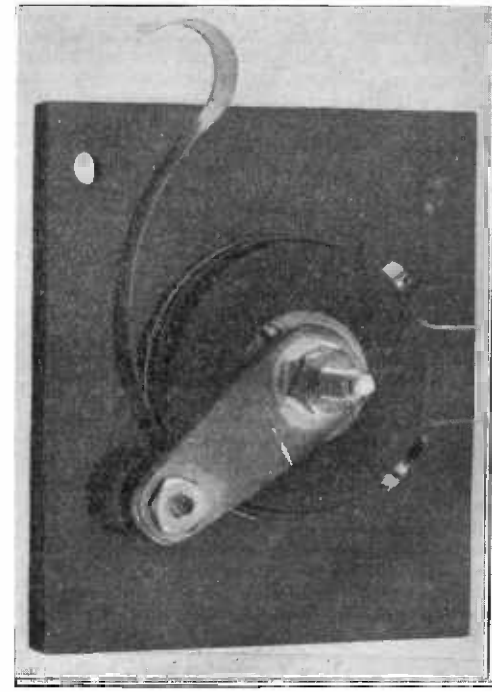
Then $L = 0{\cdot}85 \times 2{\cdot}5^2 \times 40^3 \times 0{\cdot}96 \times 10^{-3}$ μH
$= 327\ \mu H$.

The inductance of a basket coil may be found with this formula.

C. To secure the maximum inductance for a given length of copper strip, the ratio $\frac{\text{radial depth}}{\text{mean radius}}$ should be 0·75.

ANOTHER VARIABLE GRID LEAK.

Many attempts have been made to design a serviceable variable grid leak and particularly since the introduction of the Flewelling receiver. The variable leak shown in the accompanying photograph is built to the description given on page 550 of the *Wireless World* of July 28th last. It consists of a fibre strip mounted on an ebonite cylinder and coated with graphite pencilling on the outer face. A springy brass strip is pressed against the face of the fibre by a rotatable arm which short circuits a portion of the resistance. A necessity in building this useful component is to obtain close contact between the brass strip and the leak resistance. The roller which presses the surfaces of the brass strip and resistance together must revolve freely, or otherwise the brass may slightly loop up out of contact with the pencilling. This component should prove most useful in valve receiving apparatus, though a few practical modifications are perhaps needed to render the arrangement entirely reliable and constant in its adjustment. H. J. C.



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THE AMATEUR'S PART IN WIRELESS DEVELOPMENT.

AUTUMN SESSION PRESIDENTIAL ADDRESS TO THE RADIO SOCIETY OF GREAT BRITAIN.*

By W. H. ECCLES, F.R.S., D.Sc.

A YEAR ago our then President, Admiral Sir Henry Jackson, set up the custom of an autumn address on what might be called the politics of amateur wireless, and therefore, in accordance with custom, which we cannot yet call immemorial, I am going to address you this evening on the amateur and things of interest to the amateur, especially in the light of what is happening in the development of broadcasting in this country and other countries. An amateur, I take it, is a person who is fond of the subject for its own sake, and not for what he gets out of it. An amateur cultivates his subject, perhaps as a serious study, or perhaps as a pastime, but the subject is never his main business. Within the scope of this definition, especially as applied to wireless, there are all sorts of persons. On the one hand we find people who are not learned in the physical sciences, and on the other hand we find mathematicians, physicists, and electrical engineers, each very deeply versed in his own particular subject, and it is very strange, it seems to me, that to all these types wireless makes an irresistible appeal. Perhaps at first its attraction springs from the sense of mystery, the feeling of eeriness with which one picks up and listens to the sound of signals that have come thousands of miles from the great stations, or perhaps its attraction lies in the glow of achievement which follows an exploration into the regions beyond the perception of the unaided human senses. The first time the amateur listens in to any distant signals he must feel that he has entered a new world, a world of which the people around him are quite ignorant, and which could not be entered except by making the special preparations he may have been making for weeks before. In addition to these very unusual elements of fascination, wireless offers nearly all the other distractions, difficulties and delights that any other hobby ever did offer.

We may say that when following any study or hobby, any amateur in any subject is obeying an impulse towards making something; he is answering the call of the creative instinct. The boy who does fretwork, or the man who does ornamental turning, is employing simultaneously his mechanical and artistic gifts in the production of something useful or decorative; and the strictly mechanical devotee who makes elaborate working models of steam engines and other machines, as well as the man with electrical leanings who makes dynamos and model motors, is obeying the same instinct, the joy of making something. But these older forms of hobby have a great difference from the type of hobby that we follow, because when they make model engines they make mere copies of real things, which are usually extremely inefficient and incapable of practical application. I remember very well the first steam locomotive model that I made, and the great difficulty that it experienced in dragging its slow length along. These things are admittedly things to be put into glass cases for admiration and not for use. Therein is a great contrast with wireless. The apparatus of the wireless amateur is practical apparatus. It is as good as, and sometimes better than, the apparatus supplied by commercial firms, supplied, in fact, to ships employing commercial operators and doing commercial business, especially as regards receiving apparatus. As regards transmitting apparatus, the difference between the plant of the amateur and that of the professional is usually one of size merely, and not one of quality. The efficiency, in the strict quantitative sense, of the amateur's apparatus may in fact be greater than that of many a commercial station, and it is one of the problems of the large power wireless engineer to try to get big plants working as efficiently as the small plant of the amateur can work. In consequence of this difference between wireless as a hobby and any other hobby I have ever experienced, I can say that the wireless amateur tastes more completely than do any of the other scientific amateurs the joys of having accomplished something really usable in every sense of the word.

From the instant the wireless amateur first tunes up his receiving apparatus and listens in to all the world's telegraphic traffic crossing sea and land and the boundaries of different countries, he comes into close contact with the practical telegraphic world. This fact, taken together with the circumstance that he is using full scale apparatus, ensures that there is a perpetual flow of improvements and suggestions from the amateur fraternity into the practical world as regards wireless methods and apparatus. It seems probable that if we could estimate the minor improvements of apparatus and conveniences attached to modern commercial apparatus, it would be found that the contributions of the amateur would outweigh those of the commercial designer.

We may go further, and say that many of the great advances in wireless have been initiated by the amateur, and that most of the early steps in the inception of the subject were taken under the stimulus and guidance of men who were neither telegraphists nor engineers, but merely lovers of the infant science. Perhaps it is in the nature of a platitude to state that before wireless became commercial all the workers in it were amateurs; they were experimenting in ignorance of the vast commercial future before it, and were studying it without thought of gain. Sir Oliver Lodge's work with the short aerial, on waves a few metres long, using the fillings coherer with the tapper back, in 1894, constituted the first complete wireless receiving set ever assembled, and was certainly

* Delivered on September 26th, 1923.

done "for fun." It was an aside from his laborious scientific work in the laboratory and in the study; in fact, he probably set it up to amuse people, and it is rather a curious reflection that this early piece of apparatus is regarded, and must be regarded, as more important in the practical world than those studies which Sir Oliver Lodge preferred to follow at that date. One may say also that until about 1897 Marconi was an amateur making experiments with Hertzian waves, as were a great many people in the various physical laboratories and lecture rooms throughout the world, and Rutherford's open-air experiments with his own magnetic detector in 1896, when he received signals across Cambridge, a distance of a mile and a half, were done without thought of pecuniary recompense. On that occasion we may say that, as Rutherford stayed only about two months with wireless, we had too little Rutherford.

Later, Duddell, whilst still a student, discovered the singing arc, which, in the hands of Poulsen and other practical engineers, has become one of the most important elements in high power wireless telegraphy. At a later date, when wireless was in full swing as an industry, the work of innumerable amateurs brought forth a great miscellany of detectors. The various contact detectors ranged from Walter's tantalum mercury instrument, in which a fine wire of tantalum dipped into a cup of mercury, to Pickard's perikon detector, with its crystals in contact, through all sorts of combinations of crystals and other things, metals and liquids, which were tried in every country in the world by a legion of amateurs. It was the amateur who brought forward the crystal detector, who found out the best combinations, who introduced it into our subject. It was some time after this work by the amateur that the crystal detector came gradually into practical commercial telegraphy.

Dr. W. H. Eccles, F.R.S.

Again, it is notable that the earliest frame aerials were employed for directive reception by amateurs, especially in America and Germany. It was some years after these early trials by the American amateurs that the frame aerial was introduced into practical work. Again, in 1913, a young American student, E. H. Armstrong, working with wireless circuits because he loved them, produced the first auto-heterodyne receiver using the audion, and staggered all the professionals and commercial experts of the world by demonstrating in New York the reception of transatlantic signals, inaudible otherwise. Finally, when the war came, the amateurs penetrated in their hosts into the armies, and turned their wireless experience and their talents to the design, construction, operation and improvement of apparatus for use in war. Of the countless gadgets invented by the transformed amateurs a great many survive to this day, and may be seen by the observant eye in much of the apparatus now manufactured in various countries. It is very interesting to note that a great many of the different ways of winding inductance coils now practised are due to the experimenter; and it is well to notice, in passing, that the numerous elegant and simple methods of calculating inductances by means of abacs have emanated from the amateur world under the stimulus of the desire for accurate scientific design. These and numerous other small improvements all contribute to the general advance in the technique of wireless construction and operation.

The above survey of the influence of the amateur on wireless progress encourages one to declare that if wireless investigation, invention and design had been confined strictly to commercial firms, the development of wireless would have been slower, and the subject would have been in a position less advanced than it is to-day. For one thing, the people permanently engaged in the industry are few in number compared with the amateurs, and therefore they could not have thought of so many things to try nor have made so many trials. Again, it is a tenet of some commercial firms to resist improvements in standardised apparatus until as much business as possible has been done with the standardised apparatus, or until some other firm threatens their position. This is always, in all industries, a well-known clog on the progress that the employees could make if they were unhampered.

It is inevitable that the prominently successful amateur should often be drawn into the wireless industry in a professional or commercial capacity when that industry expands. That happens in every walk of life—literature, music, art, and connoisseurship, sports and games—and therefore, why not in science? That this is so does not detract from the beneficent influence that amateurship has exerted and still exerts in every branch of human activity. And that not only the prominent personages whom I have mentioned, but also many

of those who make minor improvements, tend to cross the boundary and become technicians. This is also of great advantage to the community, for it is in my opinion certain that no new technique, no novel industry, can possibly develop rapidly unless this transmutation takes place freely. We have seen this happen during the war, and again, quite recently, during the rise of broadcasting to popularity.

This recalls the fact that broadcasting as it is to-day is indebted to the amateur for its existence. In America the broadcasting movement was started by amateurs and their clubs and societies giving gramophone concerts and other entertainments to their fellow amateurs. In this country a similar movement took place, but was limited to smaller dimensions by the restrictions which were an aftermath of the war. It will be remembered that during the greater part of the year 1921 this Society was occupied with negotiations which extended into the various Government Departments using wireless, in the endeavour to obtain official sanction for the broadcasting of music and speech for half an hour on one evening a week, with an output of ¼-kilowatt. This year of struggle culminated in the Wireless Society of London and its Affiliated Societies presenting to the Postmaster-General a formal petition on the subject, and, as a result, the small station at Writtle was permitted to start a limited programme. A few months later, broadcasting on a large scale was proposed by the commercial companies, and sympathetically considered by the Postmaster-General. It is not unreasonable, however, for the amateurs to claim that their previous presentation of the case smoothed the way for the inauguration of the British Broadcasting Company and its large scheme of eight powerful stations.

The incidence of broadcasting on the amateur world compels us to stop and take thought for the morrow. From what I have already said, we shall have to adopt as the policy of this Society the cry of "Freedom for experiment," for the patriotic reasons I have stated. To pass from the general to the particular, the change of the amateur position can be reviewed better this year than last, because now we have the experience of nearly a whole season's working, and can make some definite statement about the reactions which the broadcasting industry is sure to make on the amateur field. There are, of course, advantages and disadvantages. The advantages of broadcasting to amateurs include these: he can now test apparatus by listening-in to the broadcasting stations for long periods of each day, and can trust to their reliable wavelengths in a way that helps him in his calibrations very considerably; he can test telephones and other apparatus of that kind involving speech currents, because he can rely on the high quality of the articulation which is present in the broadcasting waves, if they are properly received; and he can conclude quite safely that if speech or music is mangled by a piece of new apparatus it is his own fault, or perhaps I should say the fault of his apparatus. Leaving out the æsthetic benefits which the amateur or any other listener receives from broadcasted matter, there are other advantages, social advantages, which I think we ought to admit. I think it is not an exaggeration to say that many a father who studied morse in a laboratory has brought his apparatus down into the drawing-room, and is in a sense restored to the bosom of his family. (Laughter.) We may say that broadcasting has brought harmony into the home in more senses than one, and that many an errant spouse has been restored to the wireless widow, of whom we heard so much some years ago. Then there are many other advantages, either social or national. There is, for instance, the fact that listeners who buy apparatus because they wish to hear concerts become lovers of their apparatus, become amateurs. The story of the motor cycle and the motor car is being repeated. I think most young men who bought motor cycles did not rest satisfied with riding them, but usually spent a little time, either willingly or unwillingly, taking them to pieces. In that way many a person who did not intend it became an accomplished motor mechanician. These are the advantages.

There are also disadvantages disclosed by the last season's working of the broadcasting stations, and I think I may quote from a letter which is typical of other letters that our Secretary receives, showing some of these disadvantages rather strongly. For instance, this letter says that the experimental-licence holder is now faced with the following problems. First, he can work only after broadcasting hours; next, he has a fixed wavelength to transmit on only; next, his letter says that the experimental transmitter has to carry out experiments during the hours when other people are sleeping; next, he is open to be shot at by any possessor of a crystal set who tunes on to him by accident instead of tuning on to the broadcasting station; and next, he gets the full disadvantage of the spark transmission at 450 metres from ships, etc., which is entirely stopped during broadcasting hours, and, as a result, when the time for work comes, this spark sending starts with terrific volume, and spoils at least a portion of the time the experimental-licence holder can devote to the work.

There are many other grievances. There is the one that Sunday also is barred to the amateur transmitter, and that therefore the only day on which the real amateur, who has to work on other things during the week, can use his apparatus is thus taken away from him. Still another disadvantage, which one experiences when close up to broadcasting stations, is that receiving sets intended for other work than listening to concerts become jammed; and, in fact, if you are near enough to a broadcasting station and are endeavouring to do laboratory experiments, you may find that near the wavelength of the station the calibration of a piece of apparatus for scientific purposes is almost impossible.

There is another side to this picture, which is the fact that the unskilled and inconsiderate experimenter often spoils the sport of those people around him who are anxious to listen to the concerts. The only thing one can say about that is that in wireless, as in all things, the injunction should be followed that "thou shalt love thy neighbour as thyself." This Society is doing all it can to help the authorities in curbing the inconsiderate and unreasonable experimenter.

The question which we have to face is "Will these disadvantages increase or diminish in the

future ? " If we try and see what the future contains, by looking at America, France, Germany, the Argentine and other countries where broadcasting is in operation, we find that, sometimes in one country, and sometimes in another, there are commercial exchange prices being broadcasted, Stock quotations, in some cases sporting and general news and racing results, and in other cases political orations in addition to entertainments. If broadcasting develops in this country from the entertainment or instructional side which it exhibits at the present time, and takes up all these items, it is quite possible that it will become as necessary to the community as the Press. If that is so, it may become even more influential than the Press, because hearing is very much easier to most people than reading, and because the voice carries personality. I have spoken to people in the United States who have listened to some of their great political orators over the broadcast, some of whom have had good voices and some of whom have had bad voices, and it is the fact that those with good voices made many converts and provoked much admiration, whilst those with bad voices had better have staved away, for the sake of their political reputation. It seems that it is not so much what you say, but how you say it, that counts in politics; and for that reason wireless broadcasting will exert quite a different influence from what the Press does, if it is carried so far as to enable the politicians to harangue us in our own homes. It may come, therefore—it probably will come—that every large city and town will possess its own broadcasting station ; it may have it in the town hall, and may rent it with the hall, and candidates and Members of Parliament could take it in their turns and all their speeches would be broadcasted ; and, for that matter, municipal elections may come to be conducted in the same way.

The idea that every large city and town may have its own broadcasting station some day is not so fantastic as would have been the suggestion in Caxton's days that some time or other every large city would have one printing press in it ; and it is not so fantastic, by any means, as would have been the suggestion that at some day to come every person in a country, or nearly every person, would be able to read the printed word. Therefore we have to contemplate—we, as amateurs—this possible expansion, and to think how we shall fare under it. If it is to come it will come quickly, because ten years of technical progress nowadays is really more than a century in Caxton's time. In future, too, the kind of programme may be very different, and the kind of programme will have a considerable effect upon relations between broadcasting as an industry or as part of social life, and the amateur. Up to the present the Broadcasting Company has maintained a very high standard, and has broadcast the highest class of music and very interesting and instructive literature. Perhaps the only interesting and instructive literature not yet broadcasted is the Report of the Broadcasting Committee. The items are greatly appreciated by the present clientèle, but the future clientèle may be very different. It may be more numerous ; if it is more numerous it will be more humble on the average. A foretaste of the kind of comment that will come when things too good for average life are put on the broadcast was given us the other day, when the British Association Presidential address was sent forth all over the country. According to some of the newspapers, the complaint in nearly every home was that there was too much Rutherford ; but it is a fact, and we must admit it, that you cannot run a daily paper on choice extracts from the poets and essayists. Bach and Beethoven will not suit everybody. In fact, I can imagine that, rather than hear Bach and Beethoven, many people will prefer constant repetitions, with strong affirmation, of the fact that we have no bananas. King Demos may become less and less sympathetic with the experimenter the more and more broadcasting becomes like a popular daily paper, and it may be that in a few years we may find that the majority of users of the broadcast will be, we will say, something like that famous verse-maker of about half a century ago, who said, if I may modify it a little—

" Let laws and learning, art and science die,
But give us jokes and jazz and lullaby."

But the immediate future is more interesting than the remote future of ten years hence and the prime interest we have is wrapped up with the Broadcasting Committee's Report. I had hoped that by this evening that Report would have been published and that I could have spoken freely about it—in support of it. It has been half published, and you will have seen that there are three main principles which have been suggested in it and which have been discussed pretty freely by all the newspapers. The first main principle is, perhaps, that the licence fees collected from the listeners must pay for everything—for administration and for the concerts. The second principle, which has been disclosed already in the newspapers, is that the licence fee must be adjusted to support the authorities giving the broadcast services. And the third main principle which has been discussed in the papers is that there should be one licence for receiving apparatus of all kinds, and it has been suggested that it shall be ten shillings per annum. Now, I am not in a position to say that these are accurate forecasts or inaccurate, and besides that, we do not know that any of these will be adopted by the Postmaster-General, who is responsible, but I should like to say that if we assume that one licence has been recommended, and that the Postmaster-General accepts that recommendation, it is not fair for some amateurs to object, as they do, to the payment of the ten shillings. I have heard it stated by some vehement amateurs that it is wrong that they should be called upon to pay anything towards the authority that does the broadcasting when, in fact, they do not receive anything, being interested in quite different affairs ; but I should like to point out to them that in the first place broadcast transmissions are useful for experiment. In the second place, an occasional concert will not do an amateur any harm ; and in the third place 2½d. a week is worth paying for the sake of peace and for the good of the cause in general. I hope that the suggestion, if the Postmaster-General adopts it, of a ten shilling licence fee per annum, will not cause any real trouble in amateur ranks.

There have been various newspaper forecasts of the Report, and I saw one in the *Times* Engineering

Supplement for August 25th, which foreshadowed provisions for the multiplication of stations working as relays, so that it does seem imminent that more stations will be erected and more wavelengths will have to be allotted to these stations, and the question will arise before very long, what will become of the amateur transmitter; will he become extinct? I think it will depend on the record he can show of the services rendered, directly or indirectly, but probably indirectly, to the whole community; and it will depend also upon the influence he can bring to bear on public opinion. At present his numbers are very small compared with the estimates of the numbers of those who listen in. He is in the proportion, perhaps, of only 1 in 2,000, and in a democratic country noses must be counted, and an insignificant number may come to be ignored, even though they may be the salt of the earth. Now, it cannot be for the good of wireless in general that non-commercial wireless experimenters should be barred from the study of any branch whatever of wireless. Therefore I think it is the duty of all amateurs—it ought to be part of the whole amateur movement—to work together so as to get a fair hearing when the freedom of experiment is endangered in any section whatever. If we take things on that basis, if we suppose that the whole of the amateurs will stand by their brothers who happen to be in the section that is threatened at any particular juncture, then we can say that we have a much greater claim for consideration than if the transmitters try to act alone. The ratio of amateurs to broadcast listeners is probably something like 1 in 5. It may increase if, as I have suggested, men with broadcasting sets become interested in their apparatus, but that is a substantial minority. We live, too, not in a hard and fast democracy where the only way of settling the question is by the counting of votes, but we live in what one might call a mitigated democracy where the rights of minorities are studied and protected by statesmen and administrators, and where great weight is given to minority views if they are shown to be important to the progress of the nation. This has happened in the past in other things than wireless, and it has happened now and again in wireless. The Post Office have always listened sympathetically to every case made out before them, even when that case affected only a small minority of the users of wireless, and have taken into account every consideration put before them.

Probably the most immediate problem that the amateurs have to think about is the allocation of the wave bands. The increase in the number of broadcasting stations will demand that an increased wave band shall be set aside for broadcasting. It follows that there will be less space left in the spectrum for the amateur, and we, as amateurs, ought to take on the whole problem of preparing a case to be put before the authorities, whenever they require to hear us, in order that we may set forth our views and put them in proper form for exerting due weight. It is conceivable that in default of some such preparation on the part of the amateur fraternity, the allocation of wavelengths to them for their use in transmission experiments may be too narrow or even nil. This, I think, will be very harmful to the study of every section of wireless, but especially to the study of transmitting apparatus, and therefore ultimately to the industry.

In what I said earlier I pointed out that wireless telegraphy was originated by amateurs who were neither engineers nor telegraphists, and that wireless development since then has owed as much at least to the amateur experimenter as to the trained technician. But it is not alone on these rather obvious grounds that I would base the argument that the pursuit of wireless as a hobby and a study is a national weal, for there are two important national aspects not yet alluded to which must not be forgotten. There is, firstly, the direct educational benefit to the individual, of which no more need be said than that wireless, I think, is the best gateway to many branches of physical science, for it touches upon some of the more advanced regions of electricity and magnetism, upon acoustics and radiation, and it teaches skill in the manipulation of a great variety of apparatus as well as in a special technique. The second and less obvious national advantage arises from the fact that the cultivation of any branch of learning, artistic or scientific, and the universal practice of any technique as a hobby, has a profound influence upon the development of the corresponding industry. Manufacture is stimulated, improvements in existing methods are introduced, new inventions are made and industries are established to exploit them. Moreover, the presence of a large amateur wireless section in a population ensures that that community will be receptive to new ideas in wireless and produces an environment in which the highest form of technician can flourish. As a consequence, men of special ability are afforded adequate scope, and genius is discovered and given its opportunity. When it is remembered that one inventor or genius, like James Watt, may be worth untold millions to the world, we feel the importance of encouraging to the utmost the spread of the amateur spirit in wireless as in other branches of our modern electrical civilisation.

Radio Society of Great Britain.

The next informal meeting of the Society will be held at 6 p.m. on Wednesday, October 17th, at the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, W.C.2. A discussion on "Short-Wave Reception" will be opened by Mr. Philip R. Coursey, B.Sc. (Smoking permitted).

The October Ordinary General Meeting of the Society will be held at 6 p.m. on Wednesday, October 24th, at the Institution of Electrical Engineers. A lecture, illustrated by lantern slides, will be delivered by Mr. Thomas, M.Sc. (of the National Physical Laboratory), on the subject of "Distortion in Radio Telephony."

R.S.G.B. at the Exhibition.

By the courtesy of the organisers of the All-British Wireless Exhibition, to be held at the White City, Shepherd's Bush, on November 8th to 21st, the Radio Society of Great Britain has had a stand placed at its disposal which will be furnished by the Society for the use of its members and those of affiliated societies.

THE BROADCASTING REPORT.

Summary of Conclusions and Recommendations.

Below we extract from the Report of the Broadcasting Committee the Summary of Conclusions and Recommendations. Each subject is of course dealt with at greater length in the body of the Report, which can be purchased for 9d. through any bookseller by those readers who wish to study the full text.

Future of Broadcasting.

(1) That broadcasting is of great value for purposes of instruction and entertainment, with great potentialities, and that it will be in the public interest to encourage its development, under adequate control, and to facilitate its use for a wide variety of services.

Existing Scheme.

(2) That the existing scheme was based on an arrangement between the manufacturing industry and the Government, under which the manufacturers were to undertake to provide and maintain a satisfactory broadcasting service, financed partly out of tariff payments on manufactured apparatus, and partly out of licence fees to be paid by listeners and collected by the Post Office: in return for the liabilities thus undertaken it was to be a condition of the licence that apparatus of foreign origin (with certain exceptions) should not be available for use under the scheme—this to be ensured by the use of apparatus marked "B.B.C."

(3) That the scheme was successful in securing the establishment of a broadcasting service of considerable merit—which, having regard to the many difficulties they have had to contend with, reflects great credit on the enterprise and ability of the British Broadcasting Company—and partly successful in ensuring that the demand for receiving sets during the initial period should mainly benefit British manufacturers who had established the service.

(4) That the scheme has broken down in certain respects, largely owing to the unforeseen facility, cheapness and popularity of the construction of home-made sets.

(5) That the consequent difficulties cannot be overcome by any system of marking component parts either "B.B.C." or "British Manufacture."

(6) That the system of marking apparatus and deriving revenue for the broadcasting service from royalties on such apparatus gave the Company a privileged position; we have had no proof that they have made any improper use of it; but the system is open to objection from several points of view, and should be abandoned as soon as possible.

Recommended Scheme.

Controlling Authority.

(7) That a Broadcasting Board should be established by statute to assist the Postmaster-General in the administration of broadcasting and to advise him on important questions concerning the service.

Operating Authorities.

(8) That the broadcasting service should not be operated by a Government Department, but that those entrusted with the service should work under Government licence.

(9) That it is desirable that the operation of the existing service by the British Broadcasting Company should be continued for a definite period, subject to agreed modifications in the Company's licence, but that, subject to existing rights, the Government should keep its hands free to grant additional licences, and should consider various alternatives for the operation in the future, either by the Company or by other authorities, of local or relay stations in addition to large stations.

Financial Provisions.

(10) That no part of the cost of broadcasting should fall on the taxpayer, but that the Government should not endeavour to make a profit on the administration of the service.

(11) That the bulk of the revenue required for the service should be obtained from the receiving licence fee, which should be retained at 10s. a year, subject to consideration of a reduction in the event of more revenue being received than is sufficient to carry on an adequate service.

(12) That instead of 5s., as much as 7s. 6d. out of the 10s. fee might be allocated under any new scheme to meet the cost of broadcasting, subject to a sliding scale under which the payment per licence would decrease as the number of licences increased.

(13) That certain supplementary sources of revenue should be the subject of early consideration.

Conditions of Receiving Licences.

(14) That in place of the present broadcast and experimental receiving licences a uniform and simple type of licence be issued and placed on sale at Post Offices without any formalities, containing a clause forbidding improper use of back-coupling, on pain of withdrawal of the licence, but no other limitation on the apparatus allowed to be used.

(15) That effective measures be taken to enforce such a licence, and that certain additional statutory powers be obtained to strengthen the Postmaster-General's hands.

Application of Recommended Scheme.

(16) That the immediate application of the recommended scheme is most desirable.

(17) That in consideration of the recommended modifications in the existing Agreement, the British Broadcasting Company should be given an increased share of the receiving licence fees and a two years' extension of their own licence, on modified terms, if they will agree to the immediate application of the scheme, and to certain alterations in their Articles of Association, but with retention of the limitation of dividends.

(18) That the Committee is unable to make any recommendation on the desire which has been

expressed for the protection of the manufacturing industry against foreign competition, feeling that, although it was an object of the existing scheme, it must be left to be dealt with by Parliament as part of the fiscal policy of the country.

Wavelengths and Hours.

(19) That arrangements be made for the greatest possible extension of the existing broadcast band of wavelengths (350 to 425 metres), preferably by the allocation of a band from 300 to 500, excluding 440 to 460 metres.

(20) That all possible steps be taken to protect the band allocated to broadcasting from interference by other services.

(21) That the present restriction of the hours of broadcasting be removed, thus enabling additional facilities to be provided.

Programmes.

(22) That the British Broadcasting Company have achieved a large measure of success in gauging the public taste and providing satisfactory programmes.

(23) That there should be a gradual extension of the broadcasting of news, under proper safeguards, and that more latitude should be given for the broadcasting of special events without regard to the hour.

(24) That the Postmaster-General should remain the final arbiter when any question is raised as to what kind of matter may or may not be broadcast.

Simultaneously with the issue of the Broadcasting Committee's Report, the Postmaster-General announced the terms of the New Regulations based on the Committee's Recommendations in the following statement :—

IN giving instructions for the issue of the Report of the Broadcasting Committee, the Postmaster-General desires to express publicly —as he has already done privately—his warmest thanks to the Committee for the great care which they have given to the consideration of the novel and difficult questions referred to them by his predecessor.

The Report makes the following main recommendations :—

That a Broadcasting Board should be established by Statute.

That the Broadcasting service should not be operated by a Government department, and that the existing service of the British Broadcasting Company should be continued and extended for two years upon modified terms.

That *one* form of licence at a fee of 10s. a year (of which the Broadcasting Company should receive 7s. 6d. and the Government 2s. 6d.) should be issued and placed on sale at Post Offices.

That no protection should be given to the British manufacturers by the licence.

Sir Laming Worthington-Evans finds that it is not possible for the scheme recommended by the Committee to be brought fully into operation immediately. As the Committee themselves point out, it has been necessary to have regard to the existing agreement with the British Broadcasting Company, which does not expire until December 31st, 1924. Under this agreement, and in accordance with the statements made in the House of Commons at the time, the Manufacturers are entitled to protection, and no licences were intended to be granted to any persons not using sets marked "B.B.C." and manufactured by members of the Company.

The immediate cause of the appointment of the Committee was the deadlock which had arisen between the Post Office and the Company in regard to the proposed introduction of another form of licence, viz., a "Constructor's Licence," to persons who make their own sets or assemble them from ready-made parts, but who do not desire to carry on experiments. These receiving sets were being used contrary to the terms of the agreement. Large numbers of such persons had applied to the Post Office for licences, and probably many others, realising that no licence was in existence appropriate to their case, have been using their apparatus without making application.

The continuance of the present situation would be bad for all parties; the Broadcasting Company because it is losing a revenue upon which it has counted, and the Post Office because, as the Department entrusted with the administration of the law regarding the licensing of wireless apparatus, it is unable to enforce the contemplated restriction.

In these circumstances a compromise has had to be sought. In order to recognise the Company's rights under its agreement and at the same time to meet the views of the Committee as far as immediately practicable, the Postmaster-General has agreed with the Broadcasting Company that a Constructor's Licence should be issued for a limited period at an annual fee of 15s. (as compared with the fee of 10s. charged for the B.B.C. licence). The additional 5s. for the constructor's licence is justified because otherwise the constructors would be obtaining the benefit of the Broadcasting Company's programme without making a proportionate contribution to the expense.

The Company have agreed to this arrangement on condition that the licensee gives an undertaking that, in constructing his apparatus, he will not knowingly use parts manufactured elsewhere than in Great Britain or Northern Ireland. In all the circumstances, and especially having regard to the unemployment which at present exists, and which would be accentuated by the importation on any considerable scale of wireless receiving apparatus from abroad, the Postmaster-General has accepted this condition.

There are, however, probably 200,000 persons already in possession of unlicensed receiving apparatus, and as the Committee point out, these persons are paying nothing towards the cost of the programmes because in the past there has been no licence applicable to them. A special interim licence will be issued at a fee of 15s., covering their present apparatus, whether made or purchased

and wherever made or purchased, which will be granted to them provided that they apply for licences before October 15th. No charge will be made for past use and no proceedings will be taken in respect of past use if the licence is taken out before October 15th.

Constructor's and Interim Licences as above will be placed on sale at all Head and Branch Post Offices and certain sub-offices on and from October 4th. Applicants for such licences, as well as for the existing B.B.C. licence, will be required to fill up and sign a simple form. Copies of these application forms may be obtained not only at head and branch offices, but at all sub-offices at which money orders are issued.

This system of licensing will be continued for an interim period expiring on December 31st, 1924, after which it will be possible for the single form of licence recommended by the Committee to be introduced, without any condition as to the marking or origin of the licensed apparatus, if it should be then thought desirable.

Out of the fees of 15s. for the Constructor's Licence and 10s. for the B.B.C. licences, the Company will, if the House of Commons agrees, receive 12s. 6d. and 7s. 6d. respectively, instead of 5s. per licence which they receive under the existing scheme.

The Postmaster-General is not satisfied that, even with the increased contribution from licence fees, the revenue of the Company will, for some time to come, be sufficient to provide adequate programmes without a substantial contribution in the form of royalties on the sale of sets by the manufacturers who form the Company. Hence he has stipulated for the continued payment of such a contribution, but on a reduced scale. The reduction will be approximately 50 per cent., except in the case of crystal receiving sets, where it will be considerably more. This reduction should enable a cut to be made in the cost of receiving sets. The proportion of the licence fees receivable by the Company will, after December 31st, 1924, be placed on a sliding scale based on the number of licences on the one hand, and the cost of maintaining an adequate broadcasting service on the other hand. Any surplus profit accruing to the Company over and above 7½ per cent. on its capital and a necessary reserve for depreciation, etc., of plant and machinery will be surrendered to the Post Office; in other words the profits of the Company are limited to 7½ per cent. upon its capital.

The existing experimental licence, at an annual fee of 10s., will continue to be issued from the General Post Office to persons who are able to satisfy the Postmaster-General that they desire the licence for bona fide experimental purposes and are qualified to conduct experiments, and who sign a declaration to the effect that they will not use the broadcast programmes except for experimental purposes.

Each new licence (as distinct from renewed licences) will cover a period of twelve months from the first day of the month of issue. Renewed licences will cover twelve months exactly from the date of expiration of the old licence.

The basis of membership of the Broadcasting Company will be extended so as to include dealers, with suitable representation on the Board of Directors for the new membership if it becomes at all substantial; and the deposit of £50 now required from members will be abolished. The licence held by the Company will be prolonged, on suitable conditions, to the end of 1926, as recommended by the Committee.

If the Company supply a satisfactory service and are willing to erect additional stations where the Postmaster-General may consider them necessary, he will not license any other broadcasting service during the interim period up to December 31st, 1924.

After that date, if the Postmaster-General should consider it desirable that additional stations should be established in any town or district where the Company's service is not adequate, and if the Company are not prepared to provide such stations, the Postmaster-General reserves the right not only to license other organisations to do so, but also to give them an appropriate share of the revenue arising from new receiving licences in the district in question. He also reserves the right to license other services (without regard to geographical area) without withdrawing from the Company any part of the licence fees to which they may be entitled. In either case, he reserves the right to allot suitable wavelengths to the new organisation, while taking all reasonable steps to avoid creating interference with the Company's services.

The Postmaster-General proposes at an early date to appoint an Advisory Board, as recommended by the Committee, to assist him in all important questions relating to broadcasting. He has noted with pleasure the Committee's commendation of the present broadcasting service; and he trusts that the service will give increasing satisfaction under the new conditions, and that a great impetus will be given to the sale of British-made receiving apparatus.

In the enforcement of the new scheme of licensing, much will depend upon the willing co-operation of the public. So long as there has been no licence to fit the case of the many thousands of "listeners" who are using home-made apparatus, it would have been unreasonable for the Post Office to attempt to enforce the law with any strictness; but now that such a licence is available, there will no longer be any excuse for the use of receiving apparatus without a licence. The Postmaster-General believes, however, that the "listening" public will require no pressure in this respect. He is confident that they will be not only willing, but anxious, to put themselves right as regards the law, and at the same time to contribute their quota towards the cost of a service which is affording them so much enjoyment.

Copies of the Broadcasting Committee's Report may be purchased through any bookseller or directly from H.M. Stationery Office at the following addresses:—Imperial House, Kingsway, London, W.C.2., and 28, Abingdon Street, London, S.W.1.; York Street, Manchester; 1, St. Andrew's Crescent, Cardiff; and 120, George Street, Edinburgh. Its price is 9d., or, if ordered by post, 1d. extra for postage.

General Post Office. *October*, 1923.

Wireless Club Reports.

North Middlesex Wireless Club.*

As it is the endeavour of the Committee to cater for all members, both novices and experienced wireless amateurs, on September 19th a demonstration was provided, in contrast to the rather technical paper which was read at the previous meeting. The demonstration took the form of a comparison of the results obtained from the use of various circuits, and of different kinds of loud speakers, items from the various broadcasting stations serving to illustrate the points of the lecturer, Mr. J. H. Forbes.

The receiving apparatus—which was kindly loaned for the occasion by Mr. Pulford—was the product of a well-known manufacturer of radio appliances, and very good results were obtained.

There was one unexpected diversion. While Mr. Forbes was "searching" for a French broadcasting station, suddenly a voice came from the loud speaker in a tongue which the linguists among the audience declared to be French, and the audience were just congratulating themselves upon the excellence of the reception when the voice ceased, and the well-known tones of **2 LO** announced "That was Monsieur ——— speaking from the London station." As the set was then tuned for something like 2,000 metres, this amusing incident was an excellent illustration of the lecturer's point that amateurs would be well advised to gain experience with the more selective circuits.

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

Tottenham Wireless Society.*

A recent demonstration night of the Tottenham Wireless Society was occupied by a brief exposition of reflex circuits by Mr. J. Kaine-Fish, who by means of a single valve reflex circuit and loud speaker, comfortably filled a large room with sound.

Other members then came forward, and using the Club's apparatus, fitted up reflex circuits of their own design.

Hon. Sec., S. J. Glyde, 137, Winchelsea Road, Bruce Grove, Tottenham, N.17.

Finchley and District Wireless Society.*

The Society met at Squire's Lane Schools on September 24th, when an interesting discussion took place on "Tuning Coils" and the efficiency of different types.

Messrs. Tanner and Read were elected to the membership of the Committee.

New members are still needed, and application for particulars will be welcomed by the Hon. Sec., A. E. Field, 28, Holmwood Gardens, Finchley, N.3.

The Radio Society of Highgate.*

An interesting lecture was given on September 14th by Mr. J. L. Jeffree, entitled "Freak Circuits." The lecturer explained the action of the Reinartz circuit, the Lee de Forest circuit, the Cockaday four-circuit arrangement, the Round Reflex circuit, and finally the S.T.100 circuit.

This was followed by a short lecture by Mr. C. H. P. Nutter, entitled "Hints and Tips." Mr Nutter dealt with drilling ebonite, lacquering brass, soldering, etc., and gave much helpful advice.

On September 21st, Mr. G. A. V. Sowter gave a lecture on "a portable receiver." This receiver was entirely self-contained, and was built into a small attaché case. Several different circuits could be used, and the arrangement of the connections was most ingenious. The wiring and mechanical details were of a very high order. Dull-emitter valves were used, and gave very good results. The receiver was connected to the Society's aerial, and **2 LO** was received very loudly and clearly, using a crystal detector only.

Full particulars as to membership of the Society may be obtained from the Hon. Sec., J. F. Stanley, B.Sc., A.C.G.I., 49, Cholmeley Park, Highgate, N.6.

Kensington Radio Society.*

At the monthly meeting on September 13th, at 8.30 p.m., the President, Mr. J. H. Reeves, who has been elected Group Representative on the enlarged Committee of the R.S.G.B., gave an outline of the position to-day, and members present joined in the general discussion on this subject.

Members' views relating to the wellbeing of the local Society were also put forward. It was agreed to hold an informal club meeting on the second or third Thursday of each month, full particulars of which will be given at the next club meeting in October.

Several members then gave their experiences in the management of rejector circuits as applied to the B.B.C. telephony stations.

Full particulars concerning membership of the Society can be obtained from the Hon. Sec., J. Murchie, 33, Elm Bank Gardens, Barnes.

Harrow Radio Society.*

At a meeting held on September 19th, the membership was increased to over 50. Mr. E. S. Firth (**2 ID**), the President, sketched out the prospects and programmes for the winter, and asked for the support of all amateurs in the locality.

On Saturday, September 22nd, 25 members visited the General Electric Co.'s research laboratories at Wembley, and were initiated into the making and testing of lamps, valves and other of this Company's products.

Hon. Sec., H. J. Powditch, 93, Pinner Road, Harrow.

South Shields and District Radio Club.*

A very enjoyable evening was spent by the members of this Club, when a visit was recently paid to the North Eastern Wireless Schools.

During the course of the evening the Telefunken and Marconi (1½ kw.) transmitting sets were very clearly and concisely explained. A Poulsen Arc set, together with a R.A.F. two-valve transmitter,

were also examined, and the able way in which the various sets were dealt with was much appreciated by those present.

A buzzer class is held every Friday evening, commencing at 7.30.

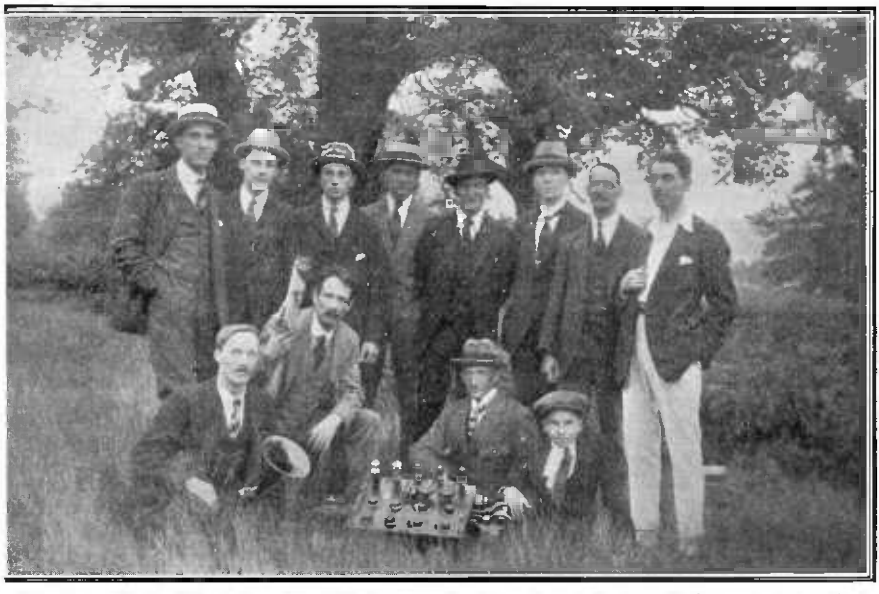
Hon. Sec., W. Smith, High Dock House, South Shields.

The West London Wireless and Experimental Association.*

The Association commenced its new session on Tuesday, September 25th, with a good attendance of members, who listened with pleasure to an interesting paper given by Mr. Wm. Casson, entitled, "The Theory of Relativity and the Ether."

Meetings are held every Tuesday evening at Headquarters, The Acton and Chiswick Polytechnic, Bath Road, from 7 to 9.30 p.m., and the Hon. Sec. will have much pleasure in supplying information regarding membership of the Association.

Hon. Sec., Horace W. Cotton, 19, Bushey Road, Hayes, Middlesex.



Members of the West London Wireless and Experimental Association photographed on a recent field day.

Barnet and District Radio Society.

There was a record attendance on Wednesday evening, September 19th, when the Club's three-valve set was partially dismantled and Mr. C. E. Green (who, with Mr. J. Finch and his son, carried out the construction of the set) thoroughly explained each of the five units. Blue prints of the set were circulated among the members, who had no difficulty in following Mr. Green's lucid demonstration. Afterwards the set was re-assembled, and satisfactorily passed its tests.

A three-valve "Armstrong Super," exhibited by Mr. W. Watson Baker, the son of the Society's President, greatly interested the members. It was tested on a frame aerial, but, owing to the bad screening effect of the galvanised iron on the roof and walls of the club-room, combined with the extreme sensitiveness of the circuit, it was a matter of great difficulty to secure signals of a high degree of purity.

Hon. Sec., J. Nokes, "Sunnyside," Stapylton Road, Barnet.

The Dulwich and District Wireless and Experimental Association.

"Ebonite" was the subject of an instructive paper delivered by Mr. Harrie King on September 17th. The remarks of the lecturer were much appreciated, and much useful knowledge of this necessary radio accessory was gained by those present.

At the conclusion of the paper, a general discussion arose on the various insulating mediums.

Wireless enthusiasts in Dulwich are warmly invited to apply for particulars of membership, which will be readily furnished by the Hon. Sec., L. Pilbean, 499, Lordship Lane, S.E.22.

Honor Oak Park Radio Society.

Messrs. Pollard and Lane, on September 19th, gave an interesting talk on simple valve circuits, demonstrating a specially constructed two-valve set.

The funds of the Society have been augmented by a handsome donation from the President, Mr. E. A. Graham.

New members are cordially invited, and full particulars of the Society can be obtained from the Hon. Sec., G. J. Price, 22, Honor Oak Park, Forest Hill, S.E.23.

Notes and News

R.S.G.B.'s Prize Scheme for Amateurs.

The Radio Society of Great Britain proposes to hold an Exhibition of amateur apparatus in connection with which three prizes are offered for the best work. Full details of the competition will be given in our next issue.

Ipswich Wireless Exhibition.

The Ipswich and District Radio Society is to be congratulated on its decision to hold an exhibition for the benefit of the general public in the neighbourhood. The Exhibition is to take place on Wednesday and Thursday, October 31st and November 1st respectively, at the British Legion New Hall, St Margaret's, Ipswich, and will be opened by Sir John Ganzoni, M.P., a Vice-President of the Society.

Half of the available space will be allotted to trade displays, which are to be highly attractive, whilst the remainder of the exhibition will be given up to the apparatus of members. There is every indication that the exhibition will be a success, and the demonstrations of broadcast reception which have been arranged should provide a very attractive feature.

R.S.G.B. to Broadcast.

By courtesy of the B.B.C., the Committee of the Radio Society of Great Britain are to be allowed a short period each Thursday evening at about 7.25 p.m. for broadcasting matters of interest to their members and to experimenters generally, and announcing forthcoming events. The first of such transmissions will take place on Thursday, October 11th, at 7.25 p.m., and will be radiated simultaneously from all broadcasting stations so that the members of the Radio Society and all affiliated societies should have no difficulty in picking up the messages. Dr. Eccles, the President of the Radio Society, has promised to make the first transmission.

Northampton Polytechnic Institute.

A copy has been received of the educational announcements of the Northampton Polytechnic Institute for the evening classes of the coming session. It is interesting to note that under the section devoted to Radio Telegraphy and Telephony, the following statement is made:—

> "As it is now quite common for students to enter this new branch of the subject direct and without previous training in the older forms of telegraphy and telephony, the work in this section has recently been developed so as to embrace both elementary and advanced classes. These classes include lectures, laboratory and exercise work. In the laboratory there is now available excellent equipment for both elementary and advanced students, and the Polytechnic is licensed by the Postmaster-General as a radio telegraphic station from which, under the official regulations, messages can be transmitted, and at which they can be received. In the session 1923-24, therefore, there will be two complete courses—an elementary (or A) course, and an advanced (or B) course."

Lectures by Professor Fleming.

"Ionic and Thermionic Valves" is the title of a series of six lectures which are to be given by Professor J. A. Fleming at University College, London, W.1, on Wednesdays at 5 p.m., beginning on October 24th. The course is open to a limited number. A syllabus of the lectures and particulars as to fees can be obtained on application to the Secretary, University College.

R.S.G.B. and Transmitters.

The letter of the President of the Radio Society of Great Britain recently sent to all holding transmitting licences has met with a ready response, and it is evident that the formation of a "Transmitter's and Relay Section" of the Society meets with general approval. A scheme is shortly to be placed before those who have replied to the letter and intending members are reminded that this section will be open not only to members of the Radio Society of Great Britain, but to members of affiliated societies, and also to those who belong to no society. A representative committee will be set up for the transmitters' section, and they will have their own meetings for discussion and the organisation of relay work. Mr. Philip R. Coursey and Mr. Maurice Child are collaborating with the President in arranging the details of this section.

The Schools Radio Society.

Arrangements are now in progress with the object of evolving a scheme of co-operation between the Schools Radio Society and the Radio Society of Great Britain. Details of the new plans will shortly be made public, and in the meantime secretaries of School Radio Societies not at present included in the organisation are strongly urged to communicate with the organising Secretary of the Schools Radio Society, Mr. R. J. Hibberd, Grayswood Mount, Haslesmere, Surrey.

Wireless and the Blind.

Highly practical sympathy towards the blind was shown by the Brighton and Hove Radio Society when, on Saturday, September 15th, they presented a three-valve wireless set to St. Dunstan's Annexe, Brighton.

The presentation, which took place in the lounge of Portland House, was attended by a distinguished company, including Capt. Ian Fraser, Chairman of the Blinded Sailors' and Soldiers' Hostel, London. In expressing the grateful thanks of all connected with St. Dunstan's, Capt. Fraser said that the set possessed an added value by reason of the fact that it had been designed and constructed by members of the Society.

The ceremony concluded with a brief demonstration.

Concerning Transmitters.

We would again remind transmitters of the advisability of employing the phonetic or "ac, beer" method of pronouncing call letters. Many

reports of "doubtful" stations are still received and in many cases it is certain that the use of the phonetic system would save confusion and mistaken identity. A valuable plan for ensuring correct recognition of the transmitter is the sending of the call letters *in morse* at the conclusion of each transmission.

Christiania Heard Again.

Another report of clear reception of the Christiania broadcasting station has reached us from Hawick, Scotland, where Mr. William Reid, using a two-valve set (H.F. and D.), obtained very distinct telephony.

Radio Transmitters' Society.

The first lecture held under the auspices of the newly formed Radio Transmitters' Society will take place at 6.30 p.m. on Wednesday, October 10th, at the London School of Economics, Houghton Street, Aldwych, when Capt. H. J. Round, Chief of the Research Department of Marconi's Wireless Telegraph Company, Limited, will open the proceedings by delivering a lecture upon "The Control of a Wireless Transmitter."

Transatlantic Tests.

The many reports of the long distance reception published in these columns during the last few weeks have shown to what extent the approach of winter has revived interest in such feats. The proposed Transatlantic Tests should therefore have a greater appeal than ever. It will be remembered that such tests were carried out last December with extraordinary success, the American signals being picked up every night of the test. This winter tests on a much larger basis are contemplated. A full programme is being arranged by the Radio Society of Great Britain, and all experimenters interested are asked to co-operate so that the tests may be successful and not merely result in useless jamming of each other's efforts.

The Post Office authorities have already intimated to the Committee of the Radio Society of Great Britain that they are not averse to the granting of special facilities provided the tests are organised on a proper basis.

Any member of the Radio Society who is desirous of taking part is invited to communicate with the Hon. Secretary, and members of affiliated societies should make application through their own local secretaries.

The Western District Affiliated Societies.

A meeting of the Western District Affiliated Societies was held at the General Engineering College, Earl's Court, on the evening of October 3rd.

The meeting was attended by representatives from the affiliated societies concerned, with Dr. Gordon Wilson in the chair.

At the request of the meeting, Mr. L. Bland Flagg of Paddington, consented to act as hon. secretary to the meeting for the purpose of reporting the proceedings. Mr. J. H. Reeves, Western District representative on the Radio Society of Great Britain, read a paper describing the objects of the meeting, and suggesting that the societies represented should form a local association with which Mr. Reeves could keep in touch, in order to give the societies direct representation on the Committee of the Radio Society of Great Britain. A resolution was passed unanimously that an Association of the Western District Metropolitan Affiliated Societies should be formed.

An abstract of the paper read by Mr. Reeves will appear in an early issue of *The Wireless World*, in order that other representative groups may have the opportunity of taking advantage of the suggestions contained therein.

Radio Society of Great Britain.

An ordinary meeting of the Society was held at the Institution of Electrical Engineers at 6 p.m. on Wednesday, September 26th. Following the reading and confirmation of the minutes of the previous meeting, the President, Dr. W. H. Eccles, F.R.S., delivered an interesting address on "Wireless, Topics."

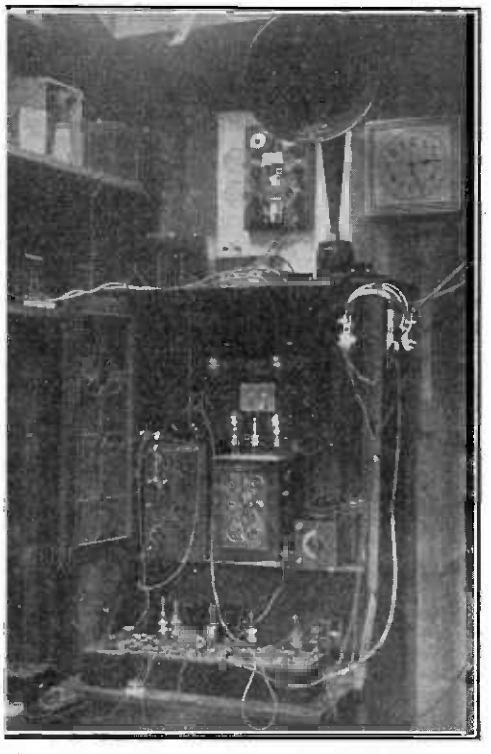
At the conclusion of the meeting the following were elected to the membership of the Society :—

Membership.—Dr. Alfred Iles, W. Bruce Bannerman, Major E. N. Crankshaw, F. L. Devereux, P. P. Eckersley, W. F. Hurndall, Lt.-Col. Frank Hall, G. W. Ogden, Capt. T. E. Longridge, J. E. Wilkes, I. G. Samuel, Gordon Castagnoli, E. R. Hollis, Jas. B. Seymour.

Transfer to full Membership.—R. H. Herbert.

The following Societies have been accepted for Affiliation :—

Carmarthen and District Radio Society, The Thornton Heath Radio Society, The Prestwich and District Radio Society, Salisbury and District Radio Society.



The enclosed cabinet receiver of Mr. L. C. Solomon, of Faversham. The neat arrangement of the apparatus is particularly commendable.

FORTHCOMING EVENTS.

WEDNESDAY, OCTOBER 10th.

East Ham and District Radio Society. At 7.30 p.m. At the Church Army Social Centre, Barking Road, E.6. Informal Meeting.

Tottenham Wireless Society. At 8 p.m. At the Institute, 10, Bruce Grove, N.17. Lecture by Prof. A. M. Lowe (President).

Radio Transmitters Society. At 6.30 p.m. At London School of Economics, Houghton Street, Aldwych. Lecture: "Control of a Wireless Transmitter." By Captain H. J. Round (Chief of Research Dept., Marconi's Wireless Telegraph Co., Ltd.).

THURSDAY, OCTOBER 11th.

Hackney and District Radio Society. Lecture: "Some Early Relays and their Applications and Developments." By Mr. R. M. Lucy (of Messrs. S. G. Brown, Ltd.).

Ilford and District Radio Society. Informal Meeting.

FRIDAY, OCTOBER 12th.

Wembley Wireless Society. "A Wireless Evening with the Lantern." Conducted by Mr. A. H. Hawking.

The Leeds Radio Society. At 7.30 p.m. General Meeting.

MONDAY, OCTOBER 15th.

Kingston and District Radio Society. Demonstration of Flewelling Circuit. By Mr. H. F. Keen.

TUESDAY, OCTOBER 16th.

Plymouth Wireless and Scientific Society. General Discussion.

WEDNESDAY, OCTOBER 17th.

Radio Society of Great Britain. At 6 p.m. At the Institution of Electrical Engineers. Informal Meeting. A Discussion on "Short Wave Reception" will be opened by Mr. P. R. Coursey, B.Sc.

Calls Heard.

Leigh-on-Sea.
2 FD, 2 FG, 2 FK, 2 FL, 2 FO, 2 FQ, 2 FS, 2 IM, 2 KF, 2 KT, 2 KZ, 2 LT, 2 LZ, 2 NM, 2 NO, 2 OD, 2 OM, 2 ONJ 3 X, 2 SM, 2 SR, 2 SZ, 2 TR, 2 TV, 2 VD, 2 WK, 2 XI, 2 XP, 2 XR, 5 DT, 5 DV, 5 DX, 5 EA, 5 FR, 5 GJ, 5 IT, 5 LF, 5 NJ, 5 SR, 5 JT, 6 IM.
(L. J. J. Davis).

Lymm, Cheshire.
2 DF, 2 FU, 2 JF, 2 KF, 2 KW, 2 KX, 2 NA, 2 NM, 2 OD, 2 PC, 2 PP, 2 RM, 2 SZ, 2 TR, 2 WK, 5 CX, 5 GS, 5 KO, 5 MU, 5 NN, 6 BI, 6 NI, 8 AW, 8 BM, 8 BV, 8 CS, 8 CZ.
(J. Allan Cash, **2 GW**).

Sheffield.
2 DF, 2 FN, 2 FU, 2 HF, 2NA, 2 NM, 2 IJ, 2 KF, 2 OD, 2 ND, 2 ZK, 2 XP, 5 CX, 5 KO, 5 MI, 5 OX, 6 DZ, 6 NI, 6 AV, 6 NK, 8 AW, 8 AQ, 8 AV, 8 BN, 8 BW, 8 FV, 8 CF, 8 CZ, 0 DV, 0 MX.
(Capt. L. A. K. Halcomb, **5 DN**).

Hammersmith.
2 AA, 2 AJ, 2 AM, 2 AN, 2 AQ, 2 BM, 2 BV, 2 BZ, 2 CP, 2 DC, 2 DP, 2 DT, 2 DY, 2 DZ, 2 FG, 2 FQ, 2 FV, 2 GL, 2 GP, 2 HT, 2 ID, 2 KF, 2 KN, 2 KT, 2 KV, 2 LI, 2 LU, 2 LW, 2 MF, 2 MI, 2 MK, 2 MO, 2 MR, 2 MT, 2 NH, 2 NM, 2 NQ, 2 OD, 2 OM, 2 ON, 2 PA, 2 PY, 2 QI, 2 QQ, 2 QS, 2 SH, 2 SI, 2 SN, 2 SQ, 2 SS, 2 SX, 2 SZ, 1 TA, 2 TI, 2 UC, 2 UV, 2 VJ, 2 VP, 2 VR, 2 VW, 2 WD, 2 WZ, 2 XL, 2 XQ, 2 XT, 2 XZ, 2 YH, 2 YN, 2 YX, 2 ZO, 2 ZZ, 5 AC, 5 AG, 5 AP, 5 AQ, 5 BT, 5 BV, 5 CB, 5 CP, 5 DC, 5 DK, 5 DM, 5 HK, 5 HY, 5 IO, 5 LF, 5 OP, 5 OX, 5 OG, 5 PU, 5 SU, 5 VD, 5 VP, 5 VR, 5 VM, 6 HD, 6 HY,
(H. Eade, Jun.)

Correspondence

Multilayer Coils.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—With reference to the article appearing on page 863 of the September 26th issue of *The Wireless World and Radio Review* on the subject of Multilayer Coils, written by Mr. W. James, I notice in describing Fig. 137, same is referred to as a "Telefunken Coil."

I beg to inform you, however, that this method of winding coils was invented by me in 1901 when I was assistant to Prof. Slaby in Berlin. In 1904 I became chief engineer to the Telefunken Company, to whom I introduced this type of coil, and Mr. W. James is under a misapprehension in attributing the device in question to the Telefunken Company.

Yours faithfully,

(Sgd.) DR. GEORG SEIBT.

REGULAR PROGRAMMES ARE BROADCAST FROM THE FOLLOWING EUROPEAN STATIONS:

GREAT BRITAIN.

LONDON 2 LO, 369 metres; **MANCHESTER, 2 ZY,** 385 metres; **BIRMINGHAM, 5 IT,** 420 metres; **CARDIFF, 5 WA,** 353 metres; **NEWCASTLE, 5 NO,** 400 metres; **GLASGOW, 5 SC,** 415 metres. Regular morning and evening programmes, particulars of which appear in the daily press, are conducted from these stations by the British Broadcasting Company. The usual times of transmission are:—Weekdays, 11.30 a.m. to 12.30 p.m. (**2 LO** only), 3.30 to 4.30 p.m., 5 to 10.30 p.m. Sundays, 3 p.m. (**2 LO** only), 8.30 to 10.30 p.m.

FRANCE.

PARIS (Eiffel Tower), **FL,** 2,600 metres. Daily, 6.40 a.m., Meteorological Forecast; 11.15 p.m., Meteorological Report and Forecast; 2.30 p.m., Financial Bulletin (Paris Bourse); 5.10 p.m., Concert; 6.20 p.m., Meteorological Forecast; 10.15 p.m., Meteorological Report and Forecast. Sundays, 5.20 p.m., Concert and Meteorological Report.

PARIS (Compagnie Francaise de Radiophonie Emissions "Radiola"), 1,780 metres. Daily, 11.30 a.m. Exchange News, 11.45 a.m. News and Concert, 3.45 p.m. Commercial Intelligence, 4 p.m. Concert 7.30 p.m. News, 8 p.m. Concert, Tuesday and Friday, 4 to 5 p.m., Dance Music. Thursday and Sunday, 9 to 9.45 p.m., Dance Music.

ECOLE SUPERIEURE des Postes et Telegraphes, 450 metres, Tuesday and Thursday, 7.30 p.m., Concert. Saturday, 5.30 to 6.30 p.m., Concert.

LYONS, YN, 3,100 metres. Weekdays, 9.45 to 10.15 a.m., Gramophone records.

DENMARK.

LYNGBY OXE, 2,400 metres. 9.30 a.m., 3.30 p.m., and 8.45 p.m. Meteorological Report in Danish. 7.30 p.m. to 8.45 p.m., Concert (Sundays excepted).

HOLLAND.

THE HAGUE, PCGG, 1,050 metres. Sundays, 2.40 to 5.40 p.m., Concert. Mondays, 8.40 to 9.40 p.m., Concert. Thursdays, 8.10 to 10.10, Concert (temporarily suspended).

THE HAGUE (Heusden Laboratory), PCUU, 1,050 metres. Sundays 9.40 to 10.40 a.m., Concert. Tuesdays, 7.40 to 9.40 p.m., Concert.

THE HAGUE (Velthuisen), PCKK, 1,050 metres. Fridays, 8.40 to 9.40 p.m., Miscellaneous.

IJMUIDEN (Middelraad), PCMM, 1,050 metres. Saturdays, 8.10 to 9.40, Concert.

AMSTERDAM, PA5, 1,050 metres. Wednesdays, 7.40 to 9.40 pm. Concert.

AMSTERDAM, PCFF (News Office Vas Daiz), 2,000 metres. Daily, except Sundays, 7.50 to 8.10 a.m., 9.40 to 9.55 a.m., 11.10 to 11.15 a.m., 11.25 to 11.35 a.m., 11.55 to 12.10 p.m., 12.45 to 1 p.m., 2.40 to 3.10 p.m., 3.55 to 4.10 p.m., News and Market Reports. 1.10 p.m., 1.25 p.m., 1.40 p.m., 1.55 p.m., 2.10 p.m., 2.25 p.m., Stock and Bond Quotations.

BELGIUM.

BRUSSELS, BAV, 1,100 metres. Working days, 12 noon, Meteorological Bulletin. Daily, 4.50 p.m., Meteorological Bulletin, Tuesday and Thursday, 9 p.m., Concert. Sunday, 6 p.m., Concert

GERMANY.

BERLIN (Koenigswusterhausen), LP, Sunday, 4,000 metres, 10 a.m. to 11 a.m., music and speech; 2,700 metres, 11 a.m. to 12 noon, music and speech; Daily, 4,000 metres, 6 to 7 a.m., 11 a.m. to 12.30 p.m., 4 to 4.30 p.m., Financial and other news.

EBERSWALDE (2,930 metres), Daily, 12 noon to 1 p.m., 7 to 8 p.m. Tuesday and Saturday, 5.30 to 6.30 p.m., Concert.

CZECHO-SLOVAKIA.

PRAGUE, PRG, 1,800 metres, 7 a.m., 11 a.m. and 3 p.m., Meteorological Bulletin and News. 4,500 metres, 9 a.m., 2 p.m. and 9 p.m., Concert.

KBEL (near Prague), 1,000 metres. Daily, 6.20 p.m. Concert, Meteorological Report and News.

SWITZERLAND.

GENEVA, HB 1 (Radio Club de Geneve), 1,100 metres. Thursdays, 8.30 to 9.15 p.m., Concert (temporarily suspended).

LAUSANNE, HB 2, 1,100 metres, Tuesdays, Thursdays and Saturdays, 4 p.m., Concert. Monday, Wednesday, Friday and Sunday, 7 p.m., Concert.

QUESTIONS AND ANSWERS

"**F.W.L.**" **(Sheffield)** *asks* (1) *For a diagram of a four-valve receiver, one H.F., tuned anode coupled, detector, and two L.F. valves, with Dewar type switch to cut out the H.F. valve, and double pole change-over switches to connect the telephones or loud-speaker at will, and to couple the reaction coil with the closed circuit inductance or with the anode inductance.*

(1) The diagram is given in Fig. 1.

(1) The diagram is not correct. (2) Tuning coils are essential in this receiver. (3) The correct diagram of this receiver is given in Fig. 2. For the reception of British broadcast transmissions, basket coils wound on a former $1\frac{1}{2}$" in diameter, and having the following numbers of turns, should be constructed. Aerial tuning inductance, 40 turns; reaction inductance, 50 turns.

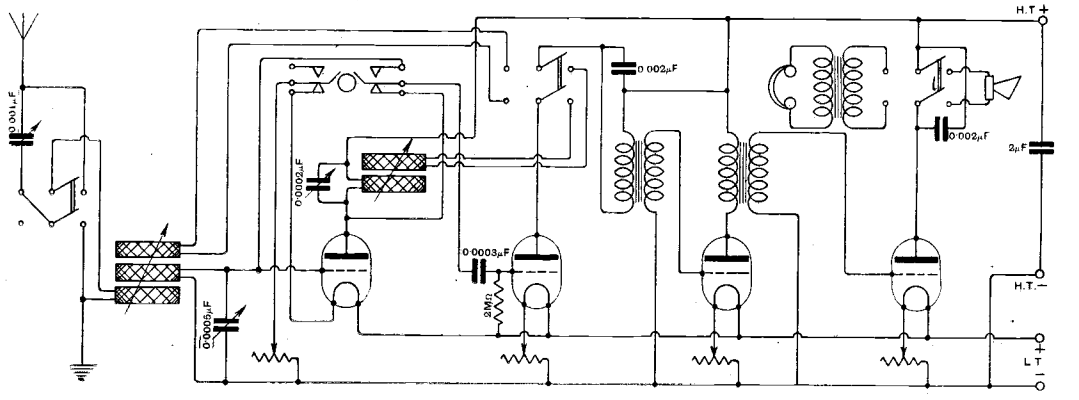


Fig. 1. "**F.W.L.**" **(Sheffield).** *Receiver with H.F., valve rectifier and two note magnifiers. Switches are provided to switch the first valve, change the reaction coil connections, and to join telephones or a loud speaker to the last valve.*

"**X.Y.Z.**" **(Gosport)** *submits a diagram of a three-valve receiver, and asks* (1) *For criticism of the diagram.* (2) *Are tuning coils necessary with this set when receiving broadcast transmissions with a frame aerial.* (3) *For a diagram including the tuning coils, and giving suitable dimensions of basket coils for the reception of British broadcast transmissions.*

"**GAMMA**" **(Dollis Hill, N.W.10)** *asks* (1) *How to become a member of the Institute of Radio Engineers.* (2) *Where to apply for particulars of the examination for the P.M.G's certificate.*

(1) Apply to the Secretary, Institute of Radio Engineers, College of the City of New York, N.Y., U.S.A. (2) Apply to the P.M.G., G.P.O., London, E.C.

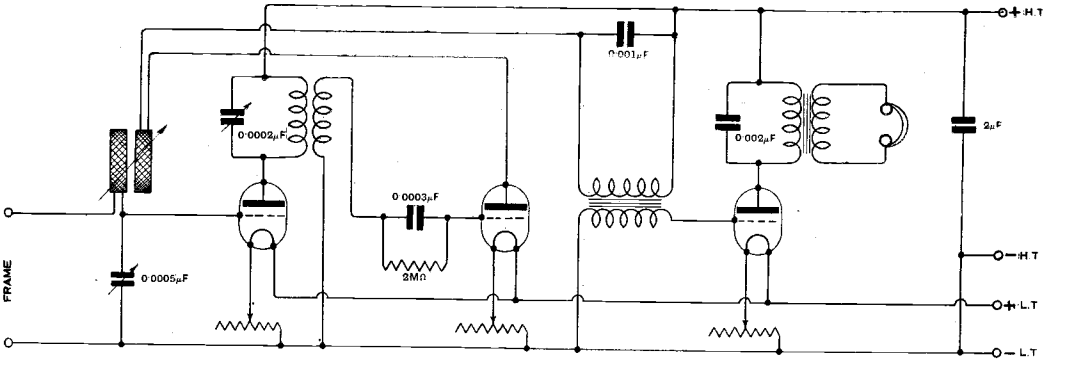


Fig. 2. "**X.Y.Z.**" **(Gosport).** *Connections of a receiver with H.F., rectifier and note magnifier.*

"**E.A.T.**" **(W. Kilburn)** *asks* (1) *Would it not be advisable to use a small variable condenser with a variometer.* (2) *For a diagram of a crystal receiver employing a variometer with variable condenser and a one-valve L.F. amplifier.*

(1) The use of a small variable condenser is an advantage when tuning to the higher wavelengths of the variometer range. (2) The diagram is given in Fig. 3.

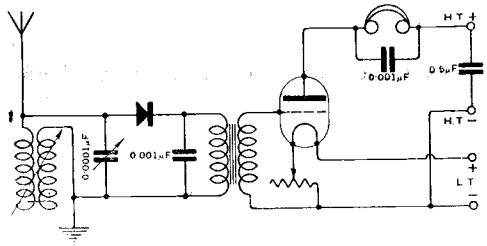


Fig. 3. "**E.A.T.**" **(W. Kilburn).** *A simple set consisting of a note magnifier added to a crystal receiver.*

"**E.H.O.**" **(Leytonstone)** *asks* (1) *How could a wireless recording instrument be made, utilising a "Weston" moving coil relay.*

(1) We would refer you to the issues of this journal of October 29th to November 26th, 1921, with reference to the discussion before the Wireless Society of London, on "Some Methods of Recording Wireless Signals."

"**R.A.G.**" **(Broxton)** *asks questions about the Armstrong Super-Regenerative Receiver.*

The Armstrong receiver is suitable for use only on short wavelengths. We recommend that you construct a receiver according to the instructions given by "**5 HZ**" in the issue of August 15th, 1923, and to add power amplifying valves in the ordinary way if required.

"**W.S.N.**" **(Shoreditch)** *describes two types of Armstrong receiver, and asks which of the two is the better.*

We think the circuit No. 2 best suited to your needs. "**D.E.R.**" valves may be used with a consequent lowering in weight of the apparatus but the results obtained will not be so good as with power valves from the point of view of strength.

"**B.C.**" **(Bootham School)** *referring to circuit No.* 84 *of "The Amateurs' Book of Wireless Circuits," asks* (1) *For dimensions of a variometer suitable for use in this circuit.* (2) *The values of condensers* C_1 *and* C_2. (3) *Dimensions of H.F. choke.*

We think you would have great difficulty in making up a wavemeter of this type, and would recommend the use of circuits 82 and 83 in the above-mentioned book.

"**J.Y.**" **(North Berwick).**—The wavelength tables given on page 351 of the issue of June 16th, used in conjunction with the inductance curves on pages 696-7 of the issue of August 22nd, 1923, will give all the information required.

"**J.W.H.C.**" **(Manchester)** *asks* (1) *For particulars of basket coils to tune from broadcast wavelengths to* 2,600 *metres.* (2) *If there is a simple method of calculating the wavelength of basket coils.* (3) *For a practical circuit diagram of a one-valve double magnification receiver.* (4) *For an explanation of certain tuning effects noticed in his receiver.*

(1) Try a series of five coils having 50, 80, 120, 200, and 300 turns on the former you describe. (2) Find the mean diameter of the coil and then treat as for a cylindrical inductance of this diameter having the same number of turns. See the wavelength and inductance tables and curves in the issues of June 16th and August 22nd respectively. (3) We would refer you to the article on "A One-Valve Dual and Crystal Receiver" in the issue of August 22nd. (4) Your trouble is due to the fact that you are using too small an A.T.I. Try a No. 75 D.L. coil.

"**LOUD SPEAKER**" **(Leamington)** *asks questions about the "Filter Feed Circuit for Loud Speakers," described in "The Wireless World and Radio Review" of July 7th,* 1923.

(1), (2) and (3) You might use a former $2\frac{1}{2}$" diameter and 4" long, and an iron wire core $\frac{1}{2}$" in diameter. The wires should be sufficiently long to permit of their being bent back over the windings as in the construction of some intervalve transformers. The No. 34 D.S.C. wire may be run straight on to the former; we are afraid that you will find regular winding in layers rather difficult. (4) We do not think that there will be an appreciable diminution in volume.

NOTE.—*This section of the magazine is placed at the disposal of all readers who wish to receive advice and information on matters pertaining to both the technical and non-technical sides of wireless work. Readers should comply with the following rules:*—(1) *Each question should be numbered and written on a separate sheet on one side of the paper, and addressed "Questions and Answers," Editor,* **The Wireless World and Radio Review**, 12/13, *Henrietta Street, London, W.C.*2. *Queries should be clear and concise.* (2) *Before sending in their questions, readers are advised to search recent numbers to see whether the same queries have not been dealt with before.* (3) *All questions will be answered through the post. Those of general interest will also be published.* (4) *Every question, except those under* (5) *below, should be accompanied by a postal order for* 1*s.*, *or* 3*s.* 6*d. for a maximum of four questions, and also the coupon taken from the advertisement pages of the current issue.* (5) *For the benefit of those readers who would rather not pay the charges, a free Questions and Answers Coupon will be placed in the advertisement pages of the first issue of every month. This coupon should accompany the question submitted, together with a stamped addressed envelope. The free coupon is valid for the current week only.* (6) *In view of the fact that a large proportion of the circuits and apparatus described in these answers are covered by patents, readers are advised, before making use of them, to satisfy themselves that they would not be infringing patents.* (7) *Four questions is the maximum which may be sent in at one time.*

THE WIRELESS WORLD AND RADIO REVIEW

THE OFFICIAL ORGAN OF THE RADIO SOCIETY OF GREAT BRITAIN

No. 218. (No. 3 Vol. XIII.) OCTOBER 17th, 1923. WEEKLY

CONTENTS

	PAGE
Editorial	66
Home-made Inductance Coils of Low Distributed Capacity. By Victor Gabel	67
Building the Three-Valve Resistance Coupled Amplifier. By F. H. Haynes	74
A Simplified Method of Neutralising Valve Capacity in Radio Frequency Amplifiers	79
Variometers—I. By W. James	81
Wireless Club Reports	85
Novel Ideas and Inventions	87
Correspondence	89
Notes and News	90
Questions and Answers	94

THE EDITOR will be glad to consider articles and illustrations dealing with subjects within the scope of the Journal. Illustrations should preferably be confined to photographs and rough drawings. The greatest care will be taken to return all illustrations and manuscripts not required for publication if these are accompanied by stamps to pay return postage. All manuscripts and illustrations are sent at the Author's risk and the Editor cannot accept responsibility for their safe custody or return. Contributions should be addressed to the Editor, "The Wireless World and Radio Review," 12 and 13, Henrietta Street, Strand, London, W.C.2.

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WHY?

By THE EDITOR.

IN the last issue of this Journal we referred editorially to the report of the Broadcasting Committee, and expressed the view that, taken altogether, the report and the Postmaster-General's statement must be considered as a satisfactory solution of the immediate difficulties, and that it would be accepted with appreciation by almost every interested party.

A further study of these two documents, however, leaves one at a loss to understand the reason for a clause in the Postmaster-General's statement regarding the present experimental licence. The wording, it will be remembered, is as follows :—

> " The existing Experimental Licence, at an annual fee of 10s., will continue to be " issued from the General Post Office to persons who are able to satisfy the " Postmaster-General that they desire the licence for *bona fide* experimental purposes " and are qualified to conduct experiments, and who will sign a declaration to the " effect that they will not use the broadcast programmes except for experimental " purposes."

It is quite reasonable that, since the introduction of a Constructor's Licence, the Postmaster-General should call for satisfactory evidence that the applicant for an Experimental Licence requires it for *bona fide* experimental purposes, and is qualified to conduct experiments, but we would like to know the reason why owners of Experimental Licences must " sign a declaration to the effect that they will not use broadcast programmes except for experimental purposes."

To begin with, this is a restriction which can never be enforced, as it would be impossible to check whether the broadcast programmes were being used for experimental purposes or otherwise, and secondly, we cannot see that any unfairness to any interested party would result if this clause were not included. After all, it is no fault of the experimental licence-holder (unless, perhaps, for the reason that he originated broadcasting in this country) that broadcasting should fill the ether between certain hours daily ; in fact, although it is a boon to the majority, it is often very much the reverse to the genuine experimenter, to whom alone the experimental licence will be issued in future ; but nevertheless, if it should happen that during the course of his experiments some other members of his household take pleasure in listening in to snatches of music, the experimental licence-holder, if he has a conscience, should, we suppose, remember his declaration made when the experimental licence was issued to him, and, by some means or other, prevent any portion of the broadcasting programme from becoming audible in the sense of constituting entertainment.

We can quite understand that, if the Postmaster-General had not introduced the constructor's licence to meet the requirements of those who are primarily interested in broadcasting, and in the hobby of constructing their own apparatus, then the experimental licence might get into the hands of persons other than genuine experimenters, but now that there is no occasion for the Postmaster-General to issue experimental licences, except to those who satisfy him that they desire to conduct genuine experiments, we cannot see that there is any question of evading contribution to the B.B.C. which, in our opinion, would have been the only legitimate reason for the insertion of such a clause.

If the right exists now for a clause to be inserted prohibiting the experimenter from listening in to broadcast transmissions, then the same right must certainly have existed in the days before broadcasting for commercial companies to insist that the amateur should not listen in to commercial transmissions. The experimenter and the experimental licence existed many years before broadcasting, and it is difficult to understand what circumstances have arisen now to justify the necessity for such a declaration as is called for in the issue of future experimental licences. The only purpose which we see in the demand for this new declaration (if indeed it has a purpose) is to discount the value of the experimental licence and after a time serve as a means of indicating, so far as statistics are concerned, that the number of genuine experimenters is declining and that he is therefore a factor of less importance for consideration in future legislation.

HOME-MADE INDUCTANCE COILS OF LOW DISTRIBUTED CAPACITY.

By VICTOR GABEL.

IN my work I make considerable use of home-made basket coils and modified honeycomb coils, because of their great convenience and possibility of rapid preparation. In the following article I shall endeavour to explain in detail the different methods of winding coils with small distributed capacity and to give practical instructions for building them.

After numerous experiments I selected one standard size of basket coil, which satisfies the wants of practice. For convenience in the preparation of formers, a pattern, illustrated in Fig. 1, is used. Let

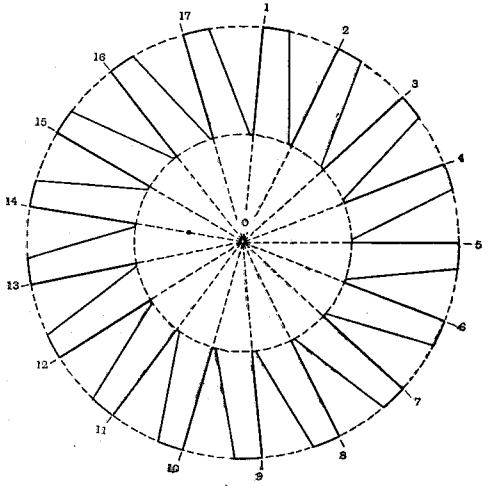


Fig. 1. A pattern to assist in rapidly making formers for basket coils. The inside diameter is 2" and the outside 4".

us draw on a piece of thick, solid pasteboard two concentric circles having respectively 2 ins. and 4 ins. diameter. For the same purpose, fibre, sheet brass and other rigid materials are very convenient. Let us divide the outer circumference in 17 equal parts and make cogs, as shown in the drawing (Fig. 1). Cut them out with a sharp knife or scissors and make a hole in the centre with a pin. Then put such a pattern on a piece of cardboard about 1-2 mm. thick, pierce a pin through the centre, and, holding the pattern tightly, draw with a sharp pointed pencil a straight line along the ribs 0-1, 0-2, 0-3. . . . 0-17.

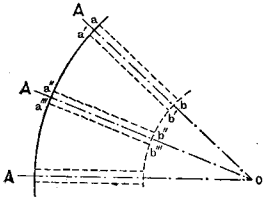


Fig. 2. When the former has been marked out with the aid of the pattern, the slots are cut as at ab—a'b', etc.

Now make marks at one of the cogs for the outer and inner radius, take the pattern off, and trace both circles. After cutting out the outer circle, make cuts with scissors at the lines ab, a'b', a''b'', a'''b''', etc., parallel to pencil lines OA (Fig. 2), so that aa' = a''a''', etc., is equal to $\frac{1}{8}$ in. or a little less. Then with a sharp knife cut the angles b, b', b'', etc., and the lines bb', b''b'''. . . . The formers may be prepared in less than ten minutes.

By means of such a former and using different systems of winding, I get inductance coils of an equal diameter from 0·1 to 1·5 millihenrys, wound with No. 26 D.C.C. wire.

Let us try now to wind. To commence with let us take the simplest winding, shown in Figs. 3a and 4a, where the circumference of the former is developed in a straight line. Beginning with any one of the slots, wind the first wire away from oneself, pass one cog, and bring the wire to yourself, passing one cog more, and so on. The *pitch* of the winding is the distance between the two points where the wire is passing in the same direction (in the diagram the pitch is marked with **). In this case the pitch is equal to 1 + 1) = 2 cogs. Now continue winding. You will note that after making one full turn, the wire is put in the same slot

from which you started winding, that is in the direction to yourself; but when the second turn is wound the wire will lie in the same slot but in the direction "from oneself," that is in the same direction as at the beginning of the winding. Let us stop again. After observing the winding with attention, you will note that all the cogs are covered with one turn of wire on each side, in every cut there will be found two crossed wires, and on further winding the cog will be covered with a second row of wire, which will be disposed in the same manner as before. Let us name a *series* the number of full turns of wire, after which the winding will be repeated. In the present case the series consists of two turns. Winding further we shall get on our former about 17 series. It is easy to determine the number of turns of a wound coil. Let us count how many times the wire was placed on one side of a certain cog. Multiplying this number by the pitch, which—as we shall see further—is always equal to the number of turns in a series, we shall get the sought number of turns. Our coil has $17 \times 2 = 34$ turns.

Let us now wind so that we miss two cogs from each side (Fig. 3b and 4b). The pitch is equal to $2 + 2 = 4$, and in each series 4 turns are involved. Each cog is covered on both sides with two wires, and as before, two crossed wires are placed in the slots. Let us determine the number of series of a finished coil by the number of wires lying against the slots. If it is equal to 17, the number of turns of the coil is equal $17 \times 4 = 68$.

In Figs. 3c and 4c the winding is shown with a pitch equal $3 + 3 = 6$ with six turns in a series, and in Fig. 3d a coil with a pitch $4 + 4 = 8$ and with 10 series, having $10 \times 8 = 80$ turns. Let us try now to wind with asymmetric pitches, combining the number of cogs omitted in front and behind. For instance in Fig. 4d a system of winding is shown in which on one side one cog is omitted, while from the other side three cogs are omitted. The pitch is equal $1 + 3 = 4$. After winding on one series, you will see that there are 4 full turns. When the winding is completed the coil will have 17 series, with $17 \times 4 = 68$ turns, differing from those wound before, in that one side of it is flat.

It is sometimes difficult to determine the number of series in a coil wound with a pitch more than $2 + 2$ cogs, because the winding is very complicated. Yet, observing the winding attentively, you will note that the wire is placed at some points in parallel rows, which are especially clearly seen if the winding is done accurately. Let us count the number of these rows, repeating the count at several points to check. The number obtained will give you the number of series. In the former

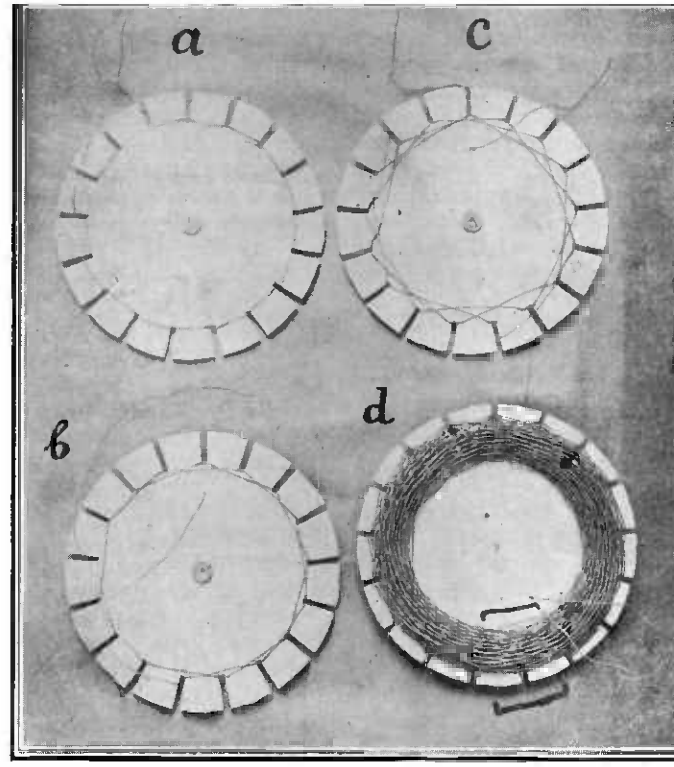


Fig. 3. *Basket coils wound with different pitches,* **a** *having the pitch* (1 + 1), **b** — (2 + 2), **c** — (3 + 3), **d** — (4 + 4).

example the number of series is most easily determined on the other side of the coil, where one cog only was omitted. It is equal to the number of wires disposed on any cog. In Fig. 3d the point, where the rows of wire are well seen, is marked with two parentheses.

It is not rational to take more than 4 cogs on our former (that is to take the pitch more than $4 + 4 = 8$), because with 5 cogs the wire lies too close to the centre and would little affect the value of the inductance. Below is a table with all possible combinations of the pitch h, the full number of turns N and approximate values of inductance L in millihenrys for several coils, wound on the former $2'' \times 4''$ with 17 cogs, the wire being No. 26 D.C.C. The number of series is everywhere 17.

h	N	LmH	h	N	LmH
1+1=2	34	0·11	2+3=5	85	0·46
1+2=3	51	0·23	2+4=6	102	0·77
1+3=4	68		3+3=6	102	0·81
1+4=5	85		3+4=7	119	1·0
2+2=4	68	0·4	4+4=8	136	1·3

Of course one can wind small inductances by increasing the pitch and reducing the number of series, because then the capacity of the coil is very little. Yet I often prefer to wind all coils of the same diameter for the following reasons. As is known, the inductance of the coil depends upon its geometric dimensions and the number of turns of the wire. Let us express this relation by the formula $L = kN^2$, where k is the coefficient, depending upon the geometric dimensions of the coil, and N from the above is equal to hs, where s equals the number of series in the winding. If we wind a number of coils with different pitches, but of the same diameter and on the same formers, then s will be the same for all the coils. Suppose we wish to know the inductance of these coils only approximately, say to 10-20 per cent., then we can also take k the same for all the coils, because we can neglect in this case the different thickness of the coils, wound with different pitches. Supposing k and s constant, we can write $L = ks^2h^2 = Kh^2$, where

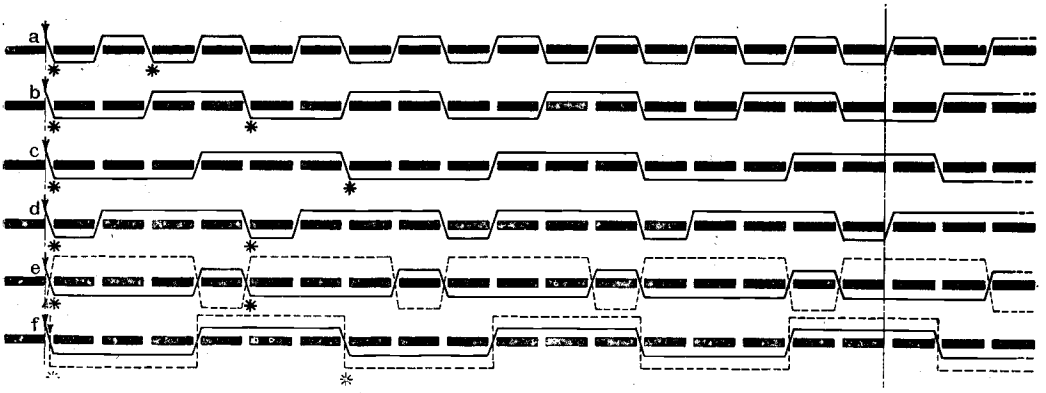


*Fig. 4. Examples of different methods of winding basket coils ; A to D using one wire, and E to F with two wires simultaneously. The windings D and E have asymmetric pitches. The distance between ** is the "pitch," of the winding.*

$K = ks^2$. We see that the inductance is approximately proportional to the square of the pitch. The above-mentioned table emphasises this statement. Knowing, for instance, the inductance of the coil wound with the pitch (1 + 1), one can check approximately the inductance of any other coil wound with another pitch and *vice versa*.

The wavelength is determined by the formula $\lambda = k' \sqrt{LC}$. Then with the constant capacity C we shall have $\lambda = k' \sqrt{Kh^2C} = K'h$ where K' is written for the product of the constant values $k' \sqrt{KC}$. Hence, knowing the wavelength corresponding to a certain capacity and pitch of the winding, it is easy to calculate the approximate wavelength with other pitches and the same capacity.

If you intend to design a basket coil of other dimensions and with another number of cogs, you must have in view the following. In order that the coil shall have the smallest

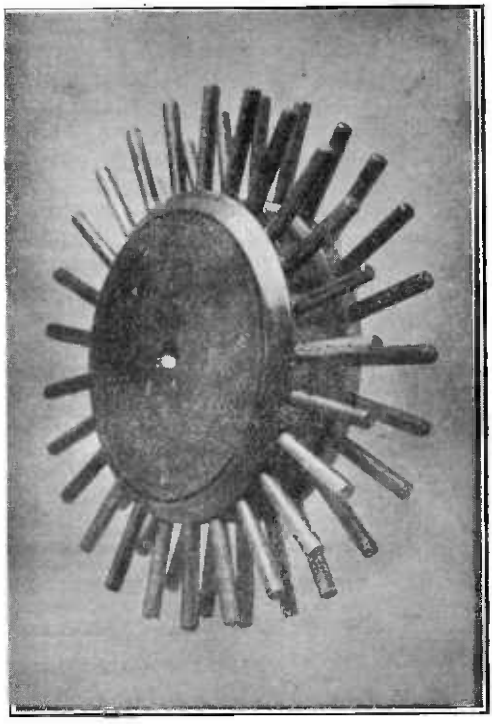


Fig. 5. The wooden former used in the construction of plaited honeycomb coils.

possible distributed capacity, it is necessary to so dispose the winding that parts of the wire, having a considerable potential difference, are either spaced apart one from the other, or crossed at an angle; the closer this angle to 90 degs. the better. If a basket coil is wound regularly and accurately, this condition is always fulfilled. Let us make any winding in two series (for instance, with a pitch $3 + 3$) and observe it attentively. You will see that the wires of the same series are crossed, and the parts of the wire lying parallel belonging to different series and possessing a certain difference of potential, are separated by a wire passing among them.

To make such a winding possible, it is necessary that the number of cogs of the former and the pitch have no common divisor, while the number of cogs may be even or odd. For instance, the former with 16 cogs permits a pitch to be $1 + 2 = 3$, $2 + 3 = 5$, $3 + 4 = 7$, but does not permit $h = 1 + 1 = 2$, $1 + 3 = 4$, etc. On the former with 15 cogs we may wind with $h = 2 + 2 = 4$, $1 + 3 = 4$, $1 + 1 = 2$, etc., but we may not take $h = 3 + 3 = 6$, $2 + 3 = 5$, etc. On the formers with a prime number of cogs, we may wind with any pitch.

In choosing the number of cogs, it is necessary to give consideration to their rigidity, for if the number is too large, then the cogs at the foundation will be too narrow

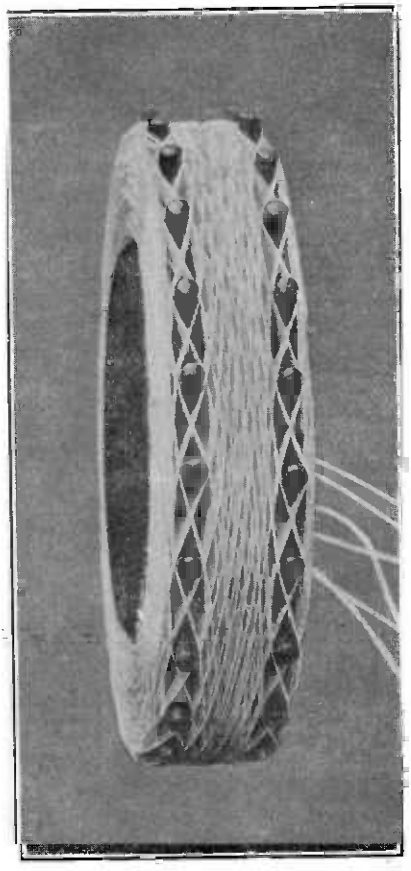


Fig. 6. Specimen of plaited honeycomb coil, having 600 turns and an inductance of 60 mH.

and will easily bend or even break. Usually I find the approximate number of cogs N with the formula

$$N \leq 8\,d$$

where d = the inner diameter of the former

in inches. I use cardboard a little more than 1 mm. thick.

Increasing the diameter of the former, we may get a basket coil with a large inductance; for example, I have coils with diameters of $3'' \times 6''$ and N up to 21 cogs. Their inductance reaches 6-7 mH, yet for this purpose, especially when one desires to have a coil of small dimensions (which is in most cases more profitable), it is better to use another winding, similar to the winding of honeycomb coils. Let us name such coils "plaited honeycomb coils."

Such a coil (unilateral) is represented in Fig. 6. The former, as is to be seen in Fig. 5, consists of two equal rows of spokes each $\frac{1}{8}$ in. diameter, in the actual case 25 in each row. Its inner diameter is 3 ins., the outer diameter 5 ins. The winding is shown on a developed diagram Fig. 7a. The wire passes all the time from one side to the other, while the pitch consists of two half-pitches; in the actual case the pitch is equal to $2 \times 12 = 24$, the half-pitch $4 + 8 = 12$. Effectually, this winding differs in no manner from basket-coils. The series has here also the number of full turns equal to the pitch, in the present coil—24 turns. Its inductance is about 60 millihenrys, but I have another coil, wound by the same system, the inductance of which is equal to 140 mH.

Let us cut from a pattern two cogged circles from cardboard not less than 2 mm. thick and some more circles of diameter 2 ins., so that when the latter are stuck together we have a cylinder $\frac{3}{4}$ in. thick or a little more. First let us glue all the circles accurately one with the other, squeeze in a press for an hour, then let us glue on each side a cogged circle, observing that the inner circles are concentric with the outer ones, and that the cogs of both the circles are accurately placed one opposite the other.

An example of a unilateral winding is shown in Fig. 7b (full line). From both sides there are two cogs passed and by passing from one side to the other — 7 cogs. Therefore the "lengthened" pitch is equal to $2(7+2) = 18$. On our former 16 series may be wound (the wire being No. 26 D.C.C.), and the total number of turns will be $16 \times 18 = 288$. The inductance is about 5·3mH. One can wind also with a "shortened" pitch $2(6 + 2) = 16$ and get 256 turns. Taking the pitch equal to $(1 + 6) + (2 + 6) = 15$ or $(2 + 7) + (3 + 7) = 19$, we shall get a winding similar to duolateral winding. We should not pass on more than 4 cogs, as in basket coils, and furthermore, in passing from one side to the other, we should not pass more than $h' = 10$ cogs, otherwise the wires of two contiguous layers will lay under a too sharp angle, the capacity of the coil will increase, and the winding will become generally inaccurate. Thus the greatest pitch is equal $(10 + 4) + (10 + 4) = 28$, which will give a "multilateral coil."

In designing plaited honeycomb coils of any other dimensions, one should follow the rules indicated for the construction of basket-coils. The pitch and the number of cogs N ought not to have a common

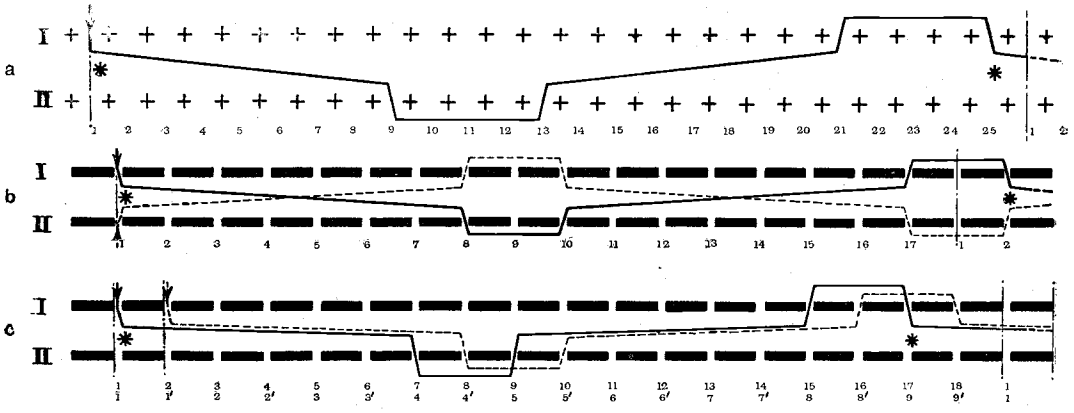


*Fig. 7. Examples of methods of winding plaited unilateral honeycomb coils with one and two wires. The pitch is shown thus **.*

divisor and N should equal about $8d$ (if the cardboard has a thickness not less than 2 mm.). If the former consists of a series of spokes, as shown for instance in Fig. 5, N can be larger. To prevent the wires crossing between the circles with too small an angle, the coil must not be too narrow. Let us take the spacing between the circles from 1/5 to 1/6D, where D is the outer diameter in inches. Secondly, h' must be from 0·3 to 0·4 N approximately, and not more than 0·8 aN. Since the number of cogs passed on the sides of the former must not exceed 4, the greatest possible pitch (and consequently the greatest number of turns in the series) will be determined by the

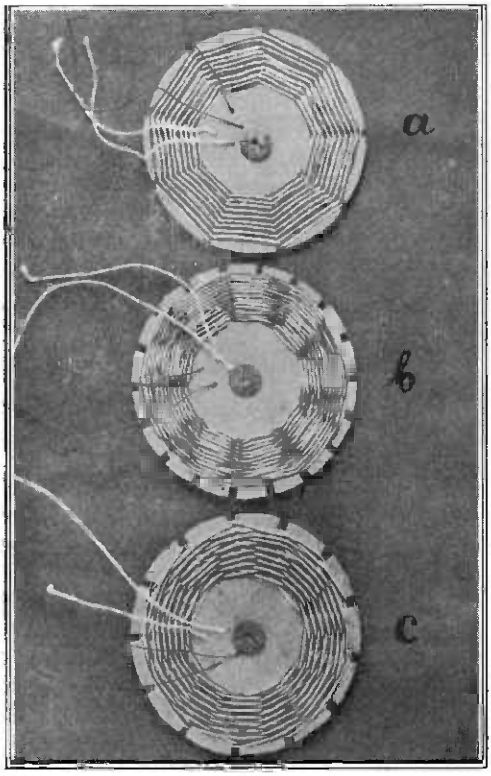


Fig. 8. Specimens of basket coils with two windings. Both windings are put on together.

value $h\,max. = 2(h' + 4)$. We can find the component parts of the pitch by taking the difference $h - 2h'$ and dividing it in two parts, m and n, each of them not exceeding 4; then the pitch $h = h' + m + h' + n$.

Example: It is required to design a coil with an inner diameter $d = 2\frac{1}{4}$ ins., and an outer diameter $D = 3\frac{1}{2}$ ins. We will find $N \simeq 8 \times 2\frac{1}{4} = 18$, let us take $N = 19$; $a = \frac{1}{5} \times 3\frac{1}{2}''$ to $\frac{1}{6} \times 3\frac{1}{2} = \frac{5}{8}''$; $h' = 0{\cdot}3 \times 19$ to $0{\cdot}4 \times 19 = 16$ or 7; $h\,max = 2(0{\cdot}8 \times \frac{5}{8} \times 19 + 4) = 26$ to 27 ($h'max = 9$ to 10); let us take, for instance, $h = 21$, then $h - 2h' = 21 - 2 \times 7 = 7$; we take $7 = 3 + 4$ and we get $h = 7 + 3 + 7 + 4 = 21$.

The basket and plaited honeycomb coils can be wound with two wires simultaneously. Several examples are given in Figs. 4e, 4f, 7b, 7c and 8. The coils 8a and 8c are wound with parallel turns, while 8b is wound on the former with 2×9 cogs. One wire is passed through the odd slots 1, 3, 5 . . . , the other through the even: 2, 4, 6 . . . . In Fig. 4f a diagram of the winding is shown, analogous to the coil 8c, while on the diagram 4e both the wires are crossed in slots; consequently, the mutual capacity of windings is reduced. A specimen of a double winding of the plaited honeycomb coil is shown in Fig. 7b and 7c. On the diagram 7b the natural capacity of the two windings will be a little less than on the scheme 7c. On the last one the former has on each side 2×9 slots, that is a separate row for each winding. The coils with double winding can be used for H.F. transformers also for heterodynes.

I use finally a third method of winding coils with small distributed capacity, which gives very light coils, because they have no formers. As the construction of such coils is similar to the lace-weaving, let us name them "lace coils." Two samples of lace coils are shown in Fig. 9. They are wound on nails or pins, fixed in a piece of wood on two or more concentric circles. The wire is impregnated during the winding at crossing points with a thick varnish, for instance, shellac or celluloid varnish. When the winding is finished, varnish all the accessible points of crossing and let them dry for 24 hours. When the varnish is dried, take out the nails and remove the coil. The big coil, for instance, with 11 nails fixed on the circumference of diameter $4\frac{1}{2}$ ins., and with 11 nails on the circumference of $3\frac{1}{2}$ ins., has about 60 turns. The inductance is 0·44 mH. The fundamental principles of the winding are the same as for basket coils, with a difference, however, that we must try—in order to attain a greater rigidity of the coil—to get more crossing-points. Thus

in the above-mentioned coil the wire was wound firstly by zig-zags, at the next turn on the outer circumference, passing one nail each time, then again by zig-zags, etc., modifying the system of winding with every turn. We can give full freedom to our

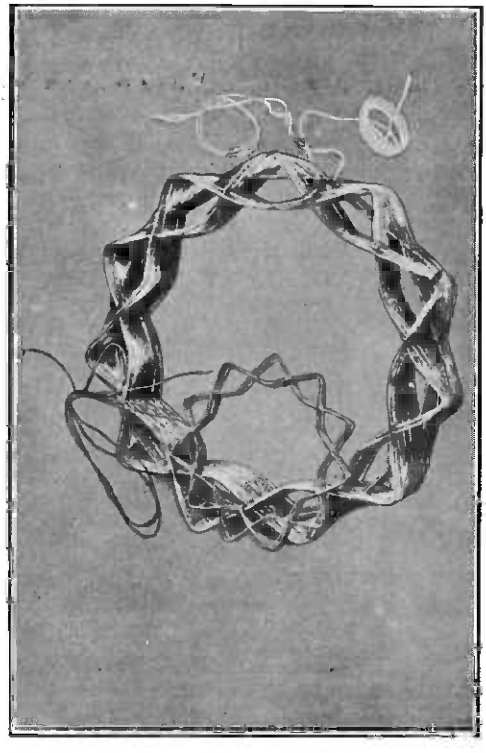


Fig. 9. Specimen of lace coil, having very small capacity and weight.

inventiveness and modify the winding in different ways, varying the number of nails passed, or taking different pitches, changing them at every turn or in every series, etc. We must not forget the general principles of winding mentioned in the foregoing text, and we must avoid to lead the wire with too sharp bends, because in that case the resistance of the coil increases uselessly. In Fig. 10 is shown a sample of the scheme of lace coil winding with 9 turns in the series. As a matter of fact, those coils can also be wound with two wires simultaneously. On the same principle it is possible to arrange a winding on a wooden cylinder, on the circumference of which two rows of nails are fixed. The finished winding will be similar to that shown for plaited honeycomb coils. Loosing the winding from the nails, and taking it cautiously from the cylinder, we shall get a very nice lace-coil type of honeycomb.

In conclusion, a few words about the fixing of the ends of windings may be helpful. In basket-coils I begin by drawing the wire through a hole in the middle part of the coil, and then put the end of the wire under the winding near the centre (in most cases it is possible to put it through along the points of crossing of the wires in the slot; or one can carefully make a space with a thick knitting needle or an awl). Sometimes, on the contrary, it seems more convenient to have the ends of the wires at the circumference of the coil. Then the beginning of the wire is passed through a

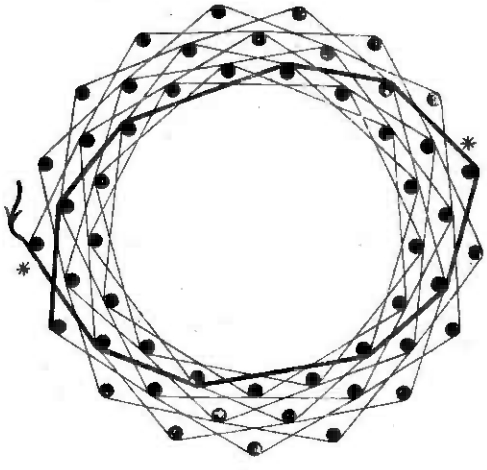


Fig. 10. Example of one of the many possible systems of winding lace coils. One turn is shown for the sake of clearness with a thick line.

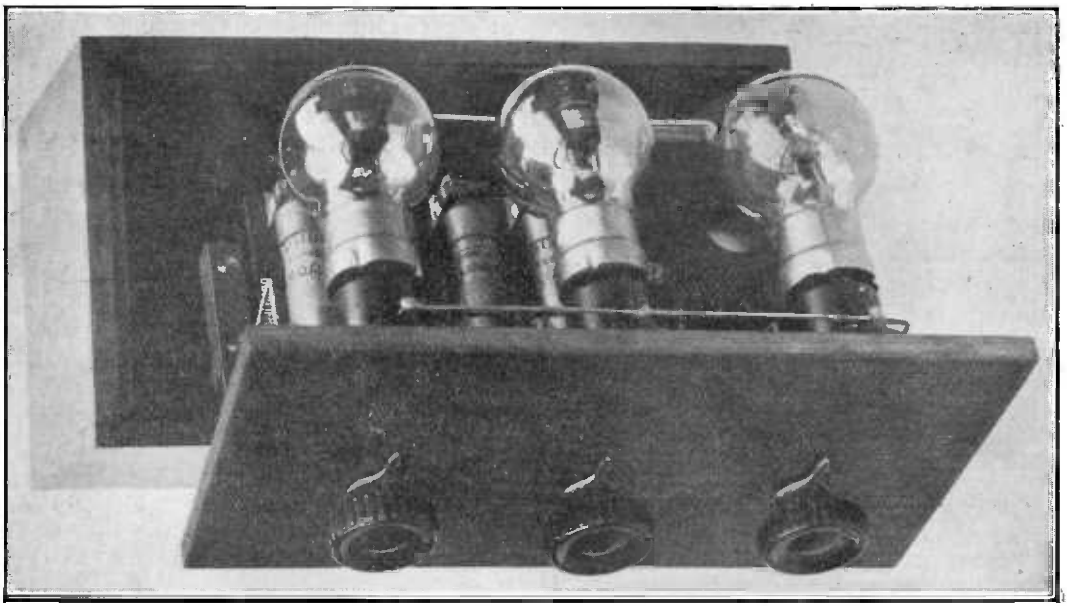
hole in the cog, round the outstanding end of the cog and bound with a thread to the last turns of the wire. In plaited honeycomb coils I always fix the ends with the second method, and in the lace coils it is natural to bind the ends with a thread during the winding, while the coil is not yet taken off from the former. It is best to bind the ends at several points and to several turns.

BUILDING THE THREE-VALVE RESISTANCE COUPLED AMPLIFIER.*

By F. H. HAYNES.

THE merits of resistance-coupled low-frequency amplification have been dealt with, and in this article the necessary constructional data is given for building an instrument embodying the principles described.

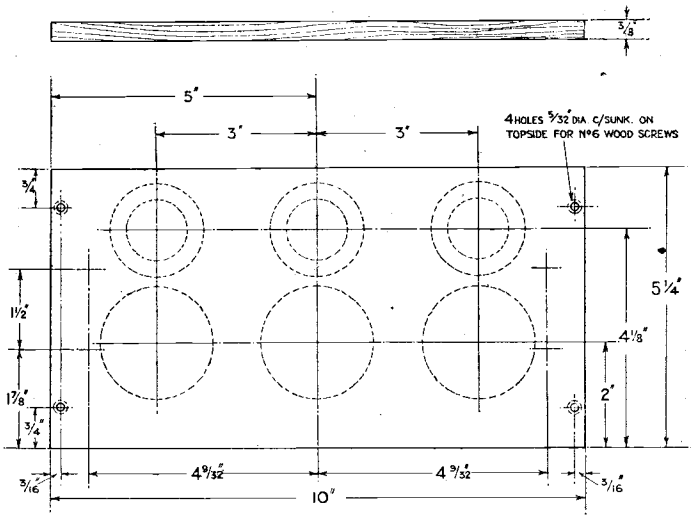
It will be noticed from the accompanying illus rations that the customary ebonite panel for mounting the components is not made use of. This is a feature that may be brought into almost any design providing suitable components are selected. The mounting panels are of wood, and the resistances, valve holders, etc., are of such patterns that no portion of the circuit comes into contact with the woodwork. The filament resistances are of the type which are mounted on moulded Bakelite or porcelain, while valve holders must be sought out which are provided with projecting pins for connections and with flanges for attaching to the wood. The anode resistances must be of reliab.e make and capable of carrying the required current without heating or fluctuating in resistance value, and can be procured with mounting clips of a particularly convenient type. Three of 60,000 ohms resistance and one of 100,000 ohms resistance are emp'oyed. The three grid leaks each have a value of 0·5 megohms. In the grid circuits are connected condensers of 0·2 microfarads capacity. This value is not critical, and may be roughly between $^1/_{10}$ and $^1/_3$ mfds. Various patte ns are available, the most well known being those contained in flat tin cases. In the instrument shown, the author made use of single sections removed from a high tension condenser having mica.



The complete resistance coupled amplifier raised from the box container.

*The general principles of this amplifier were dealt with on p. 35, October 10th, 1923.

dielectric, but sufficient space is allowed for mounting condensers of almost any pattern. Numerous screws, terminals and ebonite, etc., will be needed as shown in the working drawings.

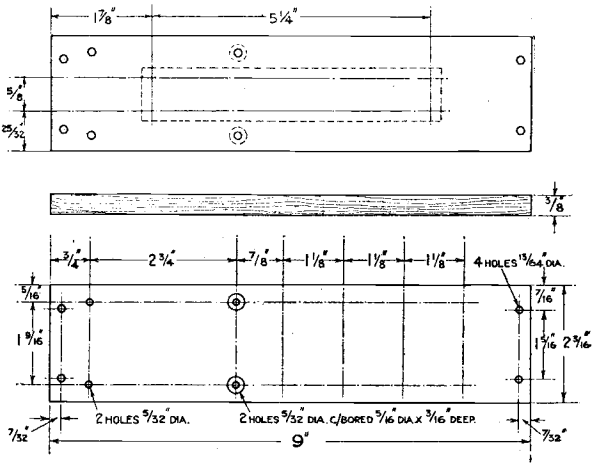


The top panel.

In making up the instrument the first step is to build the rack for carrying the condensers and resistances so that should it be found necessary to extend any of the dimensions owing to an unusual size of grid condenser, allowance can be made in extra length or width in the containing box and its wooden top. In the design given the four condensers and holding-down plate occupy a thickness of 2 ins. If this is exceeded the width of the main panel must be extended by a corresponding amount or one of the valves will foul the condensers. In assembling these condensers as a pack, pieces of thick cardboard or thin slips of wood up to 1/10 in. in thickness and soaked in paraffin wax must be inserted between them. The holders of the anode resistances are easily attached with $^1/_2$ in. by No. 4 countersunk brass wood screws so that the clips do not come into contact with the wood. This mounting rack is made of hard wood, such as teak or mahogany, as is also the panel on which the valve holders and resistances are fixed.

Little need be said concerning the fitting up of these latter components as the detailed drawings are sufficient guide. Two brackets of wrought iron strip are required for attaching the rack to the panel. Such iron strip is easily obtainable, and it is necessary to hammer it while red hot for making the bend. The brackets may be faced up by filing where necessary, and look well if painted a dull black.

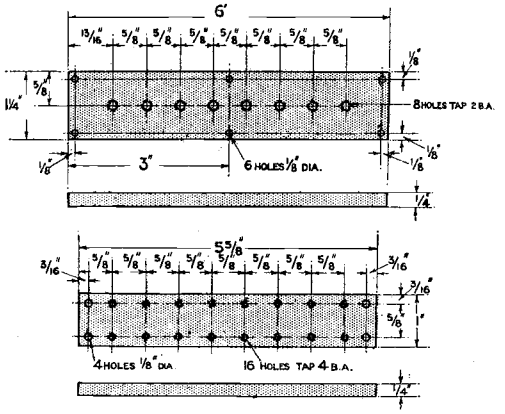
It will be noticed that the valves are accommodated beneath the panel, and filament brightness observed through gratings. The changing of a valve necessitates the removal o the instrument from the box, and for this reason special provision must be made for picking up connection with the terminals, which for the purpose of convenience are mounted a the back.



Details of the wooden panel on which the resistances and condensers are mounted.

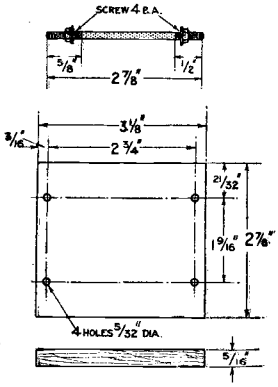
A strip of eight springs mounted on ebonite accomplishes this, details of which are given in an accompanying drawing. The springs are made from No. 28 S.W.G. $^1/_2$ in. phosphor bronze strip, which is not very difficult to obtain. They are attached to the ebonite mounting piece by No. 4 BA by 3/16 in. cheese-headed screws prior

to bending. The bends can be made by placing a piece of 3/16 in. brass rod in position and turning up the ends. The ends of the terminals which project into the box must press firmly against the springs,

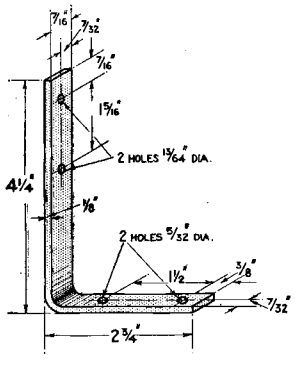


Dimensional drawings of the terminal and connector strips.

which gives a great advantage inasmuch as all circuits are broken, batteries disconnected, etc., when the instrument is lifted from the box.

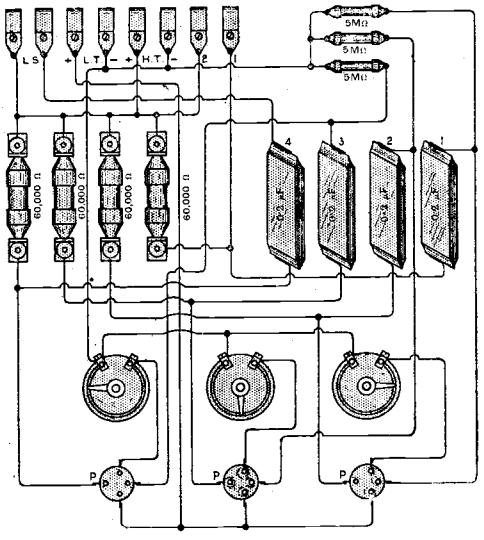


Bolts and wooden piece for clamping up grid condensers.



Iron bracket for supporting condenser and resistance rack.

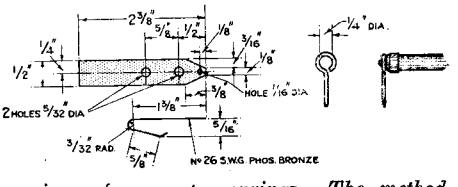
The wiring up should receive special attention, and as this is a most important detail in the construction of the amplifier every care should be taken to make a good job of it. No. 16 S.W.G. tinned copper is used as finer wires are not sufficiently rigid to support themselves and remain in position. Several feet of the wire should be unrolled, and with one end fixed and the other secured around the handle of a tool, tension should be put on the wire until it can be felt to stretch. The ends are then snipped away, and the wire will be found to possess a rod-like stiffness, straight and rigid and entirely free from the slightest kinks. A



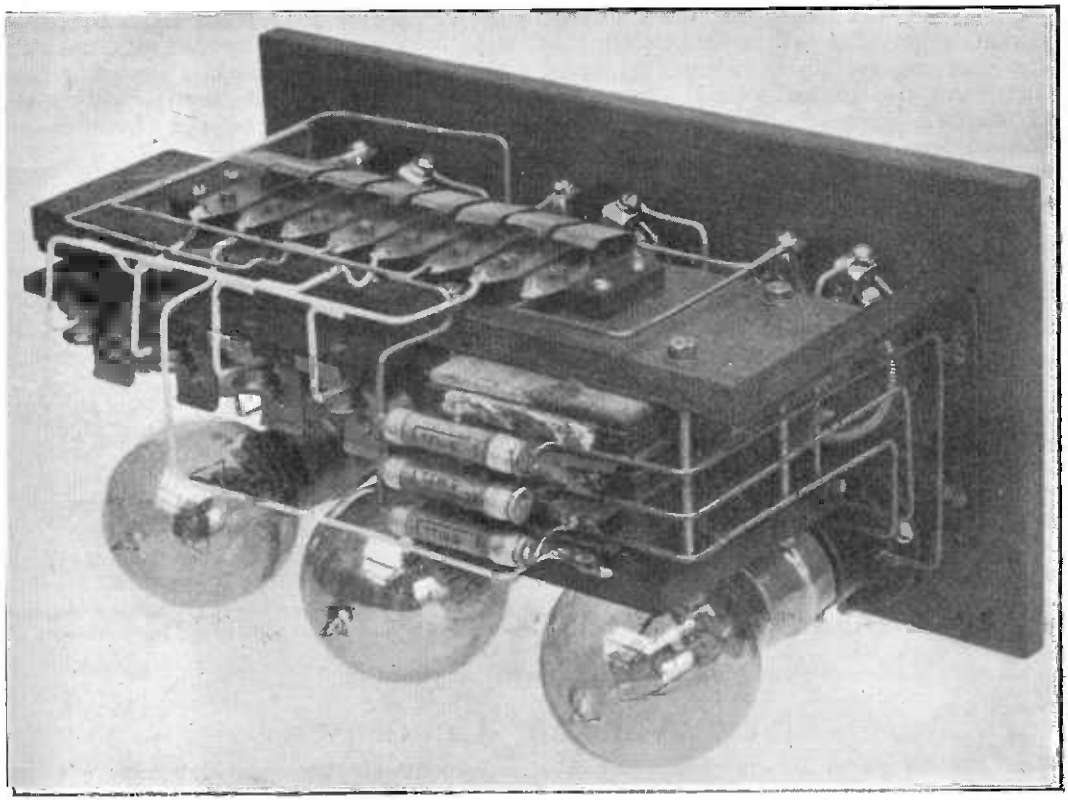
Practical wiring diagram.

very small pair of round-nosed pliers are needed to shape the lengths of wire and the paths taken must be carefully contemplated before the bends are made. It is thought possible that the actual routes taken by the leads can be traced in the accompanying photographs and those given in the previous issue. It might be mentioned that although the wires are well spaced, it is not necessary to consider, in any way, the slight capacity which can be obtained by the proximity of leads as the currents carried are of low frequency.

If the amplifier is operated from a crystal receiver, one must see that the crystal is connected on the aerial side of the telephones and not *vice versa*, for the capacity to earth

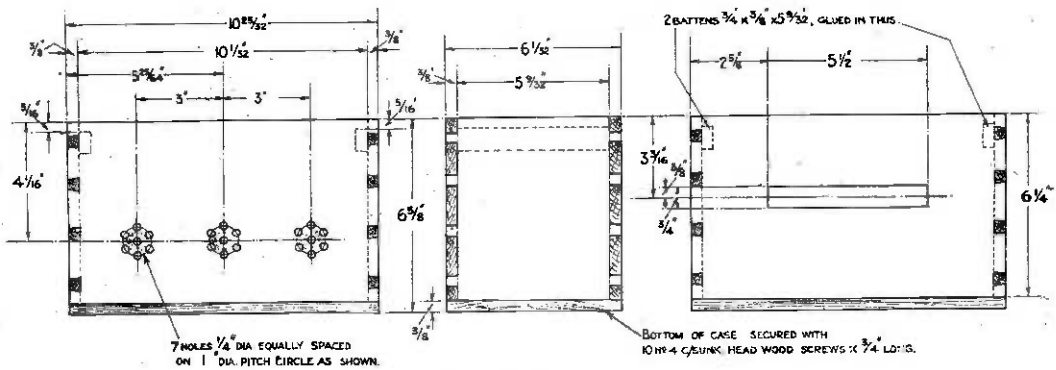


Dimensions of connector springs. The method of making connection to the grid leaks is also shown, and care must be taken not to overheat the leaks as they are wax filled.



This view shows the general arrangement of the components. For clearness and good appearance only right-angle bends are made in the leads, which are enamelled in various bright colours.

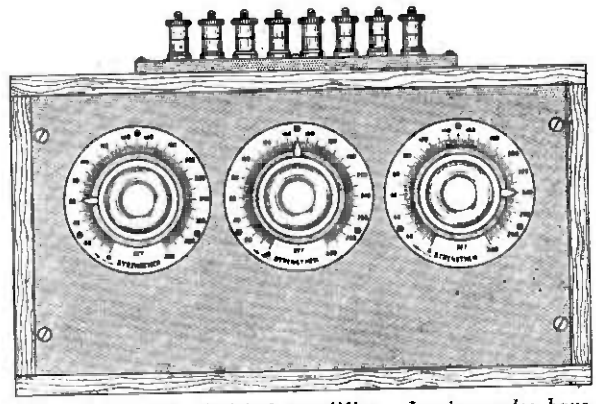
produced by the L.T. and H.T. batteries would provide a shunt path for the oscillations. The telephone terminals of the crystal set must be connected to the amplifier so that the H.T. battery end of the first resistance joins the terminal which is earth connected in the receiver. These precautions apply only, of course, when the receiver is not of the loose-coupled type. When amplifying from a crystal the 100,000 ohm resistance should be the first in circuit, as not only will this give greater amplification



Details of box work.

but the sharpness of tuning will be preserved, for one must not forget that when a tuned circuit is provided with a shunt path that the damping set up broadens the tuning and gives rise to loss of signal strength. A diagram given in the previous issue showed how to connect the amplifier when a valve detector is employed, and no difficulty is encountered providing the same batteries are used for detector and amplifying valves. If a reaction coil is included in the detector plate circuit the value of the first resistance must not exceed 60,000 ohms, consequently the first and second resistances should be interchanged. An additional H.T. battery must be connected to the amplifier to bring the voltage up to 150 to compensate for the drop through the resistances. Normally the use of grid cells is not necessary in the grid circuits of the second or third low frequency valves when resistance coupled.

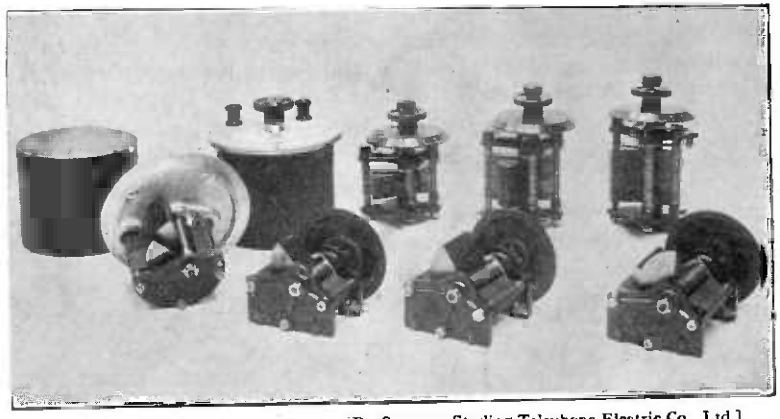
The preservation of quality obtainable with this method of low frequency amplification readily indicates that probably 95 per cent. of the distortion met with in telephony as rendered by loud speakers is due to the use of iron-cored apparatus and incorrect grid potentials, leaving only 5 per cent. as being introduced by the loud speaking apparatus.



View of top of the finished amplifier. Ivorine scales have been added to indicate the settings for the resistances.

New Variable Condensers.

The needs of the scrutinising experimenter have been carefully considered when designing the condensers shown in the accompanying illustration. The variation in the capacity of these condensers, manufactured by the Sterling Telephone and Electric Co., Ltd., is proportional to the square of the angle through which the spindle is turned, which is accomplished by specially shaping the moving vanes. The wavelength curve is thus a straight line. Vernier adjustment is provided, an essential feature for tuning on short wavelengths. The method of construction gives an extremely small minimum, in fact only 12 micromicrofarads in the 0·001 mfd. size. These instruments represent a distinct step forward in variable condenser design.



[By Courtesy Sterling Telephone Electric Co., Ltd.]

Various variable condensers for panel mounting or laboratory use, having specially shaped plates and separately controlled vernier adjustment.

A Simplified Method of Neutralising Valve Capacity in Radio Frequency Amplifiers.

LET us first consider the circuit shown in Fig. 1. If an oscillating potential is maintained between A and B, a current will flow through the inductances L_a and L_b, and also through the condensers C_a and C_b. Now if these inductances and capacities are in the right ratio, namely, if :

$$L_a : L_b :: \frac{1}{C_a} : \frac{1}{C_b}$$

then the potential of P will always be the same as that of Q. The principle is exactly the same as the more familiar Wheatstone bridge shown in Fig. 2.

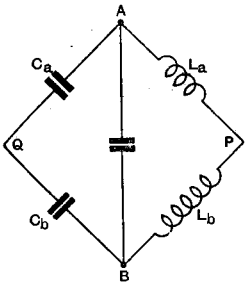


Fig. 1.

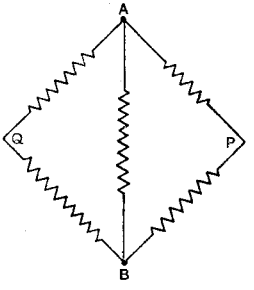


Fig. 2.

Consider next the circuit of Fig. 3. This is the part of Fig. 4 that corresponds to Fig. 1. It will be seen that condenser C_b is replaced by the valve capacity which it is desired to neutralise, but that the circuit is otherwise unchanged. If, therefore, an oscillatory current is flowing in the circuit, Q will have the same oscillatory potential as P ; that is to say Q will have no oscillatory potential due to the currents flowing in the circuit, for P has a constant potential.

If the coil L_1 has an inductance of one-twentieth of that of the coil L, C_1 must have a capacity twenty times that of the valve. The reason for keeping this ratio high is that only the potential across the coil L is handed on to the next valve, that across L_1 being wasted. If desired the ratio can be made higher still, but it is best to keep condenser C_1 small, so that it does not appreciably affect the tuning of the circuits.

It is a little difficult to know what setting of the neutralising condenser exactly neutralises the capacity of the valve, but the

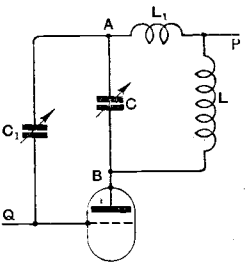


Fig. 3. *Corresponding to the arrangement of Fig.* 1.

following method gives a rough indication. With an ordinary receiver of the " tuned anode " type with reaction into the anode circuit, it is generally found that the set oscillates more readily when the aerial circuit is in tune with the anode, which clearly shows that there is some reaction into the aerial circuit. With the above set this effect gradually disappears as the

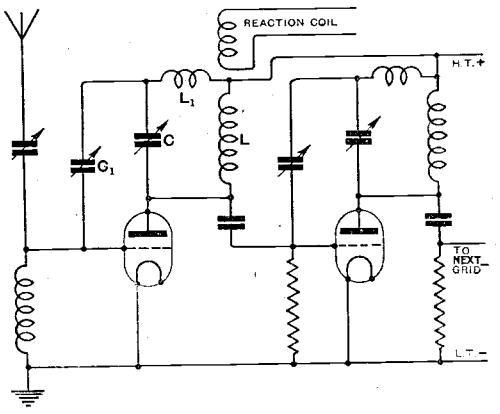


Fig. 4. *A valve circuit diagram illustrating the method of neutralising valve capacity.*

neutralising condenser is increased up to its correct value.

It is impossible to give exact values for the neutralising condensers, as they depend not only on the actual internal valve capacity, which itself varies widely with different makes of valve, but also depends largely on the type of valve holder used and the wiring of the panel. A suitable trial value might be 0·00005 mfds., which is about the size of most of the "vernier" condensers now on the market.

To benefit by this arrangement, it is essential to avoid magnetic coupling between the aerial coil and the various anode coils. They should be well spaced out preferably placed with their axes at right angles. It is also better to use a separate high tension battery for the H.F. amplifier as the detector will cause a radio-frequency component of current through it, and will, if the battery has any resistance, impress an alternating potential on all the anode circuits. If this is not done, it is best to connect a large condenser across the battery which will greatly reduce its resistance to high frequency currents.

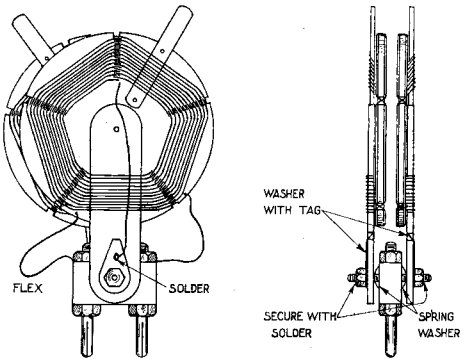
Finally, let me forestall criticism by saying that I do not claim to have invented a new principle, but rather to have produced a circuit which achieves its purpose more simply than some others which have been published.

W.L.

A Simple Type of Variometer.

THE accompanying drawings indicate a design of variometer particularly suitable for portable receivers.

The two coils are mounted on a spindle which passes through the coil plug. The



coils are held by the spring washers and nuts shown in the figure.

Consequently, either coil may be rotated about the spindle. In this way, if the coils are connected in series, the total inductance is variable.

Another arrangement consists in using one coil as an anode coil, and the other as the reaction coil, the critical amount of reaction being easily obtained by adjusting the position of the coils.

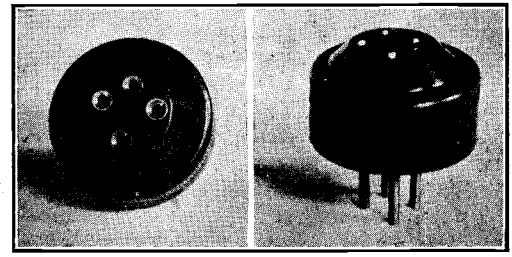
Instead of mounting a single coil on one support, the two windings of a transformer may be supported, and reaction effects secured with the other coil as before. Other uses suggest themselves.

When used as an aerial circuit variometer for the reception of British broadcast transmissions, the coil formers may be cut out of stout cardboard 3 ins. in diameter with five slots, and wound with 35 turns of No. 26 D.C.C. wire.

R.J.D.

Combined Valve Holder and Resistance.

A neat arrangement of combined valve holder and filament resistance is illustrated where the variation in resistance is obtained



by rotating the holder. This component is made by Messrs. Dickson & Gow, Ltd., 112, Bath Street, Glasgow.

INSTRUCTIONAL ARTICLE FOR THE LISTENER AND EXPERIMENTER.

VARIOMETERS.

When a continuously variable inductance is required, an instrument termed a variometer is used. Below is discussed the principles underlying the design of various types.

By W. JAMES.

SUPPOSE we have a two-layer coil such as that shown in Fig. 1. Let us consider the turns are very thin, so that we may assume the mean diameter of the winding A B is the same as that of C D. Then, since the number of turns in each winding is the same, and the lengths are also the same, the inductance of winding A B is exactly equal to that of winding C D.

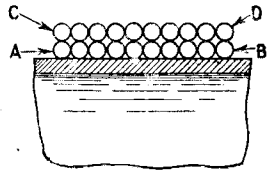


Fig. 1. To explain the principle of variometers.

(*A*) Let us suppose now that the ends C B are connected together to give a two-layer coil. The total inductance is *four times* the inductance of either winding taken separately. Thus, if the winding is 20 cms. long, 10 cms. mean diameter, and 10 turns are wound in one winding per cm. length, the inductance of each coil taken separately is 1,615 μH. With the windings in series, to give a two-layer coil, the inductance is 6,460 μH.

The total inductance L may then be said to equal L_1+L_2+2M, L_1+L_2 being the inductance of the separate windings. In the case considered, M is clearly equal to 1,615 μH ($= L_1 = L_2$).

(*B*) Let us now consider the end B is joined with end D. A current flowing through the windings will produce no magnetic field, because the field due to A B is equal and opposite to the field of C D. We have in fact a coil with negligible inductance. It will be remembered coils for use in resistance boxes, which are required to have no inductance, are wound in this manner. We may write $L = L_1 + L_2 - 2M$, and clearly M has the same value as above; then L = zero.

The quantity M is named the *co-efficient of mutual inductance*, and is expressed in henries, or parts of a henry, in the same way as inductance.

(*C*) The mutual inductance depends upon the inductance of each coil and their relative position; also the material between them. When both windings are in the same direction as in section (*A*), the mutual induction is a maximum when the windings are together. As they are separated M is reduced, and reaches its lowest value when the windings are in opposite directions.

(*D*) To obtain this variation in the value of M (and therefore in the inductance of the two windings connected in series) in practice, one winding is wound on a fixed former, and the other is wound on a former

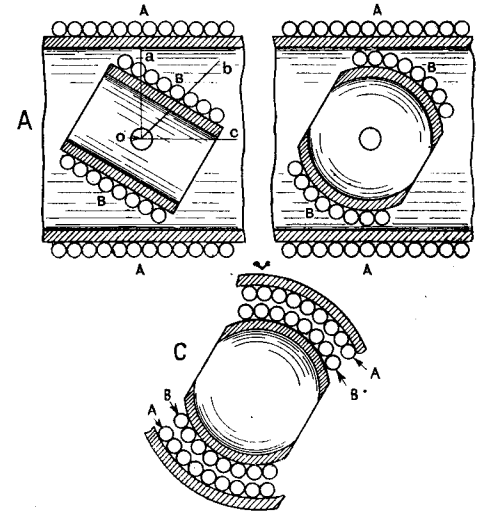


Fig. 2. The shape of some ordinary variometers. A. The fixed winding A *is wound on a cylinder and the moving winding is wound on a smaller cylinder* B. *B. Here the rotor consists of a winding upon a ball. C. This is the best method of all. The rotor and stator windings* B *and* A *are wound on portions of spheres, so that they are quite close together.*

C

which is provided with a knob and mounted so that its relative position with the fixed winding is easily changed. These two parts are called the stator and the rotor.

(*E*) There are three common types. Referring to Fig. 2A, the stator A is a cylindrical winding, and the rotor B another smaller cylindrical winding which is pivoted and rotatable. In Fig. 2B, the stator is as before, but the rotor winding B is on a ball. Fig. 2C shows both windings arranged in portions of spheres.

The total inductance has its maximum value when coil B is vertical, that is at oa, Fig. 2A, the windings being in the same direction. As the rotor is turned the inductance falls; it is obviously smaller when at ob, and smaller still when at oc.

If both windings have the same inductance $L_1 = L_2$, as in (*A*) above, the maximum inductance will not equal $4L_1$, as before, on account of the distance between the windings even when they are parallel; also, the inductance will not be almost zero when the windings are in opposition. The *variation* in inductance is smaller the further the windings are separated. The inductance variation is greatest of all when the coils are arranged like those of Fig. 2C.

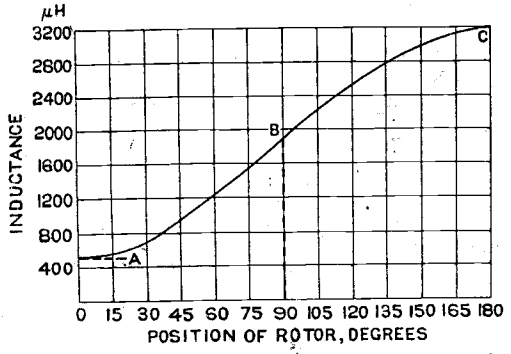


Fig. 3. The curve shows the inductance of a variometer for different settings of the rotor.

The Inductance.

(*A*) The inductance of a variometer is given by $L_1 + L_2 \pm 2M$, where L_1 is the inductance of one winding, L_2 that of the other, and M is the mutual inductance. M may be either positive or negative, according to whether the coils are placed with the windings in the same direction or in the opposite direction.

The value of M is not easily calculated, and no formula is given here. It is better to measure the inductance of a variometer for several positions of the rotor. If the value of M is required, it may then be found as explained in Vol. XII, No. 22, page 738

The ratio of the maximum inductance to the minimum inductance cannot ordinarily be made to exceed about 12 to 1.

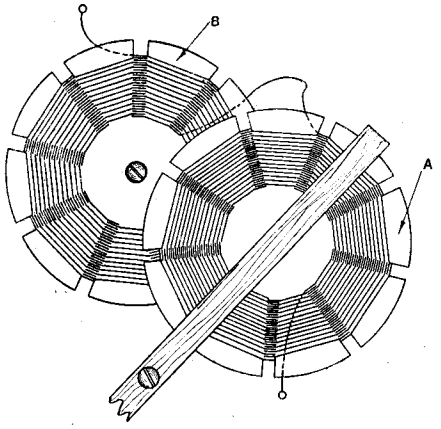


Fig. 4. Perhaps the simplest form of variometer consists of two basket coils connected in series, one of which, A, is movable with respect to B.

(*B*) A typical inductance curve of a variometer like Fig. 2B is given in Fig. 3. The inductance variation is roughly 6 to 1. The minimum value is 500 μH, and the maximum value 3,200 μH, the two windings being connected in eries.

It will be noticed the curve is practically straight along the central portion; the variation takes place only slowly at the beginning and the end of the movement of the rotor. At point A, the inductance is equal to $L_1 + L_2 - 2M$; at B, the inductance is $L_1 + L_2$ and at C has reached $L_1 + L_2 + 2M$.

A greater variation is possible if it is arranged to connect the windings in series

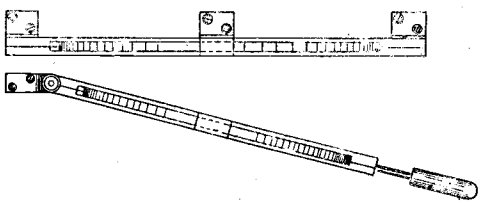


Fig. 5. This type is often employed in transmitters, the two spiral windings being connected in series, and one movable with respect to the other.

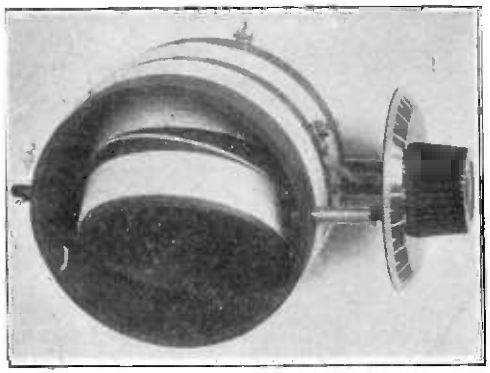


Fig. 6. A variometer represented in Fig. 2A.

or in parallel. When the windings of the variometer referred to above were connected in parallel, the inductance was variable between 120 μH and 840 μH.

Losses.

The losses which take place in ordinary inductance coils, described in Vol. XII, No. 24, page 794, also occur in variometers. To reduce them, the turns should, if possible, be slightly spaced apart. Dielectric losses will be reduced by using formers of skeleton construction.

It is poor practice to wind the coils on solid masses of insulating material, especially when the material used has not been selected on account of its low losses, but rather because it is cheap and easily moulded.

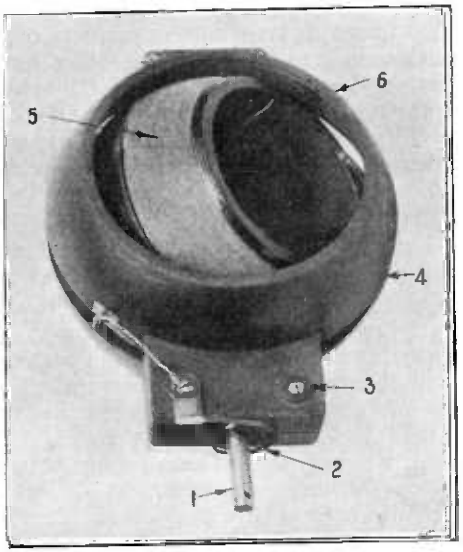


Fig. 7. This variometer is represented in Fig. 2C. Here, 1 is the spindle carrying the rotor 5. The spring 2 makes connection between the rotor and stator 4. Notice the rotor winding 6 is on the inner surface of the stator former. The other end of the coil is connected at 3. (Igranic Electric Co., Ltd.)

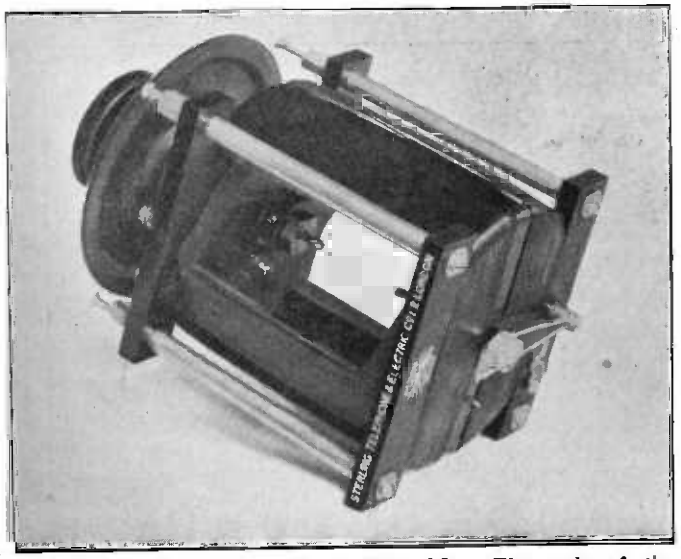


Fig. 8. Another variometer of type 2C. The ends of the windings are brought to terminals, and may be easily joined in series or parallel. Notice the method of making contact with the rotor through the wires which are held against the moving contact with a spring. (Sterling Telephone & Electric Co., Ltd.)

An excellent type, illustrated in Fig. 8, has parts of the winding self-supporting.

Because the whole of the winding of the variometer is in circuit, when only a fraction of the total inductance is used, the losses will be greater than when an ordinary coil of this inductance is employed.

Types of Variometers.

(*A*) Probably the simplest variometer is constructed by arranging one basket coil to move away from another, Fig. 4. The inductance variation, however, is not very large, and will be smaller the greater the distance between the plane of the coils. Therefore, if a reasonable variation is required, the surface of the moving coil should only just clear the surface of the fixed coil. This type is often

employed as the aerial tuning inductance of receivers when a limited wavelength range only is required.

(*B*) An equally simple arrangement often to be found in transmitters consists of two spiral coils, one fixed and the other hinged (Fig. 5). The inductance is varied by changing the position of the moving coil. Of course, any form of coil may be used, provided it is designed to work properly in the circuit it will be used in.

(*C*) Variometers of the types referred to in Fig. 2, A, and C, are illustrated in Figs. 6, 7, 8 and 9.

The reader should notice the method of supporting the rotor in each case. The instrument illustrated in Fig. 8 is in particular an excellent example. The screws which are seen projecting from the pillars are used to hold the variometer to a panel. The stator winding is self-supporting between the top and bottom mouldings. The end of each winding is brought to a terminal, and with the aid of a switch (not shown) may be connected in parallel or series.

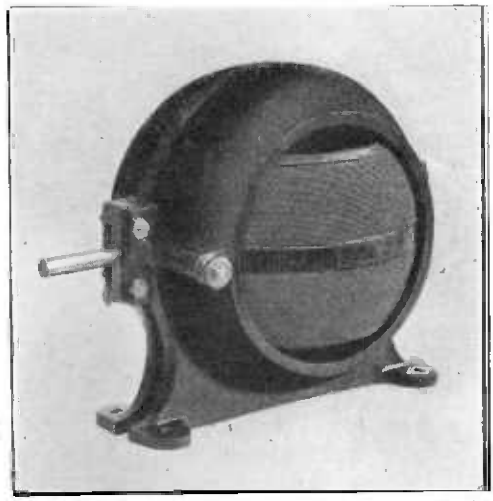
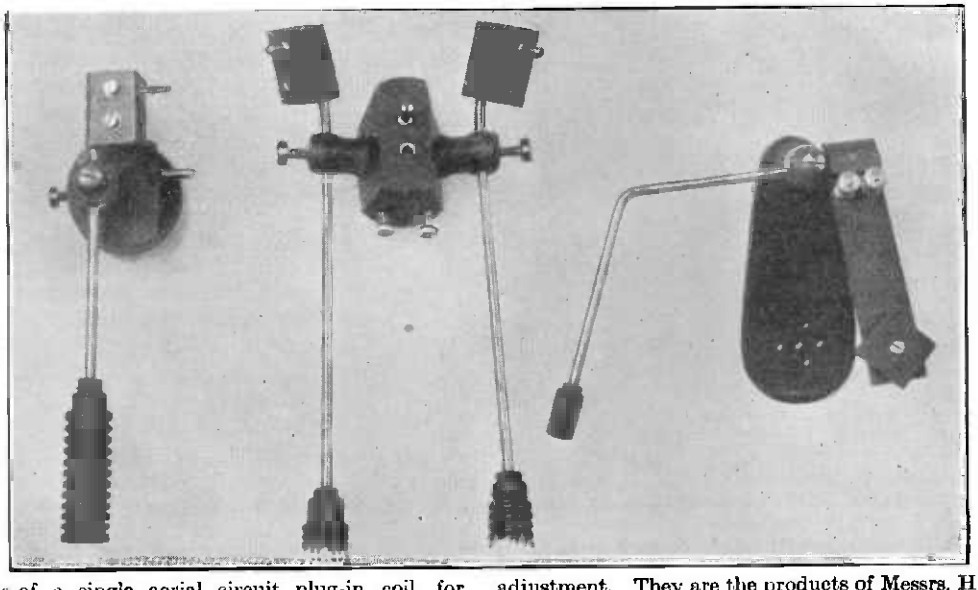


Fig. 9. This variometer is specially useful for experimental work because it is provided with feet for easy fixing to a board. The stator is internally wound, and connections from the rotor are made through the split shaft. (G. E. Marbaix.)

The method of making connection with the ends of the rotor is clearly shown.

Useful New Coil Holders.

The action of the coil-holders can be seen from the accompanying illustration without further description. For substituting loose coupling in place of a single aerial circuit plug-in coil, for reacting on to the tuned anode or H.F. transformer winding, or for converting condenser tuned anode to variometer, with or without reaction, the holders are particularly suitable, and give critical adjustment. They are the products of Messrs. H. L. Wood & Son, Ltd., of 24, Bride Street, London, E.C.



Wireless Club Reports.

Contributions to this section are welcomed. Reports should be as concise as possible and should record the most interesting features of each meeting. The Editor reserves the right to edit the reports when necessary. **Papers read before Societies will receive special consideration with a view to publication.**

An asterisk denotes affiliation with the Radio Society of Great Britain.

Tottenham Wireless Society.*

Condenser calibration had been arranged for Wednesday, September 26th, but the delay in arrival of a standard necessitated a sudden alteration. Mr. Kaine-Fish ably filled the gap with a lecture on "Waveform and Resistance Calculation," the first of a series.

Mr. P. Grimshaw demonstrated his buzzer wavemeter, and gave details of its construction, and Mr. Ellis and Mr. Cole gave their experiences in transatlantic reception, stating they had received the broadcasting on Sunday morning, September 22nd, on two valves, Mr. Cole finding **WJZ** audible on one valve.

Hon. Sec., S. J. Glyde, 137, Winchelsea Road, Bruce Grove, Tottenham, N.17.

Heckmondwike and District Wireless Society.*

The Society opened the third winter session on Friday, September 28th, when Mr. Denison, of Halifax, lectured before a large audience. The subject which Mr. Denison had selected was "Mains" and the lecturer discussed what could be done with them from the standpoint of a wireless enthusiast. Both L.T. and H.T. uses were dealt with very ably and different methods explained.

Hon. Sec., P. Hanson, Longfield Road, Heckmondwike.

Ilford and District Radio Society.*

On September 20th, Mr. A. J. Thompson gave a very interesting lecture on "Vacuum Tubes." The lecturer introduced his subject with a short explanation of the electron theory of the structure of matter, continuing with an explanation of the development of the two-electrode thermionic valve and the ultimate evolution of the three-electrode valve.

Hon. Sec., L. Vizard, 12, Seymour Gardens, Ilford.

Huddersfield Radio Society.*

The annual general meeting of the Society was held on Tuesday, September 25th at the new Lecture Hall, Y.M.C.A. Buildings.

The Secretary's report on the last year's work was read, and it was agreed that for the first year the Society's work had been successful. Attention was drawn to the lectures, and considering the quality and interesting nature of these it was considered that the attendances were not as good as might have been expected. Some excellent lectures had been procured for the coming season, including lectures for beginners, and two visits to the Manchester station of the British Broadcasting Co., Ltd. had been arranged.

The Treasurer presented his balance sheet, which was adopted. The balance sheet showed that the Society had a satisfactory balance in hand.

Mr. Sellers spoke of carrying out some interesting transmission tests with the co-operation of the members, details of which will be issued later. Questions were asked on various items by the audience, and were answered by the organising Secretary. Some new members were enrolled, and the membership is now on the hundred mark.

Hon. Sec., J. A. Badham, 14, John William Street, Huddersfield.

The Woolwich Radio Society.*

Eighteen members of the Society paid a visit to Croydon Aerodrome on Sunday afternoon, August 26th, 1923, by kind permission of the Air Ministry.

The engineer in charge showed the visitors the transmitting station and the actual transmission of messages to aeroplanes in flight was witnessed. A visit was then paid to the direction-finding station, where the mechanism for receiving from and tracking aeroplanes was shown. Afterwards the party was shown round the aerodrome, where the cabins and engines of several large aeroplanes were inspected, including Handley Pages, Instone Liners, and the ill-fated Farman Goliath that next day came to grief at Malling.

On Sunday, September 23rd, a second party of 15 members visited Croydon Aerodrome, and the same courtesy was shown by the officials.

On Wednesday evening, September 26th, at the Y.M.C.A., Woolwich, the Society was honoured by the presence of Captain C. F. Frost, of the Staff of the British Broadcasting Company. Captain Frost began his remarks by briefly sketching the progress of broadcasting in England since the formation of the B.B.C. in March. He spoke of the almost impossible conditions under which broadcasting was carried out at Magnet House, and of the greater facilities enjoyed at 2, Savoy Hill. The new studio, in which many members have been, was described, and many humorous incidents of events therein related. Simultaneous broadcasting was then touched upon, also the broadcasting of operas and plays from the theatre. Captain Frost concluded with a discussion on the future of broadcasting.

Captain C. T. Hughes, in passing a very hearty vote of thanks to Captain Frost, touched briefly on the subject of interference, fading and kindred topics, and suggested several lines of fruitful investigation for members during the coming session.

Hon. Sec., H. J. South, 42, Greenvale Road, Eltham, S.E.

The Radio Society of Willesden.*

The re-opening meeting of the Society took place on September 25th.

Mr. E. Earnshaw-Wall was elected Chairman in the place of Mr. D. G. Wyatt, who had resigned office. Mr. Coote then briefly referred to the summer activities, and a discussion on the coming winter session followed. Several suggestions were proposed and adopted, among these being the formation of a small sub-committee to deal with the development of the social side of the Society's programme, and dances and smoking concerts, etc., are being arranged. Applications respecting membership should be addressed to the Hon. Secretary, F. H. H. Coote, 183, Carlton Vale, Maida Vale, N.W.6.

Walthamstow Amateur Radio Society.*

On Thursday, September 27th, Mr. H. A. Forster gave a very interesting and instructive lecture on "Electricity and Magnetism."

Beginning with the discovery of magnetism, the lecturer briefly explained the growth of this science, and showed the great possibilities of static electricity.

Hon. Sec., H. J. Sarson, Belle Vue House, Beacontree Avenue, Walthamstow, E.17.

The Prestwich and District Radio Society.

A well attended general meeting of the Society was held on Monday, September 24th, when it was unanimously decided to proceed with the erection of permanent premises for the sole use of the Society and for the installation of transmission and other apparatus.

Mr. Page gave a description of the methods of winding honeycomb coils, illustrating with diagrams, and also with samples of wound coils and the apparatus used. An interesting discussion terminated the meeting.

Hon. Sec., H. A. Wood, Spring Bank, Church Lane, Prestwich.

Cowes District Radio and Research Society.

A start has been made with the new session, the annual meeting having been held on September 5th, when a very encouraging state of affairs was reported, and a small cash balance carried forward.

The President, Sir Godfrey Baring, Bart., has kindly consented to continue his presidency for another year, and the only change in the Committee is the appointment of Mr. N. L. Phillips to the vacancy left by Mr. Hartridge, who becomes Secretary.

Already many valuable offers of lectures have been received. Particular attention is being paid to the elimination of local interference.

Hon. Sec., E. Hartridge, Llangollen, Alexandra Road, Cowes.

Fulham and Putney Radio Society.

At the weekly meeting on September 21st, Mr. Aland demonstrated a dual amplification receiving set embodying two valves and a crystal. The evening was also marked by a test of loud speakers, for which purpose Mr. Aland's set was employed. Several kinds of loud speakers were at hand, many of them having original features, and valuable observations were made regarding the elimination of distortion and extraneous noises.

On September 28th, Mr. W. Wooding exhibited a collection of inductance coils, all being of original design, special attention being paid to the reduction of capacity between turns. Apparatus for the winding of these coils was also shown and demonstrated. A novel form of three-element tuning condenser, also of Mr. Wooding's design, was shown, which, when tested on the Society's receiving set, showed remarkable selective properties.

Hon. Sec., Mr. H. Finlay, 169, New King's Road, Fulham, S.W.6.

East Ham Radio Society.

The Society has, since its inauguration a month ago, made rapid strides. A sausage aerial has been erected on two 35 ft. masts, and has caused great comment in the district. New members are being enrolled at every meeting.

Hon. Sec., Charles Bull, 26, Keppel Road, East Ham.

Sydenham and Forest Hill Radio Society.

An interesting lecture with demonstration was given by Mr. S. R. Nicholls on Monday, September 24th, on the S.T.100 circuit. This circuit was published in *Modern Wireless* of June, 1923, under the heading "Remarkable results obtained with S.T.100 Circuit: full details in this issue." Many wireless enthusiasts had tried to wire up this circuit as shown in *Modern Wireless*, but owing to the complicated method of showing the circuit, many had failed to make it work.

Mr. S. R. Nicholls re-drew the circuit to show how simple the circuit was.

Headquarters, "The Greyhound Hotel," Sydenham, S.E.26.

Hon. Sec., M. E. Hampshire, 139, Sydenham Road, S.E.26.

Brighton and Hove Radio Society.

Much interest has been aroused in the district by the presentation by the Society of a three-valve wireless set to the St. Dunstan's Annexe, Brighton.

The ceremony took place on Saturday, September 13th, when many distinguished persons were present. A special speech of thanks was delivered by Captain Ian Fraser, Chairman of the Blinded Sailors' and Soldiers' Hostels, London.

Liverpool Co-operative Radio Association.

Under the auspices of the above newly-formed Association, Mr. S. Frith (President) delivered his "Wireless Talk for Beginners" to a large and enthusiastic audience at Unity House, Byrom Street, Liverpool, on Friday evening, September 21st. He traced the origin, growth and development of wireless telegraphy from the earliest times, some eighty years ago, to the modern three-electrode valve.

Mr. Frith's lecture was highly instructive, and the practical demonstration he gave on electrical apparatus of the existence of the wireless wave proved very interesting.

Intending members of this Association are requested to communicate with the Hon. Sec., J. Kearns, 162, Walton Road, Liverpool.

NOVEL IDEAS AND INVENTIONS

Abstracted by

PHILIP R. COURSEY, B.Sc., F.INST.P., A.M.I.E.E.

Generating Very Short Waves.

With the ordinary circuit arrangements customarily associated with thermionic valves it is not practicable to generate oscillations of extremely short wavelength—such, for example, as of the order of 1 metre. The internal capacity between the electrodes of

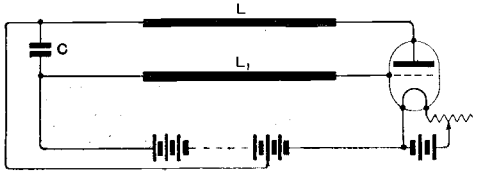


Fig. 1.

the valve plays an important part in determining the wavelength of such short waves, and in limiting the wavelengths which can be produced. It has been proposed to make definite use of these interelectrode capacities to control wavelength of the oscillations by causing them to provide the main capacity of the oscillation circuit.* The frequency of the oscillations does not depend simply upon the capacity and inductance of the circuit, but is controlled very largely by the voltage of the grid of the valve.

One possible arrangement is shown in Fig. 1, from which it will be noted that the main H.T. potential, of from 100-200 volts, is applied to the grid of the valve, whereas the plate has only a much smaller positive potential of 2 or 3 volts. The action underlying the production of the oscillations is therefore mostly concentrated on the grid.

The rods LL_1 serve as resonators and their length should be adjusted to the wavelength of the oscillations—or conversely the wavelength should be altered by varying the grid voltage and filament brilliancy until it is in tune with the rod resonators LL_1. The condenser C joining the ends of the rods LL_1, acts merely as a blocking and bypass condenser.

* British Patent No. 198757, by E. W. Gill, J. H. Morrell and Marconi's Wireless Telegraph Company, Ltd.

Sound Reproduction.

Purity in sound reproduction by telephones, loud speakers and other similar apparatus has always been an ideal aimed at but not always approached. Another attempt to improve the reproduction has been made by increasing the number of

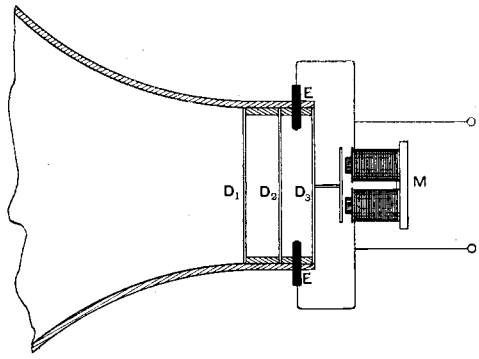


Fig. 2.

diaphragms in the telephone or reproducer, so as to obtain closed spaces filled with gas between the diaphragms*. Fig. 2 illustrates one arrangement in diagrammatic form. Three diaphragms D_1, D_2 and D_3 are mounted in parallel planes, the space between D_1 and D_2 being filled with air; and that between D_2 and D_3 with some other non-inflammable gas. The last mentioned diaphragm is actuated by the magnets M in any well-known manner.

The special feature of the arrangement is that electrodes are provided in the space filled with gas, so that a small current can be passed through the gas at the same time as the diaphragms are in vibration. The source of voltage to supply this current is derived from the P-D across the ends of the windings of M as shown, and it is claimed that this addition considerably improves the sound reproduction.

* British Patent No. 198799, by W. H. Clifford.

Double-Grid Valves for Radio Telephone Transmitters.

By the use of a special method of modulation in conjunction with double grid valves, it is claimed to be possible to feed the transmitter from low voltage supply circuits, such as of about 110 volts.* The arrangement is sketched in Fig. 3, in which V is the double-grid valve having an anode A and grids G_1 and G_2. The anode A and grid G_1 are connected to the oscillation circuit LC in a usual manner so that oscillations are set up in that circuit. The anode A is fed from H.T. + through the

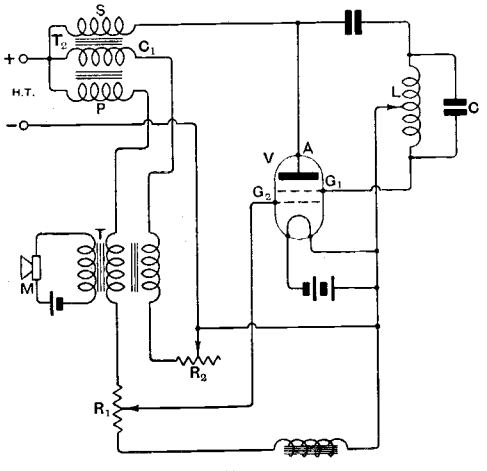


Fig. 3.

winding S of a three-coil transformer, T_2. The control grid G_2 is connected through the resistance R_1 to one secondary winding of the microphone transformer T, which winding is also in series with winding P of the feed transformer T_2. Thus the action of the microphone is not only to vary the potential of the control grid G_2, but also to effect a simultaneous direct control of the potential of the valve anode through the action of the transformer T_2. The additional secondary winding of the microphone transformer T is joined in series with the compensating winding C_1 of the feed transformer T_2, and thus serves to eliminate permanent magnetisation of the iron core of the microphone transformer by the current drawn through its windings from the H.T. source.

* British Patent No. 175635, by the Gesellschaft für drahtlose Telegraphie (Telefunken).

A Chopper for Tonic Train Transmission.

To facilitate the interruption of the oscillations at the transmitter in order to effect tonic train (or I.C.W.) transmission, a rotary interrupter may be mounted on the shaft of the generator supplying the H.T. current to the set*. The arrangement is particularly applicable to transmitters for use in aircraft.

Plugs and Sockets for Tuning Coils.

For many uses it is desirable to be able to reverse the direction of the magnetic field from the coil. In the case of most standard arrangements of plug-in coils, it is not possible to do this without reversing the connections to the socket into which the coil is plugged. If, however, a different type of plug and socket is employed, it is possible to overcome this difficulty. Thus by using a plug and socket in which the two electrodes are concentric—similar to the concentric plugs sometimes used on electric power circuits—the coil can be turned round without changing or breaking the connections†.

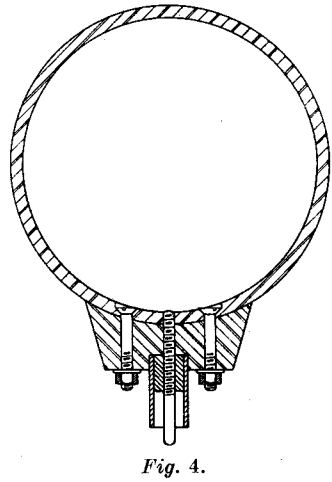


Fig. 4.

A simple attachment enables coils fitted with the ordinary plugs and sockets to be plugged into a holder fitted with concentric sockets, so that full advantage may be taken of this method of mounting without the necessity of replacing any existing coils. A cross-sectional diagram of one of the plugs is given in Fig. 4.

* British Patent No. 199279, by J. Robinson.

† British Patent No. 199258, by J. H. L. Bridge.

CORRESPONDENCE

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—I read with considerable interest Mr. Richardson's letter published in the September 12th issue of your valuable journal. This letter is all the more interesting to me since Mr. Richardson's experience with the Continental telephony stations seem to be entirely contrary to my own.

Mr. Richardson states that **FL** telephony is nearly always poor, whereas **SFR, PCGG** and L'Ecole Supérieure are always R7. In my case **FL** telephony is always at good loud speaker strength and **PCGG** is also quite good, about R5. but **SFR** and L'Ecole Supérieure come through very weak at times, Kœnigswusterhausen being about three times the strength of **SFR.** The set used consists of one valve dual, crystal detector and one valve L.F., and my aerial is a single wire 100 ft. L type, 15 ft. high at free end and 35 ft. at the lead-in end, directional N.E. It is interesting to note that a friend living about half a mile away from me receives **SFR** on the loud speaker using three valves.

I think it is agreed that any set is most sensitive on a certain wavelength, depending on the length and capacity of the aerial and also on various constants in the set itself, but do not the above results point to the probability that there are several such wavelengths to which a set can be tuned, possibly "harmonics" of the original one, the sensitivity being less on the higher "harmonics" than on those nearer the true wavelength. Thus, in the case of my set, I consider that possibly one of these "harmonics" falls on or about 2,600 metres, hence my satisfactory reception of **FL** on that wavelength and of Kœnigswusterhausen on 2,700 metres.

This explanation would account for the great difference in results obtained on a given station by people living in the same neighbourhood, but using aerials with different constants.

It would be interesting to have the views of other experimenters on this question.

ROLAND F. TERRY.

Gravesend.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—I have been following the discussion in your paper about the problem of "fading," and would suggest the following solution for some at least of its aspects:—

(1) It is well-established that the smoke from a factory chimney acts as a lightning conductor to dissipate the accumulated pressure during electrical disturbances of the atmosphere, each particle of smoke carrying a charge of electricity.

(2) The atmosphere near towns such as London and Manchester probably forms an electric conductor of the second class, varying according to wind, etc.

(3) So far as transmission to a distance *via* the Heaviside layer is concerned, it would probably be affected more by electrically charged smoke above the aerial than by such at a lower level, and the vagaries of fading might be due to the eddying of smoke into the upper atmosphere.

It would be very interesting to collect particulars of fading in different directions round **2 LO,** noting, say, particulars as to strength and direction of wind, cloudiness of sky, etc., also electric state of atmosphere—thunder, etc.

A. DAVIDSON.

Cummersdale, Nr. Carlisle.

Reception in Cornwall.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—Having obtained the necessary permission from the P.M.G., I took my wireless receiving set to Hayle, Cornwall, during my holiday there in August. The results obtained were beyond all expectation, particularly as reception during that period was extremely difficult at long distances from the broadcasting stations, presumably due to the abnormal heat. **2 LO,** it will be remembered, increased his wavelength during the morning transmissions to 400 metres.

The aerial was a single wire 76 feet long by 28 feet high, with a lead-in from near the centre, of some 22 feet, and the earth lead 15 feet of aerial wire soldered to the garden water tap. Within a few minutes of the aerial being hoisted, Eiffel Tower's afternoon concert and telephony transmission came in loudly on the Brown H.1 loud speaker, and at night all the British broadcasting stations, even Glasgow, were successfully received, Manchester and Newcastle being particularly loud, and audible all over the house.

Fading, especially from **2 LO,** was bad at times, and spark jamming from ships and French coastal stations caused considerable interference, but on the whole the experiments were entirely successful and interesting.

The set consisted of four valves (tuned anode), one H.F., rectifier, and two L.F., tuning being effected with Burndept coils together with two Burndept vernier condensers giving the exceptionally fine tuning necessary.

I was given to understand by one or two interested amateurs there that this was the first occasion broadcasting had been heard in this remote part of Cornwall; if so, wireless amateurs and those contemplating becoming wireless enthusiasts in West Cornwall need not despair of past non-success, as the Bournemouth station when in operation should be easily heard on a loud speaker with two, or at the most, three valves.

W. T. EDWARDS.

Strawberry Hill,

Notes and News

Aberdeen's Wavelength.

It is interesting to note that the recommendation of the Broadcasting Committee of an increased wavelength band for broadcasting has already been adopted in the case of Aberdeen (2 BD), which transmits on 495 metres.

Representation of Provincial Societies.

The members of the Huddersfield Radio Society have been deeply interested in the question of Provincial representation on the Committee of the Radio Society of Great Britain. In a communication we have received from Mr. J. A. Badham, Hon. Secretary of the Society, he states that careful consideration has been given to this matter, and it is desired to place many constructive suggestions before the affiliated clubs in Yorkshire.

With this object in view, a meeting is to be held at the Guildford Hotel, Leeds, on Saturday afternoon, October 20th, 1923, at 3.30 p.m. A warm invitation to this meeting is extended to any club or individual interested in the welfare of radio enthusiasts.

Christiania Again.

Not only in this country, but in Belgium, the new broadcasting station in Christiania is making itself heard. On September 17th, Mr. P. Mahieu, residing at Braine le Compte, Belgium, received Christiania very loudly on 390 metres, using a receiver with three H.F. valves.

On the same day this transmission was received by Mr. H. Hunt, jun., of Northampton, employing a single-valve set.

A Science Exhibition.

An exhibition which should prove highly interesting to many of our readers is at present being held at the Surbiton Assembly Rooms. The scope of the exhibits covers Engineering, Chemistry, Physics, Electricity, Biology, etc., etc., and a special section is devoted to the latest wireless developments. The exhibition is open each day from 3 to 10 p.m., the final day being Saturday, October 20th. The price of admission is two shillings.

Broadcast Talk on Esperanto.

Under the title "The Only Cure for a Tongue-Tied World," an address will be given by Mr. John Merchant, from the London Broadcasting Station at 7.15 p.m. on Saturday, October 20th. Mr. Merchant is President of the British Esperanto Association, and there is no doubt that his audience will find his talk as entertaining as the dance programme to follow it.

An Efficient Two-Valve Set.

An interesting account of British and Continental broadcasting reception has reached us from Mr. W. B. Chivers (6 NZ) of Birmingham, who began experimental work in 1912.

With a two-valve receiver (H.F. and D.), using a soft Dutch valve as detector, our correspondent has logged all the British and Continental broadcasting stations with the exception of Amsterdam, Kbel and Lausanne.

Wireless in Rumania.

A new radio station has been erected at Timisvara, in Rumania, English apparatus being employed.

Official Wireless in Australia.

The Australian Postmaster-General has announced that the Government proposes the establishment of wireless telegraphy in North-Western Australia, or the Eastern North Territory communicating with Wyndham, Broome and Darwin, thus bringing the pastoralists over vast areas in touch with the coastal wireless in Western Australia and the South Australian telegraph system running down to Adelaide.

The Macmillan Arctic Expedition.

In a very decided manner, the members of the Macmillan Arctic exploration party, whose intended exploits were referred to in our issue of July 14th, are keeping in wireless touch with civilisation.

Quite recently the explorers were entertained with a dance programme specially transmitted from Calgary. Operator Mix, on board the exploration ship *Bowdoin*, states that there is no difficulty in receiving the wireless "talks" which are regularly transmitted from the Government station at Calgary.

We shall welcome reports from any British amateurs who are successful in receiving WNP, the *Bowdoin's* call sign.

Amateur Activities in Portugal.

Very little has hitherto been heard of amateur activities in Portugal, but the announcement has now been made that the first amateur organisation has been formed under the name of "Radio-Academia de Portugal." The offices are at Rua Anthero do Quental, 15 Primeiro, Lisbon.

2 LO Heard in Christiania.

The pleasure experienced by British amateurs in listening to Continental broadcasting hardly exceeds that of enthusiasts abroad who succeed in hearing broadcasting from this country. We have received an interesting communication from Mr. A. G. Nielsen, of Christiania, who relates his experiences with a three-valve set (1 — det. — 1) of his own construction. With this receiver our correspondent is able to hear London, Glasgow, Newcastle and Manchester at considerable strength. Cardiff is faint, Birmingham is better, but, according to Mr. Nielsen, the stations at Paris, The Hague and in Germany are not at all distinct. British amateurs have also been heard. Christiania is approximately 600 miles from London, and the reception referred to has been carried out on a double wire aerial of about 180 ft.

"On Joining a Wireless Society."

Owing to an unexpected demand for reprints of the Editorial which appeared in a recent issue under the title "On Joining a Wireless Society," an additional number has now been printed.

Secretaries of Wireless Societies who would care to receive reprints can obtain a limited number free of charge on application to *The Wireless World and Radio Review.*

Books Received.

"La Radiotéléphonie." By Carlo Toché. Preface by General Ferrié. (Paris: Gauthier-Villars et Cie, 55, Quai des Grands-Augustins. 118 pages + viii. 2nd edition. Price 10 francs.)

Wireless Facts and Figures. By A. V. Ballhatchet. (London: Percival Marshall & Co., 66, Farringdon Street, E.C.4. 52 pages. Price 6d. net.)

"Radio and High Frequency Currents." By Edgar T. Larner. (London: Crosby Lockwood & Son, Stationers' Hall Court, Ludgate Hill, E.C.4. 56 pages. 22 figures. Price 3s. 6d. net.)

"Alternating Currents: Their Theory and Transmission." By Edgar T. Larner. (London: Crosby Lockwood & Son, Stationers' Hall Court, Ludgate Hill, E.C.4. 198 pages. 107 figures. Price 6s. net.)

"Successful Wireless Reception." By Paul D. Tyers. (London: Percival Marshall & Co., 66, Farringdon Street, E.C.4. 88 pages. 48 figures. Price 1s. 6d. net.)

Forthcoming Events.

WEDNESDAY, OCTOBER 17th.

Radio Society of Great Britain. At 6 p.m. At the Institution of Electrical Engineers. Informal meeting. A discussion on "Short Wave Reception" will be opened by Mr. P. R. Coursey, B.Sc.

East Ham and District Radio Society. At 7.30 p.m. At the Church Army Social Centre, Barking Road, E.6. "Single Valve Sets."

THURSDAY, OCTOBER 18th.

Radio Association of South Norwood and District. Discussion: "Earths," opened by Mr. S. W. Butters.

Ilford and District Radio Society. Lecture: "H.F. Amplification." By Mr. A. E. Gregory.

Hackney and District Radio Society. At the Y.M.C.A., Mare Street. Lecture: "Television." By Mr. G. W. Walton (of the General Radio Co.).

Derby Wireless Club. At 7.30 p.m. Lecture: "Accumulators." By Mr. E. F. Clark.

St. Pancras Radio Society. At 8 p.m. At the Employment Bureau, 61, Park Street, N.W. Difficulties night.

FRIDAY, OCTOBER 19th.

Sheffield and District Wireless Society. At 7.30 p.m. At the Dept. of Applied Science, St. George's Square. Presidential Address.

The Wireless Society of Hull and District. At 7.30 p.m. At the Co-operative Social Institute, Jarratt Street. Lecture: "Possibilities of Wireless." By Mr. A. Pearson.

The Wembley Wireless Society. At 8 p.m. At Park Lane School. "Practical Bench Hints." By Mr. H. Hart.

The Leeds Radio Society. At 7.30 p.m. Instructional meeting. Lecture: "A Single Valve Indoor Aerial Set." By Mr. F. Smith.

TUESDAY, OCTOBER 23rd.

Plymouth Wireless and Scientific Society. At 8 p.m. At the Y.M.C.A. Building, Old Town Street. Lecture: "Reflex Circuits." By Mr. Voss.

WEDNESDAY, OCTOBER 24th.

The Radio Society of Great Britain. At 6 p.m. At the Institution of Electrical Engineers. Lecture: "Distortion in Radio Telephony" (illustrated with lantern slides). By Mr. Thomas, B.Sc. (of the National Physical Laboratory).

East Ham and District Radio Society. At 7.30 p.m. At the Church Army Social Centre, Barking Road, E.6. Informal meeting.

Manchester Wireless Society. At 8 p.m. In the Council Chamber, Houldsworth Hall. Lecture: "The Construction of the Cossor Valve." By Mr. Y. W. P. Evans, A.M.I.R.E.

Calls Heard.

Horley, Surrey.
2 AA, 2 AJ, 2 AZ, 2 KT, 2 QQ (?), **2 QS, 2 SL, 2 SM, 5 MA, 5 PU, 5 ZU, 5 ZR.** (E. H. Brown.)

Brixton Hill, S.W.2.
2 AY, 2 BZ, 2 DT, 2 DY, 2 GF, 2 HT, 2 KK, 2 KT, 2 LR, 2 LT, 2 MJ, 2 MM, 2 NM, 2 PL, 2 QQ, 2 SF, 2 SH, 2 SK, 2 SL, 2 SS, 2 SZ, 2 TF, 2 VK, 2 VR, 2 VW, 2 WO, 2 WQ, 2 XB, 2 XI, 2 XL, 2 XR, 2 XZ, 2 ZM, 2 ZO, 2 ZZ, 5 AC, 5 AY, 5 BC, 5 DB, 5 DK, 5 DT, 5 GS, 5 HW, 5 IA, 5 IO, 5 LP, 5 LT, 5 MS, 5 OX, 5 PR, 5 PU, 5 PZ, 5 UP, 5 VP, 5 VR, 5 VX, 5 YS, 6 HD, 6 LG, 6 QT, 6 RR, 7 HJ, 8 BM, 8 BV, 8 ZZ. (A. Richardson.)

Carshalton, Surrey.
2 AQ, 2 BF, 2 DR, 2 DY, 2 FG, 2 FQ, 2 HS, 2 ID, 2 KV, 2 KZ, 2 KP, 2 KT, 2 KF, 2 MF, 2 NM, 2 OM, 2 ON, 2 OD, 2 PA, 2 PJ, 2 QI, 2 QQ, 2 SZ, 2 SH, 2 TI, 2 VJ, 2 WD, 2 WJ, 2 XO, 2 XL, 2 XZ, 2 XR, 2 YH, 2 YQ, 2 ZO, 2 ZT, 2 ZZ, 2 ZK, 5 AC, 5 BV, 5 CB, 5 CP, 5 CX, 5 DT, 5 FR, 5 HY, 5 IO, 5 IS, 5 LP, 5 LF, 5 MA, 5 NN, 5 OX, 5 OM, 5 OF, 5 PU, 5 PS, 5 SU, 5 SC, 5 VM, 5 VE, 5 VL, 5 VP, 5 VD, 5 WH, 5 XN, 6 HD, 6 IM, 6 MZ, 6 LJ, 6 NH, 6 NF, 6 NI, 8 AB, 8 BM, 8 AW, 0 NY. (S. Johnson, **6 UQ**).

Margate.
2 ID, 2 FO, 2 MV, 2 QQ, 2 TO, 5 BW, 5 PU, 5 QM, 5 SU, TVX, OFN. (Arthur Milne.)

Lytham, Lancs.
2 AG, 2 AL, 2 AT, 2 FZ, 2 II, 2 IN, 2 JF, 2 JO, 2 JS, 2 KR, 2 KS, 2 KX, 2 KY, 2 RM, 2 SC, 2 VF, 2 VG, 2 WH, 2 WK, 2 UF, 2 XW, 2 ZU, 5 AJ, 5 AW, 5 AY, 5 AZ, 5 CK, 5 CR, 5 CX, 5 DC, 5 DK, 5 DF, 5 DH, 5 DK, 5 DQ, 5 FW, 5 FY, 5 HG, 5 HS, 5 IK, 5 IV, 5 KC, 5 KT, 5 LO, 5 LC, 5 LY, 5 LB, 5 LW, 5 ML, 5 NW, 5 NX, 5 OP, 5 OT, 5 OW, 5 RT, 5 SJ, 5 SZ, 5 ST, 5 TC, 5 TQ, 5 TW, 5 TJ, 5 US, 5 UK, 5 WM, 5 ZO., 6 AN, 6 FG, 6 HH, 6 HS, Q6 IK, 6 JA, 6 JQ, 6 KK, 6 KW, 6 LC, 6 LF, 6 LY, 6 NI, 6 RY. (1—d—1.) (J. Sowerbutts and H. M. Swann.)

London, N.W.
2 BF, 2 BT, 2 CC, 2 DB, 2 DM, 2 DO, 2 FB, 2 FD, 2 FF, 2 ND, 2 GM, 2 GX, 2 GZ, 2 IJ, 2 IL, 2 IN, 2 IZ, 2 JF, 2 JJ, 2 LM, 2 MN, 2 NF, 2 NG, 2 FN, 2 OX, 2 PK, 2 PP, 2 QD, 2 QX, 2 SB, 2 ST, 2 SV, 2 TD, 2 TS, 2 TU, 2 TV, 2 VB, 2 VL, 2 WA, 2 WG, 2 ZA, 2 ZJ, 2 ZK, 2 ZN, 5 AB, 5 AH, 5 AR, 5 BC, 5 BF, 5 BS, 5 CT, 5 DN, 5 EV, 5 FC, 5 GO, 5 GX, 5 HS, 5 HW, 5 IA, 5 IK, 5 IL, 5 IX 5 IY, 5 KO, 5 KS, 5 KU, 5 LC, 5 LI, 5 LO, 5 LT, 5 MK, 5 MZ 5 NR, 5 OF, 5 PF, 5 PZ, 5 QV, 5 RQ, 5 SL, 5 ST, 5 SZ, 5 VA, 5 VG 5 VJ, 5 VM, 5 VN, 5 VS, 5 WP, 5 XD, 5 XI, 5 XN, 5 YX, 6 AD 6 BX, 6 FX, 6 NF, 6 NH, 6 NI, 6 OM, 6 OY, 6 PC, 6 QT, 6 QV 6 QZ, 6 TM, OFN, ONY, OYS, OMX, OBQ, 8 AQ, 8 AW, 8 BN 8 BV, 8 BW, 8 CM, 8 GT, 9 AN. S. K. Lewer (**6 LJ**).

Alcester, Warwickshire.
2 AX, 2 CZ, 2 DU, 2 FZ, 2 GG, 2 GH, 2 GI, 2 GJ, 2 GN, 2 HF, 2 IQ, 2 KO, 2 KU, 2 LG, 2 LP, 2 LX, 2 LY, 2 NP, 2 NQ, 2 NV, 2 OM, 2 OL, 2 OX, 2 PK, 2 QY, 2 RH, 2 RI, 2 RM, 2 RV, 2 SF, 2 SP, 2 SU, 2 SY, 2 TV, 2 UY, 2 WB, 2 WV, 2 WX, 2 YX, 2 ZK, 5 FH, 5 FI, 5 IO, 5 KF, 5 LP, 5 PX, 5 QW, 5 RI, 5 SI, 5 SW, 5 TW, 5 YI, 5 YS, 5 YX, 6 NI, 8 AB. (5 Valves.) (G. Crisp.)

Contributors to the Calls Heard section are requested to send their full address, not for publication, but for the purpose of exchanging correspondence concerning the receptions. Addresses will not be disclosed without permission.

Catalogues and Price Lists Received.

Griffin Wireless Supplies Co. (80, Newington Causeway, S.E.1). A new Price List of Wireless Sets, Accessories and Components. A copy will be forwarded on application to the firm.

J. H. Taylor & Co. (Macaulay Street, Huddersfield). Supplementary Price List of Wireless Supplies.

Canadian Brandes, Ltd. (296, Regent Street, W.1.). A new Catalogue descriptive of Brandes' "Matched Tone" Headphones. Copies available on application.

S. A. Lamplugh, Ltd. (King's Road, Tyseley, Birmingham.) An illustrated folder describing "Regent" Wireless Sets and Components.

Radio Society of Great Britain.

PRIZE COMPETITION.

A competition for amateur apparatus will be held under the auspices of The Radio Society of Great Britain during the forthcoming All-British Wireless Exhibition and Convention to be held at the White City, Shepherd's Bush, from November 8th to 21st.

Three prizes are offered, the first by the President, and the other two by the Committee of the R.S.G.B. for the best examples of amateur work.

Members of any Affiliated Society are invited to compete, and in order to organise the competition, the Committees of Societies are asked to arrange :—

Either (*a*) to hold a competition amongst its members, and to send up the work of the winner for exhibition, and as an entry for the R.S.G.B. Competition.

Or (*b*) to make itself responsible for the selection of one suitable piece of apparatus constructed by one of its members, such exhibit to be in its opinion of sufficient merit for public exhibition and competition.

The Rules governing the Competition are as follows :—

1. No exhibits for the competition will be accepted directly from private members ; all exhibits must be selected by the Committee of an Affiliated Society in one or other of the above ways, and must be accompanied with a certificate to that effect from the Secretary of an Affiliated Society, who must also certify that the set has actually been constructed by the exhibitor.

2. All exhibits to be delivered or brought personally at the cost of the exhibiting Society, or exhibitor, to the R.S.G.B.'s stand at the Exhibition on November 7th, and collected again on November 22nd at the conclusion of the exhibition. These exhibits while at the exhibition will be insured by the R.S.G.B. against fire and theft, from November 7th to November 22nd inclusive, after which no further responsibility for their safety is accepted, and for this purpose the reasonable value of the exhibit must be declared by the Secretary of the Affiliated Society.

3. A Committee will be appointed to make a first selection, and Dr. Eccles, the President of the R.S.G.B., has kindly consented to judge the selected apparatus and award the prizes.

4. The Competition Committee reserve the right to reject any apparatus considered by them not to be of a sufficiently high standard for public exhibition.

5. The Committees of the Affiliated Societies are earnestly requested, in the interests of the amateur movement, to see that only really good work is sent in.

6. The apparatus must be of amateur construction, and while bought parts are permissible, in judging the apparatus submitted, points will be given to originality of design, to skill in construction (particularly details), and to success in operation. Little attention will be given to finish. The apparatus must be so arranged as to be readily inspected in all its details.

9. Sets from members of the R.S.G.B. will not be accepted unless those members are also members of an Affiliated Society competing through their local Society.

10. A diagram of connections must accompany each exhibit for competition.

TRANSMITTER AND RELAY SECTION.

This new section has been formed because the British Wireless Relay League has been merged in the Radio Society of Great Britain. The objects of the section are (1) To promote intercommunication between experimenters and thus assist them to improve their apparatus ; (2) To join hands with similar organisations overseas ; (3) To investigate the quality of the transmissions in various directions at different hours ; (4) To establish a collection of wavemeters and other useful apparatus for loan within the Section. In supporting the Section the Radio Society will protect the principle of "Freedom for Experiment."

Rules of the Section.

1. All persons holding experimental licences are eligible for election to the Section in one of the following classes :—

		Annual Subscription.
Members of the Radio Society and its Affiliated Societies	Class TM	5 0
	,, RM	3 6
Non-Members do.	,, TN	10 0
	,, RN	7 0

Persons in classes TM and TN must be holders of transmitting licences, and in classes RM and RN must be holders of receiving licences. The annual rates of subscription may be amended at any time by the Council of the Radio Society.

2. All persons within the Section will obtain the programmes of work and may vote for the election of the Committee.

3. The work of the Section will be directed by a Committee, who shall have power to co-opt members. The Committee will be responsible for the election of candidates to the Section.

4. The Committee shall consist of the President of the Radio Society, the Treasurer of the Radio Society, and three members elected by ballot from classes TM and TN of whom not more than one shall be from class TN.

5. During the coming session the organiser of the transatlantic tests will serve as a special member of the Committee.

6. The first election of the Committee will be conducted as follows :—

Any person belonging to any of the four classes may send to the President between the

25th and the 30th November, 1923, a sheet of paper bearing three names of eligible persons arranged in order of preference and signed by the proposer. The President will count the votes and arrange the names in order of aggregate preference, and will announce the names of those three persons with the largest number of votes who are eligible and willing to serve.

7. An account of the expenditure of the Section shall be rendered to the Council of the Radio Society of Great Britain monthly, and the Council shall have power to restrict expenditure at any time.

8. It must be clearly understood that persons joining the Section do not thereby become members of any grade of the Radio Society of Great Britain. Members of the British Wireless Relay League are admitted to full privileges of the Section, but at the termination of the period covered by their subscription, should join one of the classes of the Section.

First Series of Tests.

These tests are chiefly for the purpose of esti mating the ranges of stations, and for selecting transmitters for the transatlantic tests.

From the lists of transmitters batches of ten or more will be selected and different nights assigned to each batch. For each night a table will be prepared showing the time at which each transmitter will commence work, and this time table will be circulated to all the Section. Each observer should keep a log of what he hears and should send an abstract of the log with notes on the strength of each station to the Secretary of the Transmitter and Relay Section.

During these first tests the procedure on each test night will be as follows :—

Part 1.—Outgoing Transmissions.

Each transmitter on duty will transmit certain selected matter in morse at a rate not exceeding 12 words per minute commencing precisely at the scheduled time and following the usual rules with regard to call signs. The receiving stations will have no other information than the call sign and the scheduled time of each transmitter.

Part 2.—Return Transmissions.

Immediately the last transmitter on the programme has finished his task he will address to the station immediately preceding him in the schedule a return relay acknowledgment in a prescribed form. The acknowledgment should be handed on from each station to the next preceding one as quickly as possible. At the close of the return transmission, if time allows, a brief forward signal of prescribed form may be started along the chain and returned, and so on, in order to gain practice in relay work.

The tests will be arranged to take place between 11 p.m. and 1 a.m.

* * * *

If you wish to participate in these tests please send—

(1) Your name and address.
(2) Call letters.
(3) Licensed power of station.
(4) Normal working wavelength nearest 200 m.

to the Secretary, Transmitter and Relay Section, Finsbury Technical College, Leonard Street, London, E.C.2.

AN ASSOCIATION OF AFFILIATED SOCIETIES.

At a meeting of the Western District Affiliated Societies, held on October 3rd for the purpose of forming an Association of Western District Metropolitan Societies, and briefly reported in our last issue, the principal feature of the evening was a paper on the objects of the gathering, read by Mr. J. H. Reeves, O.B.E.

Mr. Reeves began by referring to the historic nature of the meeting; for the first time a group of Societies affiliated to the Radio Society of Great Britain, had come together independently of the Parent Body, to discuss matters for their mutual benefit, and the speaker expressed the hope that before long there would be many more similar groupings among Affiliated Societies.

Before considering the constitution of the new body, Mr. Reeves dealt briefly with the constitution of the R.S.G.B., and explained clearly how adequately the Affiliated Societies can be represented through the medium of their district representatives. The question of mutual working between the Parent Body and the Association of Affiliated Societies was next touched upon. A large measure of freedom for the Affiliated Societies had been agreed upon, and the thorny question of finance had been left in their hands.

Mr. Reeves urged the adoption of a capitation fee for each member, and spoke of the benefits to be derived from such a policy. There was no reason, he said, why each individual should not receive value amounting to 1s. for every 1d. paid as capitation fee.

Regarding plans for the wellbeing of the Association, the speaker referred to the value of good lectures, and stated that the Parent Body had a scheme in preparation for the provision of expert lecturers. The Hon. Secretaries present were advised to take advantage of the opportunities offered.

Mr. Reeves then discussed the possibility of members being able to secure discount from wireless retailers, and the preparation of a list of "recommended" firms was suggested.

As reported in our last issue, it was unanimously resolved that an Association of the Western District Metropolitan Affiliated Societies should be formed.

Lecturers for Affiliated Societies.

One list of lecturers has already been circulated to societies affiliated to the R.S.G.B. The Hon. Secretary, Mr. L. McMichael, has promised that a further list will be circulated shortly, and he particularly requests all affiliated societies having one or more lecturers who would be willing to lecture to other societies in their neighbourhood to send along names, subjects and the radius lecturers would be prepared to cover (travelling expenses paid).

The group representatives of affiliated societies are regularly attending committee meetings of the R.S.G.B. The results are already apparent, and several matters affecting the immediate welfare of affiliated societies have been dealt with promptly by the committee after representations from the group delegates.

QUESTIONS AND ANSWERS

"**H.M.**" **(Normanton)** *asks questions about circuit No. 66 of "The Amateur's Book of Wireless Circuits."*

(1) The wire joining the filament end of the grid leak and the —H.T. should be broken and the L.T. battery inserted with the positive terminal connected to —H.T. (2) The grid condenser is shown connected between the plate of the H.F. valve and the grid of the rectifying valve and has a fixed capacity of 0·0003μF.

"**D.C.**" **(S.W.14)** *asks (1) for a modified circuit for the "Double Magnification Receiver," described in the issue of July 21st, 1923. (2) For information regarding the selectivity of this receiver.*

(1) Referring to the simplified diagram on page 280 of the issue of June 2nd, connect potentiometer slide directly to — **L.T.**, omit potentiometer resistances and the 1 and 2μF condensers and connect the —H.T. and —**L.T.** terminals together. (2) You should be able to receive the other broadcasting stations while **2 LO** is working, with the exception of Cardiff, whose wavelength does not differ appreciably from that of **2 LO.**

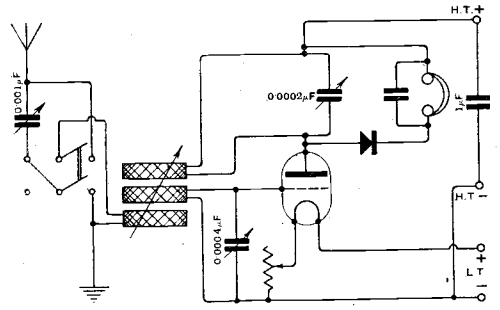


Fig. 1. **"S.A.R." (Llandaff).** *This receiver has one valve operating as an H.F. amplifier, using a tuned anode circuit coupled to the closed circuit to obtain reaction, and a crystal rectifier.*

"**S.A.R.**" **(Llandaff)** *asks (1) For a diagram of a circuit comprising one H.F. valve, and crystal detector with reaction, the receiver to include certain components which are listed.*

(1) The diagram is given in Fig. 1.

"**TISHY**" **(Fulham, S.W.6)** *asks (1) Is it possible to work a crystal set successfully with basket coils. (2) For a diagram of a crystal receiver, employing basket coils, suitable for reception of the Paris time signals. (3) What is a suitable method of mounting the basket coils.*

(1) Basket coils are quite suitable for use in a crystal receiver. (2) A number of diagrams have been given recently. The aerial tuning inductance may consist of three basket coils in series, each being wound with 80 turns of No. 26 D.C.C. wire on formers 1½" in diameter. The closed circuit inductance may consist of four such coils in series. (3) The basket coils may be mounted in a holder similar to that used for plug-in honeycomb type coils, or one may be mounted on a pivoted arm to swing over the other. See recent issues.

"**ROY**" **(Solworth)** *asks, with reference to Fig. 2 on page 257 of the issue of May 26th (1) For a diagram of a tuned anode H.F. unit to use with this receiver, employing a two-coil holder for the anode and reaction coils.*

(1) The diagram is given in Fig. 2.

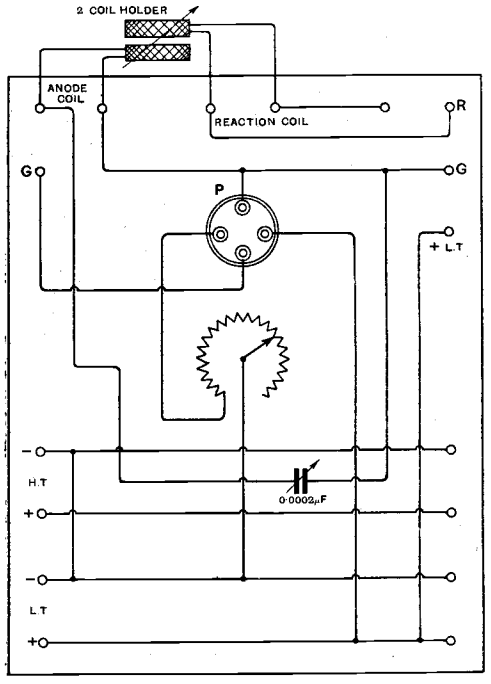


Fig. 2. **"ROY" (Solworth).** *Connections of a H.F. amplifier suitable for adding to the receiver given in the issue of May 26th.*

"**C.W.A.**" **(Seven Kings)** *asks (1) Is it necessary to obtain a licence before using a receiver which is employed with an indoor aerial. (2) Would a single circuit crystal receiver give satisfactory reception from* **2 LO** *when used with an indoor aerial at a distance of ten miles.*

(1) It is necessary to obtain a licence for the receiver. (2) We think it very improbable that satisfactory reception will be obtained under the circumstances.

"**QUEST**" **(Liverpool)** *asks (1) What qualifications are necessary to obtain a transmitting licence for C.W. and telephony, with a power of 10 watts.*

(1) Transmitting licences are issued at the discretion of the Postmaster-General after an examination of the applicant's technical qualifications, and his skill in Morse.

"**H.N.**" **(Northwich)** *submits a diagram of a three-valve receiver employing detector and two L.F. valves, and asks* (1) *For criticism.* (2) *For a repetition of the diagram with the addition of two H.F. valves, with switching for both.*

(1) The diagram is not correct. (2) The diagram is re-drawn correct with the required additions, in Fig. 3.

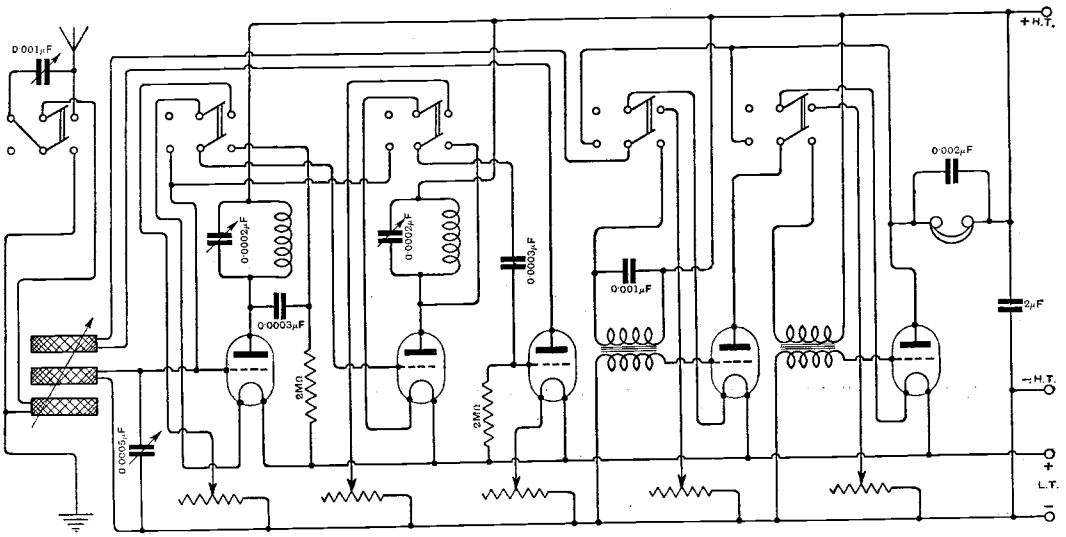


Fig. 3. **"H.N." (Northwich).** *A five-valve receiver with switches.*

"**A.Y.**" **(Glasgow)** *sends a diagram of an Armstrong super-regenerative circuit for criticism.*

We do not recommend the use of this circuit, and we suggest that you might find the article on "An Armstrong Super Receiver," by **5 HZ**, in the issue of August 15th, useful.

"**H.B.**" **(S.W.1)** *asks for particulars of choke coils for use in a H.F. amplifier for short wavelengths.*

We do not recommend the use of choke coils. Use the "tuned anode" method of H.F. coupling. A No. 75 D.L. coil shunted by a 0·0003 μF variable condenser should be satisfactory for a range of 250 to 600 metres, though the use of a series of coils and a smaller tuning condenser would be more efficient.

"**H.C.S.**" **(Dartford)** *asks* (1) *For details of basket coils for use in a certain type of transmitter.* (2) *The approximate maximum wavelength of an aerial 50 ft. long and 25 ft. high, connected to earth through a helix 4″ in diameter, wound with 7 turns spaced ⅞″ apart.* (3) *For particulars of a variometer suitable for reception in the neighbourhood of 200 metres.* (4) *Dimensions of a frame aerial suitable for broadcast reception.*

(1) We have no particulars of this transmitter, but you will no doubt find all the information you require in the articles on "Wireless Telephony," in the issues of July 28th and August 1st. (2) Approximately 200 metres. (3) Wind both the 4″ stator and 3″ diameter rotor with 20 turns each of the wire submitted. (4) Use a frame 4 ft. square, and wind with 6 turns, spaced ⅛″ apart.

"**G.W.W.**" **(Caversham)** *asks* (1) *For particulars of wire, etc., to rewind certain dynamos to give 600 volts.* (2) *and* (3) *For details of the constants of circuit No. 103 of "The Amateurs' Book of Wireless Circuits."* (4) *How to determine the primary and secondary windings of an unmarked L.F. transformer.*

(1) We are afraid that you have not given sufficient data for us to help you very much. However, we suggest that you rewind the armature of a 150-watt machine with No. 36 D.S.C. wire, and excite the field from accumulators. (2) and (3) See articles on "Wireless Telephony," in the issues of July 28th and August 1st. (4) Measure the resistance of each winding, say, by connecting in series with a milli-ammeter or galvanometer and battery. The winding having the greatest resistance is the secondary.

"**C.E.**" **(Salop)** *refers to the one-valve Armstrong super-regenerative circuit given in the issue of September 2nd, 1922, and asks* (1) *For particulars of coils L_3 and L_4.* (2) *For data to construct an iron core choke having an inductance of 1 henry.* (3) *The capacity of condensers C_2 and C_3, and whether fixed condensers can be used.*

(1) Use 1,250 turns for L_3 and 1,500 for L_4. The coils may be pile wound or duolateral wound,

with an inside diameter of about 2½", using No. 30 D.C.C. wire. (2) See "Wireless Theory," in the issue of July 21st. (3) The capacity should be 0·005 μF. Fixed condensers may be employed if the correct values are first found by using variable condensers.

The rejector circuit is tuned to the wavelength of the near-by transmitting station. (4) It should be quite easy to obtain satisfactory reception from these stations.

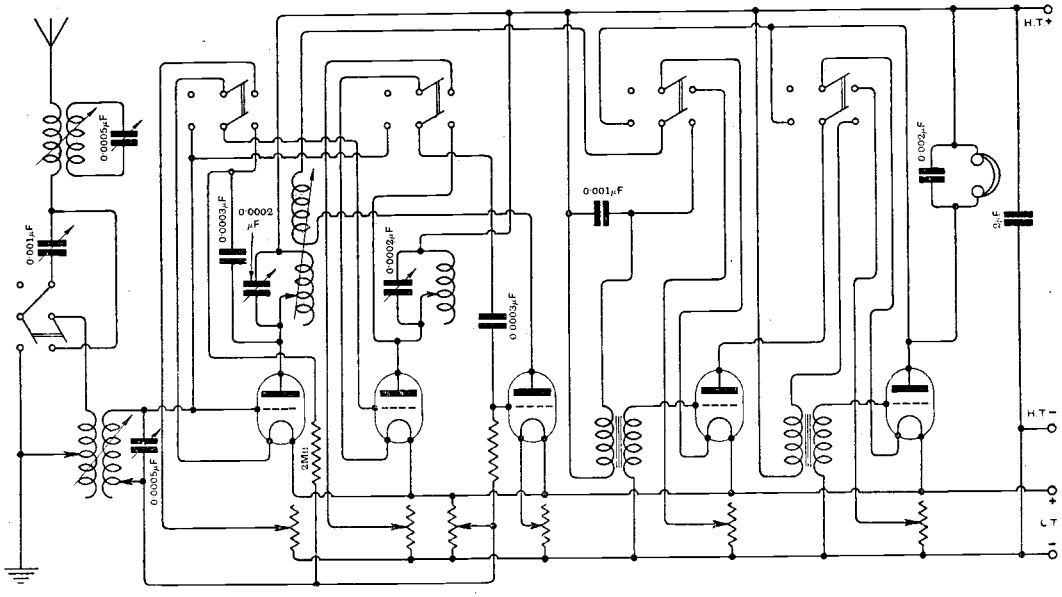


Fig. 4. "C.P.E." **(Birmingham).** *A five-valve receiver, two H.F. tuned anode, detector and two L.F. valves with switches.*

"**H.D.B.**" **(India)** *asks* (1) *For the name of the station with call letters* **LPY.** (2) *Where information can be obtained regarding the use of valve amplifiers for duplex land-line telephony.* (3) *Why* **UFT** (*St. Assise,* 15,000 *metres*) *is badly jammed sometimes by* **GBL** (*Leafield,* 8,750 *metres*).

(1) and (2) We regret we have no information. (3) A wavelength of 12,200 metres is sometimes used by Leafield **(GBL),** and jamming was no doubt observed during one of these transmissions. An inductively coupled tuning circuit would improve selectivity on long wavelengths.

"**C.P.E.**" **(Birmingham)** *asks* (1) *Will we give a diagram of a five valve receiver employing two H.F., detector, and two L.F. valves, with switches for cutting out all valves except the detector.* (2) *Will the circuit give satisfactory reception on a loud speaker from all the British broadcast stations.* (3) *Will a receiver connected according to this diagram be sufficiently selective to cut out the transmissions from a broadcast station at a distance of 2½ miles.* (4) *Will it be possible to receive from the Hague and Paris with this receiver.*

(1) The diagram is given in Fig. 4. (2) With a good outdoor aerial, the receiver should fulfil the required conditions. (3) It is difficult to say definitely the degree of selectivity obtainable with a particular receiver, as results vary considerably. The tuning arrangements shown in the diagram are very suitable for your particular circumstances.

NOTE.—*This section of the magazine is placed at the disposal of all readers who wish to receive advice and information on matters pertaining to both the technical and non-technical sides of wireless work. Readers should comply with the following rules:*—(1) *Each question should be numbered and written on a separate sheet on one side of the paper, and addressed "Questions and Answers," Editor,* **The Wireless World and Radio Review,** 12/13, *Henrietta Street, London, W.C.2. Queries should be clear and concise.* (2) *Before sending in their questions readers are advised to search recent numbers to see whether the same queries have not been dealt with before.* (3) *All questions will be answered through the post. Those of general interest will also be published.* (4) *Every question, except those under* (5) *below, should be accompanied by a postal order for* 1*s.*, *or* 3*s.* 6*d. for a maximum of four questions, and also the coupon taken from the advertisement pages of the current issue.* (5) *For the benefit of those readers who would rather not pay the charges, a free Questions and Answers Coupon will be placed in the advertisement pages of the first issue of every month. This coupon should accompany the question submitted, together with a stamped addressed envelope. The free coupon is valid for the current week only.* (6) *In view of the fact that a large proportion of the circuits and apparatus described in these answers are covered by patents, readers are advised, before making use of them, to satisfy themselves that they would not be infringing patents.* (7) *Four questions is the maximum which may be sent in at one time.*

THE WIRELESS WORLD AND RADIO REVIEW

THE OFFICIAL ORGAN OF THE RADIO SOCIETY OF GREAT BRITAIN

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CONTENTS

	PAGE
Legal Points for the Wireless Amateur	98
Resistance Coupled Low Frequency Amplifiers	99
Soldering and Soldering Appliances. By Richard Twelvetrees	100
Reading Wavelengths by Touch	104
A Novel Method of Rectification. By Frederic L. Hogg	106
The Soft Valve	108
Variometers—II. By W. James	109
Portable Experimental Receiver	113
The Automatic Reception of Wireless Signals. By E. R. Batten	114
Correspondence	118
Notes and News	119
Questions and Answers	122
Wireless Club Reports	126

THE EDITOR will be glad to consider articles and illustrations dealing with subjects within the scope of the Journal. Illustrations should preferably be confined to photographs and rough drawings. The greatest care will be taken to return all illustrations and manuscripts not required for publication if these are accompanied by stamps to pay return postage. All manuscripts and illustrations are sent at the Author's risk and the Editor cannot accept responsibility for their safe custody or return. Contributions should be addressed to the Editor, "The Wireless World and Radio Review," 12 and 13, Henrietta Street, Strand, London, W.C.2.

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LEGAL POINTS FOR THE WIRELESS AMATEUR

By OUR LEGAL CORRESPONDENT.

LIKE every other good citizen the wireless amateur must be aware of the well-known maxim that "ignorance of the law excuseth no man." It is his business therefore to ascertain as far as possible what is his legal position as a user of wireless apparatus. In the first place common prudence calls for a sufficient knowledge of the law to keep within its bounds. In the second place it is useful to know what privileges one is entitled to enjoy freely and as a matter of right without let or hindrance from others.

One fact of primary importance is clearly established. The Wireless Telegraphy Act of 1904 forbids the use of wireless apparatus by anyone who has not first obtained a permit from the Postmaster-General.

Beyond this point the law which governs a wireless licensee's relation to his landlord and his neighbour is not so well defined, simply because the various questions involved have not yet been brought before the Courts for decision. It is in this area particularly that the amateur is liable to find that attempts are being made to impose unduly upon him.

We will deal first with the position as laid down by Parliament in the Act of 1904. Here from the outset it must be borne in mind that wireless is on the same footing as the ordinary telegraph and telephone, all being comprised in the huge State monopoly which is now vested in the Postmaster-General. In other words no one in this country can use wireless apparatus either for transmission or reception unless he has first obtained the licence of the P.M.G., who, in effect, holds a "master patent" for all shapes and forms of postal communication.

The terms and conditions under which the P.M.G. will issue licences are now too well known to need repetition. Two points may, however, be mentioned. In the first place the Act makes a definite distinction between the *bona fide* wireless experimenter and all other persons. Whilst in general the P.M.G. has an unfettered discretion as to whether he will or will not grant a licence, the act says that he *shall* do so in the case of anyone who can satisfactorily prove that he wants to conduct experiments in wireless telegraphy. **Such permission is, however, subject to any reasonable terms or restrictions that the P.M.G. may think proper.**

In the second place the Act lays down penalties varying from £10 up to a maximum fine of £100 or twelve months' hard labour for the unlicensed use of wireless apparatus. Such penalties are extremely drastic, and in all probability would never be enforced, yet it is well to bear in mind that they are on the Statute Book.

Turning to what may be termed the common law point of view, trouble is sometimes caused by a type of landlord who has a rooted objection to outside aerials.

When any landlord lets a house the lease is presumed by law to include all the reasonable enjoyments of occupation. **The reception of Broadcasting at all events is becoming one of the ordinary amenities of life, and the landlord has *primâ facie* no right to interfere.** There is, however, the question as to whether the installation of a wireless receiver will damage his property.

Here two points arise. The landlord may be concerned as to the means adopted for fixing the aerial to the structure of the building, or he may be anxious as to possible danger from lightning.

As regards the first point, provided that reasonable care is taken in fixing the aerial to the roof or other part of a house, no appreciable strain or damage can possibly result to the structure of the building. **On this ground, therefore, no Court would grant an injunction forbidding the tenant to erect his aerial.** Should an action for damages be taken, a shilling or two paid into Court would not only deprive the landlord of any possibility of profit, but would also throw well-deserved ridicule upon his claim.

The question has also been raised as to whether an aerial pole planted in the ground becomes the landlord's property under the law of fixtures. The answer is in the negative. **The pole should be taken away by the departing tenant, the hole filled up, and the landlord left to prove what damage he has suffered.**

As regards the risk from lightning, there is no positive evidence to show in what degree, if any, the presence of an outside wireless aerial adds to the ordinary chance of a house being struck by lightning discharge.

The tenant would however be wise to guard himself in this respect by offering to take out any additional insurance that may be necessary in order to cover this hypothetical danger.

In actual fact many insurance companies are prepared to include the risk under an existing policy without asking for any additional premium, on the simple condition that the apparatus is always earthed when out of use. The fear that a wireless aerial will " attract " lightning is curiously widespread, although it is more of a bogey than a fact. Telephone wires are far more in evidence than aerials, but they do not produce the same symptoms of nervousness either from landlords or the general public. **The view taken by the Insurance Companies should prove reassuring. The ordinary risk of a house being struck by lightning is practically infinitesimal and the presence of a wireless aerial leaves that risk unaltered.**

Sometimes objection has been raised to the installation of wireless apparatus in a flat. Here the question is one of degree. A loud speaker, particularly if afflicted with distortion, may disturb the amenities of life in the adjacent flat, but it is necessary to prove that it causes an *unreasonable* commotion before the law will interfere. Again, one could probably not insist upon planting an aerial pole in a common garden in the face of opposition from the other tenants, although some degree of actual damage or reasonable apprehension thereof would have to be proved before the Court would grant an injunction.

Finally, in certain cases, local authorities have demanded a fee before granting permission to erect an aerial. This is only justifiable where (1) the aerial crosses a public thoroughfare, as it is then in the nature of a rent charged for a private wayleave over what is essentially public property, or (2) where the aerial crosses power lines, and the safety of the public demands that it should be subjected to some form of supervision and periodical examination.

[*In view of the above points raised by our legal correspondent it is particularly interesting to refer to clause* 50 *of the Broadcasting Committee's Report which, it will be remembered, reads as follows :—*

" 50. *It has been brought to our notice that certain local authorities and private landlords have demanded a rental charge for aerials. We think this practice unjustifiable and should be abandoned ; otherwise it may become necessary to deal with it by legislation.*"

—EDITOR.]

RESISTANCE-COUPLED LOW FREQUENCY AMPLIFIERS.

In the issue of October 10th, on page 35, a description of a resistance-coupled low frequency amplifier was commenced, and constructional details given in the following issue.

The introductory note to this article has invited discussion, as it has been suggested to us that the wording of the note is such as to lead our readers to suppose that we are of opinion that the use of resistance-coupling will eliminate distortion.

We hasten to correct any such impression which may have been conveyed. It would obviously be absurd to state that serious distortion is inherent in all transformer-coupled amplifiers, especially when we see evidence in so many directions of the extraordinary degree of efficiency in speech reproduction obtained with the use of specially designed apparatus employing this principle, and it is well known that an enormous amount of

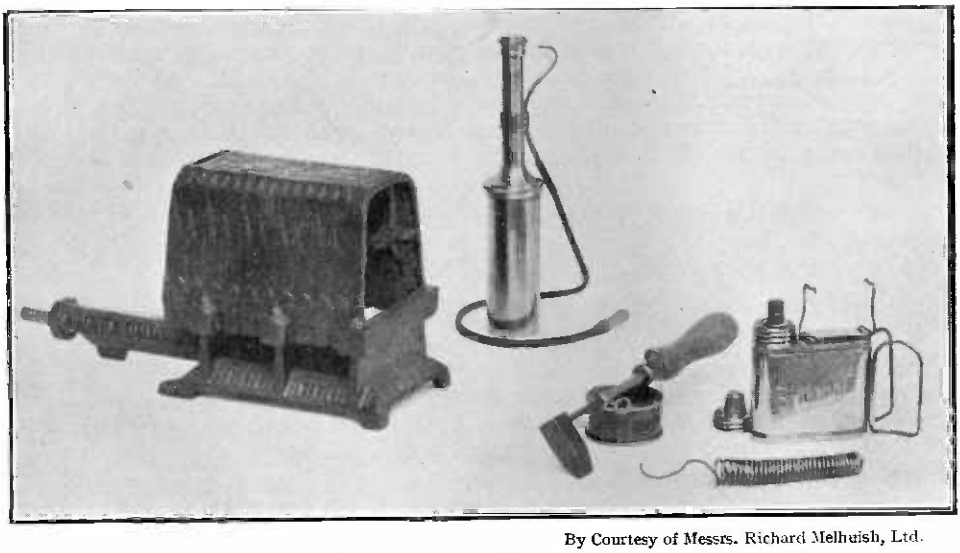
Continued on page 103.

SOLDERING AND SOLDERING APPLIANCES

By RICHARD TWELVETREES, A.M.I.Mech.E.

BEFORE the amateur has gone very far in constructional work he will discover the need of the soldering process in some form or another, and although the principle involved is a very simple one, it is really astonishing to find how few people are adept in putting it into effect. Perhaps this is because the process is so simple that one hardly realises the importance of carrying out the details with sufficient care, and disappointing results invariably follow.

for soldering processes, it will be found that there is a very wide range from which the selection can be made, and the reader will have to make up his mind to what extent soldering will be adopted. If only a limited amount is contemplated the whole outfit can consist of a small spirit stove, a couple of soldering bits, a file, a rasp, a small brush and the requisite supplies of solder, spirits and flux. Such a set can be recommended to those who have yet to make their first attempts in soldering, and the entire



By Courtesy of Messrs. Richard Melhuish, Ltd.

(1) (2) (3)

Soldering equipment. (1) *Stove arranged to reduce the gas flame when the bit is removed.* (2) *Small mouth blowlamp.* (3) *Simple soldering outfit.*

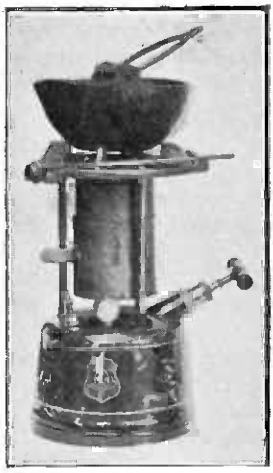
In discussing workshop appliances in these articles it will be observed that an attempt has been made to keep each class of tool in its own place, and if the practice is carried into effect in the arrangement of the workshop a good deal of time and trouble will be saved. This point applies particularly in the case of soldering appliances, where cleanliness is next to efficiency, for dirt, grease and other foreign matter are certain preventatives of good soldering.

Small Soldering Sets.—When about to decide as to the class of tools to be purchased outfit can be purchased for the modest sum of 4s. 6d.

Soldering Stoves.—If one is fortunate enough to have a convenient gas supply for the workshop, the problem of heating the soldering iron is very easily solved by using the form of stove shown in the accompanying illu tration. This type of heater, or stove, is fitted with an automatic gas cut-off, so that immediately the soldering bit is removed from the flame, the supply of gas is cut down to a minimum, thus effecting a considerable economy. If mounted on the work bench

a piece of sheet iron or asbestos should be placed under the feet of the stove to prevent scorching the wood. The stove can be purchased for 10s. or 12s., and is well recommended for all-round soldering jobs.

The absence of a gas supply means that some form of spirit stove will have to be used, but in selecting this class of appliance



By Courtesy of Messrs. Richard Melhuish, Ltd.

A useful soldering stove capable of providing sufficient heat for a variety of jobs.

one has to be careful to choose those that burn with a clear flame, for in some patterns the vapourisation is imperfect, and the soldering bit may thus be rendered greasy. Grease in any form tends to prevent an easy flow of the solder, and should therefore be guarded against. If one has to invest in a spirit stove it is best to procure one that is large enough to serve for general purposes, rather than one of limited capacity. The type illustrated will easily burn without attention for six or seven hours, and longer if required. The flame is produced by the well-known Primus principle, and the spirit container has a force pump and pressure gauge, in addition to the filling cap. The burner itself is surrounded by a metal sheath, protecting the flame from draughts, and concentrating the heat upon the bits which are placed on a suitable grid supported above by pillars. In addition to its uses for heating the soldering bits, this form of stove can be used for tinning, hardening and tempering of tools, melting insulating materials, and even for small casting jobs, should the amateur be inclined to indulge in this interesting class of work.

Self-Heating Soldering Bits.—A good deal of ingenuity has been expended upon the construction of different kinds of soldering bits, which are combined with petrol-heating devices, whilst others are made with gas burners or electrical means of raising the temperature. They possess the drawback of being very heavy to use, and the anxiety of keeping them working merely adds to that of making a good job of the work in progress, so the amateur is advised to keep to the ordinary form of tool.

A Useful Range of Soldering Bits.—In dealing with a selection of soldering jobs several shapes of bit will be required, It is possible to obtain adjustable soldering bits on which the copper heads can be twisted round to any position in relation to the handle, but the chief objection to their use is the chance of the bit working loose in the handle, just at a critical moment, for which reason those of the solid type are to be preferred. The straight bit and the hatchet bit are the most widely used, and for the larger class of work in the wireless shop the bits need not exceed one pound in weight.

By Courtesy of Messrs. Richard Melhuish, Ltd.

(1) (2)

(1) *Straight and hatchet soldering bits.* (2) *Gas blowpipe.*

These patterns can be supplemented by a pair of jewellers' soldering bits, which, though of similar shape, are of course very much smaller.

Care of Soldering Bits.—Before putting a new soldering bit into use, the business end should be carefully tinned, which consists of covering the point with a thin film of solder, and this film should be maintained at all times. The surface of the bit should be cleaned and heated slowly, until solder applied to the surface melts freely. The bit is now plunged into a solution of sal-ammoniac in water, after which the solder will run in an evenly distributed film all over the surface. Subsequent overheating of the bit will burn this film of solder and prevent the metal from running freely, and in such a case the burnt solder must be filed off and the bit tinned afresh. It is also very important that the surface of the bit should be quite smooth, as even rough file marks are sufficient to retard the flow of the solder when work is in progress.

In selecting the size of bit to be used for any specified job, it must be remembered that the bit has two functions, not one as is often supposed, for, in addition to melting the solder, it is required to localise the heat on the job and raise the surrounding metal sufficiently to allow the solder to flow freely. By omitting to observe this requirement, many amateurs produce messy results, and large surplus masses of solder have to be removed afterwards by filing or scraping.

Soldering Fluxes.—Killed spirit is the most commonly used form of flux for soldering, but many people prefer one that has a resinous base for electrical work, owing to the corrosive influence of acid. "Fluxite" soldering paste is a very popular form of flux, and those who prefer a fluid will be well served by the solution known as Baker's Preparation. The metal should be well cleaned before any form of flux is applied, for dirt and oil will cause the metal to splutter, and no amount of subsequent attention with the soldering bit will avail until the whole has been thoroughly cleaned off. "Well begun is half done," and this motto should be applied in the early stages of all soldering jobs.

If the work is well cleaned and a suitable flux is used the solder will be found to flow freely when the bit is applied, and in such a case a very little amount of solder need be used.

In wireless instrument making cored resin solder will be found convenient inasmuch as a limited amount of resin flux is run on the work as the solder is melted. Resin is the safest flux to employ for soldering the internal connections of an instrument, but to facilitate the running of the solder without overheating, a trace of fluxite may be made use of and any excess of flux cleaned away with methylated spirit applied carefully with a small soft brush.

Tinning.—This is a form of soldering which lends itself to particularly neat work. Two surfaces that have to be united are first cleaned, and heated either with the soldering bit or over a naked flame. The solder is then applied with flux, and, whilst the metal is still hot, the surplus solder is wiped off with a clean piece of rag. This leaves the two surfaces covered with a very thin film of solder and enables them to be joined together, by pressing them in contact when heated for the second time. In fitting up a number of components to which wires have to be fixed at a later stage of the construction, it is a good plan to tin all the surfaces so that the subsequent process of soldering may be facilitated.

By Courtesy of Messrs. Richard Melhuish, Ltd.

Foot bellows for use with gas blowpipe.

Blowpipe Soldering.—In certain circumstances soldering has to be done in such positions that it may not be convenient to use a soldering bit. Sometimes the space may be so confined that even the edge of the hatchet bit cannot be brought into contact

with the work, and in such a case a small blow pipe should be used. Indeed, the blowpipe can be used for such a variety of soldering jobs that those who become accustomed to handling it seldom make use of the soldering bit. For small jobs the form of methylated spirit blowlamp with a combined pipe will be found very useful. The flame rises out of the top of the lamp and is directed into a fine point by a draught of air blown through the mouthpiece, down the rubber pipe and out of the specially shaped jet. The duration of the flame in this case is limited by the capacity of one's lungs, but the appliance is very useful for small and delicate jobs. This little blowlamp can be bought for about 3s., and is well worth a place in the shop.

Larger blowpipes suitable for use with a gas supply are fed from foot bellows. The latter should be of the double blast pattern, in which the air current is produced both by the upward and downward movement of the pedal. With this combination heat can be produced that will serve for many purposes other than soldering, such as the brazing of small parts, the forging of tools and similar operations. In the latter case it is well to make a small bench forge, which need consist of nothing more than a stiff sheet iron base, cut into square shape, to which another vertical piece is rivetted around three sides, thus forming an open hearth. A hearth of this description is shown as part of the workshop equipment in a recent issue.*

A very convenient method of supplying air to the blowpipe consists of fixing up a fairly large container, and supplying it with air from a motor foot pump. A tube is connected from the outlet to the air tube of the blow pipe, and the supply regulated by means of an adjustable tap. This method has the advantage of enabling one to pump up enough air pressure to last for a considerable time, thus dispensing with the inconvenience of having to pump by foot power whilst a soldering job is in progress.

In large work scrapers should be used in preference to files if it is necessary to remove any surplus solder after a job is completed, for the solder clogs up the teeth of the files and renders them useless for any other work. A selection of scrapers, including flat, half-round and three-cornered patterns, will be found useful for purposes other than cleaning up soldered jobs.

**Wireless World and Radio Review*, p. 617 August 8th, 1923.

Resistance-Coupled Low Frequency Amplifiers—*Continued from page 99.*

research has been conducted which has culminated in the production by a number of firms of intervalve transformers which leave no room for criticism as to their efficiency when employed in telephony amplification circuits.

The purpose of the article in question was primarily to give a design for an amplifier for amateur construction employing well-known principles, and to emphasise that the average amateur who is prepared to sacrifice something in amplification will find with a resistance-coupled amplifier that it is considerably easier to eliminate some of the causes of distortion than with a transformer coupled amplifier which requires more skill, both in construction and correct manipulation.

It was pointed out in the article that in no case will attention to one part of a circuit alone, such as the amplifier, suffice to reduce distortion.

One must take into consideration every part of the circuit, including the type of telephone or loud speaker employed; in fact it is not incorrect to state that in the design of a complete receiver, attention must be paid to the different parts of the circuit so that one may compensate for distortion in another, and therefore, strictly speaking, no one low frequency amplifier can give an equally efficient service with a variety of types of loud speakers, any more than one type of loud speaker will give best results with any type of low frequency amplifier.

A resistance-coupled amplifier, however, may be expected to give better results where it is necessary to employ it with a variety of types of loud speaker or telephones.

—EDITOR.

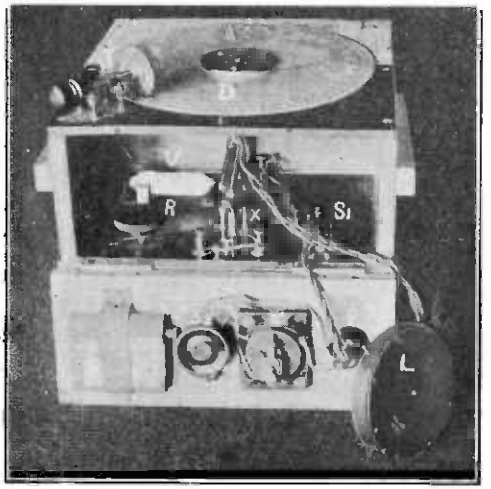
READING WAVELENGTHS BY TOUCH.

This article describes how an experimenter, handicapped by the loss of his sight, overcame the difficulty of tuning his transmitting receiving apparatus by designing an ingenious wavemeter.

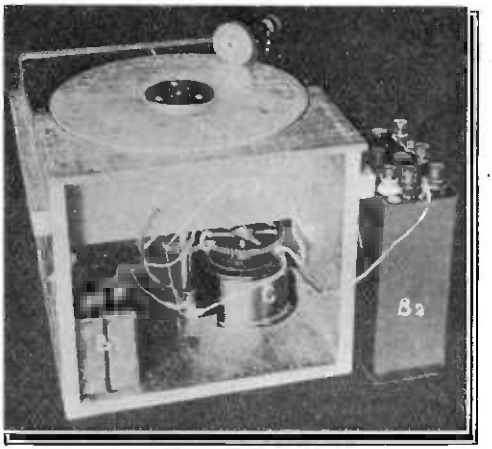
ALTHOUGH the wavemeter illustrated herewith is of a design which will, in all probability, be of value to a negligible number of readers of *The Wireless World and Radio Review*, it may be, nevertheless, that the way in which the unique difficulty which presented itself has been overcome will be of interest.

The experimenter who designed and uses this instrument was blinded in the war, and consequently his problem was to devise a means of accurately reading wavelengths by touch alone.

It was necessary to construct the dial in such a manner that the largest possible travel was obtained when the condenser was moved through 180 degrees. It will be seen that this has been secured by the expedient of gearing the control down so that one complete revolution of the dial plate is required to move the condenser from minimum to maximum. Actually the dial is 8 ins. in diameter, so that a travel of about 25 ins. has been secured. The dial, which is of ebonite covered by aluminium sheet, is divided into 36 segments by Braille embossed figures, between each pair of which are placed two vertical dots representing the half-way line. Thus 72 points on the revolving disc can be accurately read with the forefinger in relation to the fixed index line on the front ebonite panel, and intermediate positions can also be gauged with fair reliability just as with visual instruments.



The heterodyne and buzzer wavemeter arranged for reading by touch. Braille figures are raised on the dial which are sufficiently extended to provide for accurate calibration.
D. Calibrated metal dial with embossed figures. J. Fine adjustment, with rubber wheel friction drive. V. Valve. R. Rheostat. T. Telephones. X. Connector for grid and plate inductances. S1. Filament switch. S2. Buzzer switch. B. Battery for buzzer. Z. Buzzer. P. Plug to connect buzzer in plate circuit.



Side removed to show gearing for extending the scale from 180° to 360°. G. 2 : 1 gearing. C. Variable condenser. B2. 6-volt accumulator. B3. 30-volt H.T. battery.

Further, to increase accuracy, a condenser of relatively small value is used in conjunction with a larger number of coils than is normally employed. The coils consist of a plate and grid basket coil coupled together in an ebonite box with flexible leads and plug.

In practice it has been found that wavelengths of the experimenter's own transmitter and of other stations can be read with as great accuracy as is usual with most of the

ordinary instruments in the possession of amateurs, and without appreciably greater effort or expenditure of time.

Apart from the peculiar dial, the instrument follows the standard practice adopted in most oscillating wavemeters. There is, therefore, no other feature to comment upon beyond that the instrument is entirely self-contained, having its own unspillable accumulator and H.T. battery. This is found to be an immense advantage, particularly when testing a transmitter, as the whole instrument can so readily be removed a few feet from the oscillatory circuits to obtain better readings.

The writer would urge an amateur intending to construct his own wavemeter to go to the additional trouble and expense of making an oscillating instrument. The advantages as regards sharpness of tuning, as well as the usefulness of the instrument for heterodyning purposes, will amply repay any effort initially put forth.

Incidentally the writer ventures to suggest to some of the wireless firms who want to secure good friends in the world of amateur experimenters to advertise that they are willing to calibrate home-made instruments. They need not do the work with laboratory exactness, probably few of the instruments would in themselves warrant this, but it would be a boon to many if this service were available at moderate fees with a fair degree of accuracy guaranteed. I. F.

THE HIGHER POWERED AMERICAN BROADCASTING STATIONS.

Call Signal.	Owner of Station.	Location of Station.	Frequency Kilo-cycles.	Wave-length Metres.	Rating Oscill. Watts.
KDKA	Westinghouse Elec. & Mfg. Co.	East Pittsburgh, Pa.	920	326	1,000
KFDB	Mercantile Trust Co. of Calif.	San Francisco, Calif.	590	509	750
KFI	Earl C. Anthony, Inc.	Los Angeles, Calif.	640	469	500
KGW	The Oregonian Pub. Co.	Portland, Oregon.	610	492	500
KHJ	*Times-Mirror* Co.	Los Angeles, Calif.	760	395	500
KPO	Hale Bros., Inc.	San Francisco, Calif.	710	423	500
KSD	*Post Dispatch*	St. Louis, Mo.	550	546	500
KYW	Westinghouse Elec. & Mfg. Co.	Chicago, Ill.	870	345	1,000
WBAP	Wortham-Carter Pub. Co.	Fort Worth, Texas	630	476	500
WBAY	Western Elec. Co.	New York, N.Y.	610	492	500
WBZ	Westinghouse Elec. & Mfg. Co.	Springfield, Mass.	890	337	750
WCAE	Kaufman & Baer Co.	Pittsburgh, Pa.	650	461	500
WCX	*Detroit Free Press*	Detroit, Mich.	580	517	1,000
WDAF	*Kansas City Star*	Kansas City, Mo.	730	411	500
WDAR	Lit Bros.	Philadelphia, Pa.	760	395	500
WEAF	American Tel. & Tel. Co.	New York, N.Y.	610	492	500
WFAA	A. H. Belo & Co., *Dallas News and Journal*	Dallas, Texas	630	476	500
WFI	Strawbridge & Clothier	Philadelphia, Pa.	760	395	500
WGM	Atlanta Constitution	Atlanta, Ga.	700	429	500
WGY	General Electric Co.	Schenectady, N.Y.	790	380	1,000
WHAS	*Courier Journal & Louisville Times*	Louisville, Ky.	750	400	500
WHAZ	Rensselaer Poly. Inst.	Troy, N.Y.	790	380	500
WHB	Sweeney Auto & Elec. Sch.	Kansas City, Mo.	730	411	500
WIP	Gimbel Bros.	Philadelphia, Pa.	590	509	500
WJAX	Union Trust Co.	Cleveland, Ohio	770	390	—
WJAZ	Chicago Radio Lab.	Chicago, Ill.	640	448	—
WJY	Radio Corp. of America	New York, N.Y.	740	405	—
WJZ	Radio Corp. of America	New York, N.Y.	660	455	—
WLAG	Cutting & Wash. Radio Corp.	Minneapolis, Minn.	720	417	500
WMAQ	*Chicago Daily News*	Chicago, Ill.	670	448	500
WMC	Commercial Pub. Co.	Memphis, Tenn.	600	500	500
WOC	Palmer School of Chiropractic	Davenport, Iowa	620	484	500
WOO	John Wanamaker	Philadelphia, Pa.	590	509	500
WOR	L. Bamburger & Co.	Newark, N.J.	740	405	500
WSAI	U.S. Playing Card Co.	Cincinnati, Ohio	970	309	—
WSB	*Atlanta Journal*	Atlanta, Ga.	700	429	500
WWJ	*The Detroit News*	Detroit, Mich.	580	517	1,000

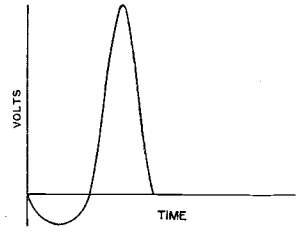
A NOVEL METHOD OF RECTIFICATION.

It is difficult to devise a method of producing H.T. for operating a transmitter if power mains are not available. The practical information on the setting up of a neon lamp rectifier for use with the stepped-up potentials obtainable from a suitably constructed induction coil or transformer, should help to solve the difficulty, particularly as no additional current from the accumulators is needed, as with power rectifier valves.

By FREDERIC L. HOGG (**2 SH**).

THE H.T. problem for amateur transmitters is always a big one. Where D.C. or A.C. mains are laid on the situation is not difficult, but where no power is available there are considerable difficulties. Small wet or dry batteries are all very well in their way, but are expensive and troublesome. Hand generators are fairly simple to rig up, but are useless for Morse work, and are very expensive indeed.

Apart from these the only possibility is some form of induction coil arrangement to step up the voltage from an accumulator such as is used for filament lighting. This type of apparatus was in use during the war under the name of the T.V.T. (tuned vibratory transformer) unit.



Voltage curve of T.V.T. secondary.

This consists of a small spark coil and interrupter specially made for the purpose, with a condenser across the secondary terminals to help smooth out the peaks of secondary voltage. From such a coil we get a secondary pulse consisting of a small kick in one direction, followed by a much larger kick in the opposite direction. Now, for Morse working this is quite satisfactory, but we must arrange the larger pulse to be in a positive direction, on the plate of the valve, which suppresses the reverse pulse. This is easily done by reversing primary and secondary leads on test and noting which gives the best results. Now if we want to do telephony we must rectify this supply before applying it, through a filter, to the valves. Unfortunately a chemical rectifier cannot be used in this case, so that the only solution appears to be a valve. Here we have immediately added a large expense of another valve and accumulator, as the rectifying valve cannot unfortunately be lighted by the same battery as the filament. Because of these troubles the T.V.T. unit is very little used by amateurs.

However, there is a solution to the difficulty which opens up a field of research for the amateur.

The ordinary neon lamps, commercially known as "Osglims," have, as is well known, certain curious properties. They pass a larger amount of current in one direction than in the other, and need a threshold voltage to start a current passing of about 140 volts. However, once a current has started to flow, the internal resistance of the lamp diminishes and the larger the current, the lower the resistance of the lamp. Now in a T.V.T. unit we have, as has been mentioned, a large pulse in one direction and a small one in the reverse direction. Suppose for the purposes of argument that the voltages of these pulses are 1,000 and 100 volts respectively. Now if we connect the unit correctly to a rectifying lead, such

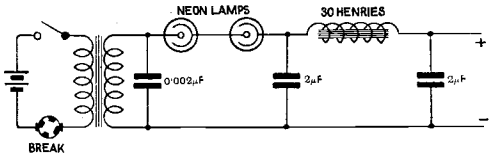


Fig. 2. Rectifier and smoothing circuit for use with induction coil and vibrator or motor-driven interrupter.

as the valve, the 100-volt pulse is suppressed, and the 1,000-volt pulse does the useful work. Now if we put a neon lamp in the circuit in the correct direction, the 1,000-volt pulse will light the large electrode up and the lamp has no effect on the circuit. But

the 100-volt pulse cannot break over the threshold value of the neon lamp voltage so that the pulse does not reach the valve. Then if we put a filter between the neon lamp and the valve we will get 1,000 volts of pure D.C. on the plate. Applied practically, enough neon lamps are placed in series to suppress the unwanted pulse. In an ordinary set two or three are required.

There are certain practical points which should be considered. The usual spark coil gives too high a secondary voltage. A new secondary can be put on a spark coil, and for 1,000 volts H.T. about 350 to 500 times the number of primary turns should be used, according to whether a 6 or 4-volt accumulator is used. It is better to use an external break of fairly rapid speed. It also helps to put a 0·001 or 0·002 fixed condenser across the secondary terminals before the lamp. As the lamps are bought, there are small resistances inside the cap which must be removed before using them for this purpose. A suitable filter consists of two 2 mfd. condensers and a 20 or 30 henry choke.

There is here a large field for experiment. I personally can only say that it works, as being more fortunately situated as regards juice, I have only subjected this to a laboratory test. It therefore remains for someone to work out the possibilities of the neon lamp in such a direction. As a suggestion, if A.C. power is available, this would be rectified from the mains by a single wave chemical rectifier and the pulsating current used on the primary of the transformer rectifying as above. I hope someone will experiment in this direction and give others the benefit of his experiences.

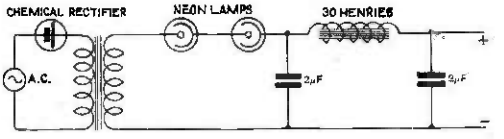


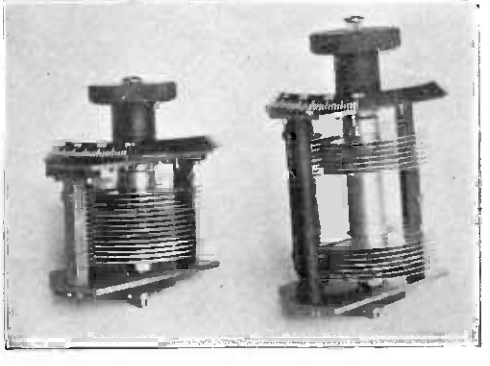
Fig. 3. Pulsating high potentials suitable for neon lamp rectification are obtained from an A.C. source by the insertion of a chemical rectifier in the transformer primary.

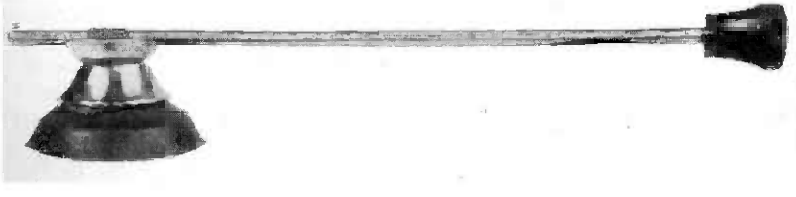
APPARATUS OF AMATEUR INTEREST.

The illustrations shown here are of an El-be Anti-capacity Extension Handle produced by Messrs. Leigh Bros., and also two types of variable condenser by The Marconi Scientific Instrument Co., Ltd.

The El-be Handle differs from other types of extension handle in that no screws or clamps are used to fix it. It is simply necessary to push the control knob on in a suitable position and it stays on the condenser dial until removed by pinching the rubber suction grip.

The condensers are of particularly good workmanship, and are especially adaptable for panel mounting.





The illustration on the right shows a double condenser especially applicable for tuning two circuits simultaneously.

THE SOFT VALVE

Now that so many soft valves are in use, this short note on their operation should prove helpful to those whose experience does not go back to the days when valves were invariably soft. The soft valve for certain purposes will give results superior to the usual hard variety.

RECENTLY, quite a number of "brothers in radio" have come to me, bewailing their fate in the following manner. "That cheap valve I got is no good; I don't know what's wrong with it but it won't work, and goes blue when it's alight."

Really these poor folks are the possessors of a splendid valve for some purposes and, once they learn how to use it, will search around to procure a stock of them.

The so-called soft valve is identical in construction to the hard valve commonly in use, the sole difference being a slight amount of some inert gas in the bulb, or else an extremely low vacuum.

Ionisation easily takes place producing the blue glow, which should not be allowed to continue. This valve is an extremely good detector and I have frequently obtained results with one, almost equal to a hard valve and one note magnifier; and all this entirely without the use of reaction.

Two things are necessary, firstly a good filament rheostat capable of fine adjustment, and secondly a high tension battery of about 40 volts adjustable in steps of 3 volts.

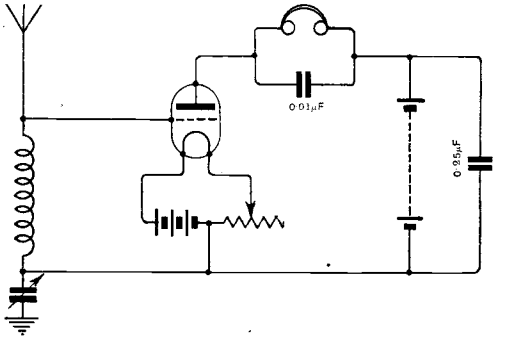


Fig. 1. Simple detector valve circuit in which a soft valve functions well.

Invariably the required plate voltage will be low, in the region of 20 to 25 volts. As far as circuits go the ordinary grid leak and condenser system of rectification may be used, but sometimes better results may be obtained with a slightly different circuit shown in Fig. 1.

Care should be taken that the low potential end of the inductance and also the negative end of the H.T. battery are brought to a point between the filament rheostat and the valve. A large condenser should be used across the H.T. battery and the value given is only a suggestion. Where low frequency amplification is to follow, hard valves should be used for the magnifiers and a tapped H.T. battery employed. The circuit would be as Fig. 2.

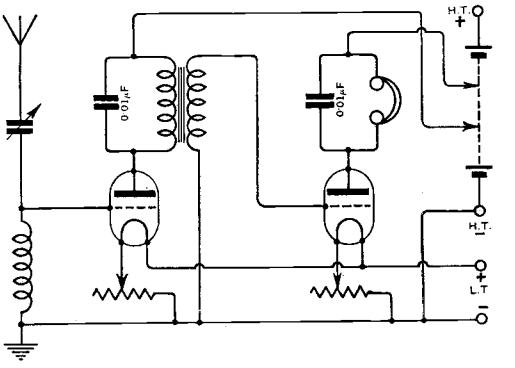


Fig. 2. Detector valve circuit and note magnifier.

The soft valve frequently makes a good high frequency amplifier, but very rarely a good note magnifier. One great exception to this appears to be the American valve, Radiotron U.V. 200, which operates in any position on a plate battery of 22½ volts. The method of operating a soft valve is as follows: Give the plate a supply of 20 volts and slowly turn up filament. The valve will now operate, but requires a rather brilliant filament. Now increase the plate battery in steps of 3 volts, keeping the filament constant. A point will be reached where a violent hissing takes place, accompanied by a slight blue glow, or distortion of signals. The filament should now be reduced until the hissing stops, and again increased to a point just preceding hissing.

The extra trouble involved in the use of a soft valve is well repaid and, if compelled to work on a single valve, the author would definitely choose this type.

A. F. B.

INSTRUCTIONAL ARTICLE FOR THE LISTENER AND EXPERIMENTER.

VARIOMETERS—II.

When a continuously variable inductance is required, an instrument termed a variometer is used. The principles underlying the design of various types were discussed in the previous issue and are continued below.

By W. JAMES.

Types of Variometers.

(*D*) To obtain a greater variation in inductance than is possible with the arrangement described in section (*A*), page 83, October 17th issue, we may wind four coils and connect them in series (or parallel, of course) as in Fig. 10. Coils W

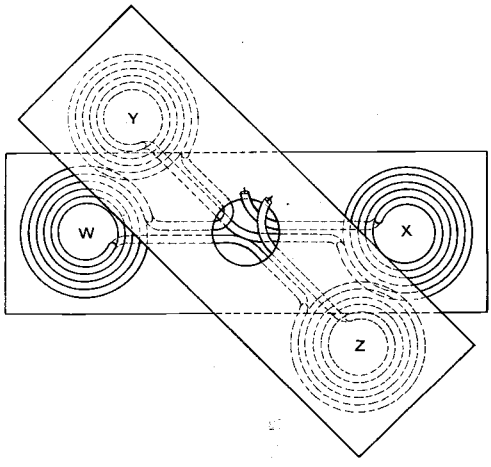


Fig. 10. *A simple variometer which provides the means of obtaining a larger inductance change than is possible with an arrangement such as Fig.* 4.

and X are fixed to a board, and coils Y and Z are movable. By changing the positions of coils Y Z relative to W X, the inductance is varied. It is a maximum when coil Z is over coil W and Y over X. The inductance has its minimum value when the coils are turned right round so that Y is over W, and Z over X. The variation will be greater the closer the surface of the coils.

(*E*) An improvement is obtained if the coils are wound to have the shape of the letter **D**, Fig. 11. A simple construction consists of cards which have slots, wound with wire, the wire passing in and out of the slots, very similar to the construction of the ordinary basket type coil. One card is fixed and the other is provided with a knob, and is pivoted. As the knob is turned, the inductance varies in the manner as described in section (*D*) above.

The windings may be connected in series or parallel. Referring to Fig. 12, which shows the coils separated for simplicity, the coils are connected in parallel. The inductance has its minimum value when the current flows through the windings in opposite directions as at A. The inductance has its highest value when the coils are placed as in B.

In Fig. 13 the windings are in series. When the coils are situated as at A, the inductance has its smallest value; with the moving coil turned right round, B, the inductance has its maximum value. The inductance is of course larger when the coils are joined in series.

(*F*) A **D** type variometer is shown in section and plan in Fig. 14. Referring to

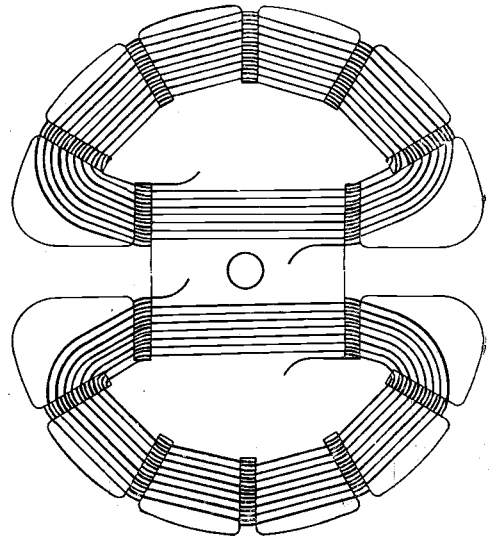


Fig. 11. *One winding of a* **D** *type variometer. Two of these are made. One is fixed, and the other mounted above it so that it may be rotated.*

this figure, the stator has two windings, A and C, wound in grooves provided in the former F. The rotor has two windings, B and D, wound in grooves provided in the former E. The knob K is attached to the spindle H, which carries the rotor.

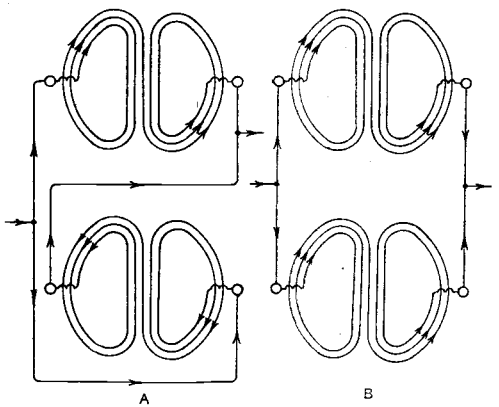


Fig. 12. *Explaining the operation of a* **D** *type variometer when the coils are in parallel. The inductance is low at A and high at B.*

When the knob is turned, the position of the lower coils is changed with respect to the fixed coils. The operation will be understood by referring to Figs. 12 and 13, which show the windings apart, and connected in series and in parallel. The variometer is fastened to the panel by the screws J. To provide the largest possible variation, the two sets of coils are mounted as close together as possible. The packing ring G is to prevent the lower coils turning too freely, and keeps particles of foreign matter from lodging between the sets of coils.

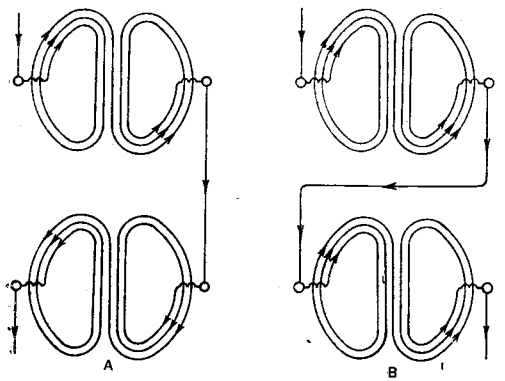


Fig. 13. ***Here the coils are in series. The inductance is low at A and high at B.***

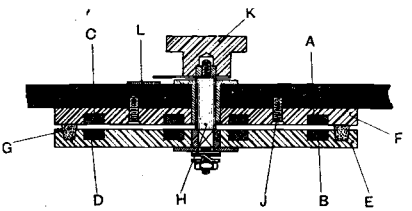
The variometer may be calibrated by measuring the inductance for various settings of the pointer on the scale L.

The inductance may be made large or small, according to the number of turns of wire in the coils.

Variometers of this description which are employed in transmitter circuits, are wound with bare spaced conductors, or rubber-covered flexible wire.

The larger inductances generally required in receiver circuits may be obtained by winding the coils with more turns of small wire.

The method of connecting a double-pole throw-over switch for connecting the two sets of windings in series or parallel is given in Fig. 14A.



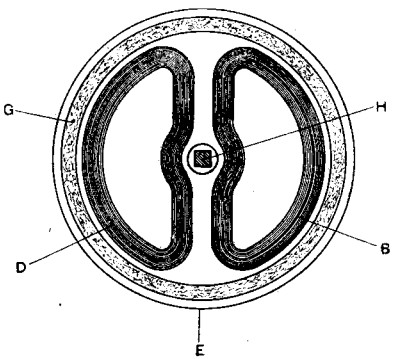


Fig. 14. *A* **D** *type variometer.*

(*G*) Cylindrical Variometers.

Another useful type of variometer, which is not used to any extent in this country, although it is to be found in some German apparatus, consists essentially of a cylinder with an appropriate winding which may be turned inside another cylinder carrying a winding on its inner surface. Referring to Fig. 15, which shows but one of many forms which will readily occur to the reader, the rotor consists of a cylinder upon which

coils X and W are fastened. The outer cylinder (stator) has also two windings, Y and Z, and these are fastened to the inner surface of the cylindrical former.

If these sets of coils are joined up in the same way as those of the flat D type variometer described above, a wide variation in inductance may be obtained by turning the rotor.

As before, the greatest variation is obtained when the clearance between rotor and stator is made as small as mechanical considerations permit.

The coils to be used in this instrument may be wound in a number of ways.

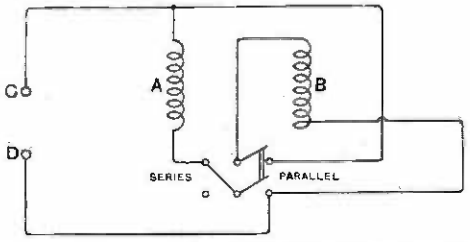


Fig. 14A. Method of connecting a throw-over switch to join coils in series or parallel.

Naturally, considerations of electrical efficiency lead one to adopt a spaced type of winding which may be prepared as, for example, like a basket coil, the winding former being removed when the coil is wound.

If skeleton construction formers are used, losses will be further reduced. The basket coil-skeleton former arrangement, is highly satisfactory, provided care is taken in fixing so that the variometer is mechanically sound.

(*H*) When large changes in inductance are required, it is sometimes convenient to interleave several D type coils, mounting alternate coils upon a spindle which may be rotated. Many elaborate instruments have been built in this way.

In others, ordinary pancake coils are enclosed in boxes of ebonite or other insulating material, alternate boxes being supported on a common spindle. To secure fine adjustments, gear wheels are employed so that a large movement of a knob produces only a small change in the position of the coils.

It will not be beyond the ability of an interested amateur to construct such a

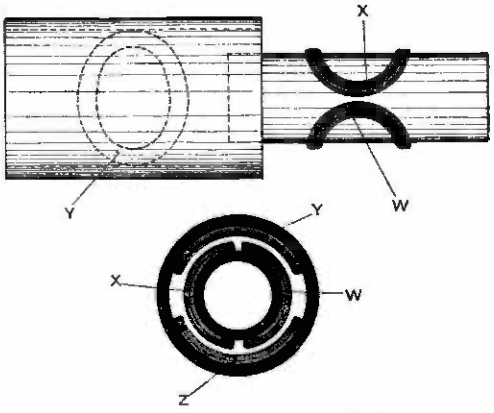
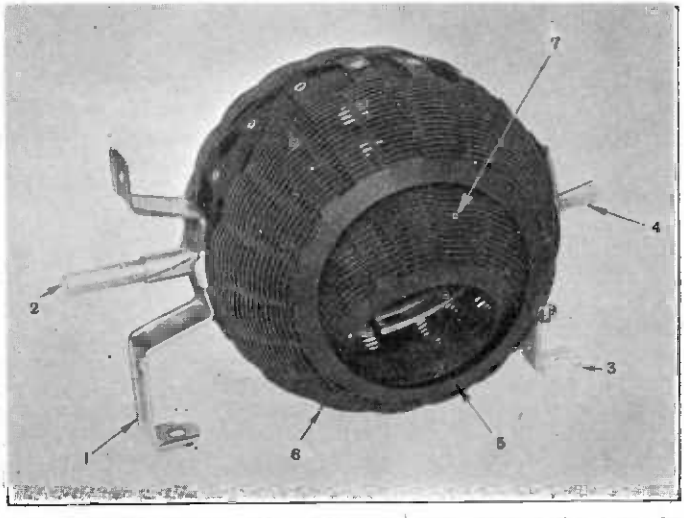


Fig. 15. The arrangement of the coils in a cylindrical type variometer. The smaller cylinder carrying the windings X and W is mounted so that it may be rotated inside of the larger cylinder.

large range variometer, using interleaved coils, and perhaps a barrel multipoint dead-end switch to connect sections in circuit as required.

(*I*) It is well worth noting that the inductance of a coil may be varied by bringing near it a metal plate, which may be connected



An American basket ball variometer. The construction may be understood by examining the photograph. Both windings are wound as basket balls. 1 and 3 are the supports, 2 the shaft to which is fastened the knob, 4 is the back end of the shaft, 5 the prepared former, 6 the stator winding and 7 the rotor winding.

(General Wireless, Ltd., 21, Garrick St. W.C.)

to one side of the coil, or not. Referring to Fig. 16, a coil such as A may have its inductance varied by changing the position of the metal plate B. The inductance change depends to a large extent upon the dimensions and material of the plate. Using copper 1/16 in. thick, a 30 per cent.

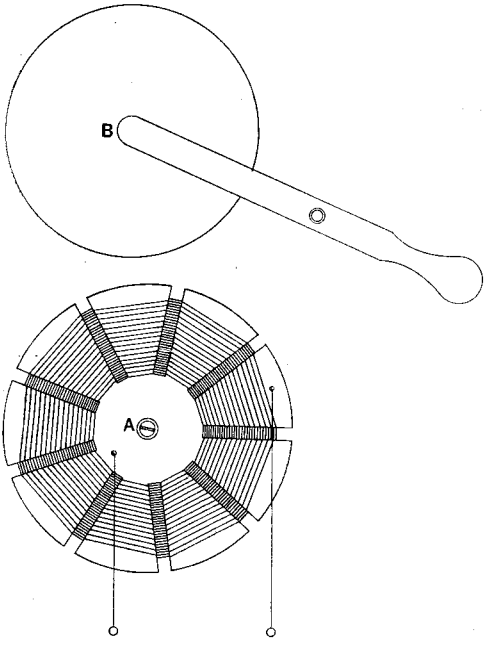


Fig. 16. *A very simple method of varying the inductance of coil A is to arrange a metal plate* **B**, *so that its position with respect to the coil may be varied.*

variation is easily obtained, which for some purposes is very convenient.

The eddy currents induced in the plate create a magnetic field which opposes that of the coil, hence the reduction in the coil inductance. The energy induced in the plate is abstracted from the coil, consequently the effective resistance of the coil is proportionately increased. By proper design, however, the increase in effective resistance may be kept within reasonable limits, and does not constitute a serious disadvantage, because in many cases this increase may be compensated for, as for example, in valve circuits where reaction or back coupling may be employed.

(*J*) If two coils are mounted close together, the mutual inductance may be varied by using a metal plate. A simple arrangement is shown in Fig. 17. The coils are A and B, and the metal plate C. The mutual inductance may be varied by changing the position of the plate, moving it away from the coils increasing the inductance. When the plate practically covers the surface of the coils, the mutual inductance is very small indeed.

With the windings connected in series, and the plate arranged so that it may be slid in or out in the space between the coils, we have a useful variometer. The inductance variation is, of course, not only caused by varying the mutual inductance, but the inductance of the coils themselves also varies. Consequently a wide range of inductance is obtainable.

The arrangement described is used in several commercial receivers. For small inductances, simple basket coils are used, and for larger values, multilayer coils are employed.

In another instrument, with two knobs, the inductance is variable to such an extent that the range of wavelengths 500 to 25,000 metres is covered with an appropriate condenser. The knobs operate through gear wheels, and control the position of the various

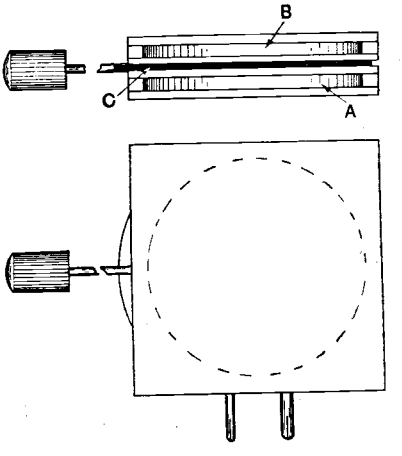


Fig. 17. *This is a variometer which has two windings A and* **B**. *The metal plate C is arranged so that it may be moved in between the two coils.*

coils as well as the number of coils in circuit (by operating dead-end switches), and fine inductance changes are obtained by adjusting the metal plates.

(*K*) The capacity between the two portions of a variometer may be high, and sufficient to affect the operation. This effect is treated in a later section

PORTABLE EXPERIMENTAL RECEIVER.

THIS set was evolved with the idea of having a convenient collection of components, together with the necessary batteries, which would be entirely self-contained and portable.

The set closes on hinges into a case measuring 17″×14″×9¾″ overall, and is made of mahogany (french polished), ⅜″ thick, with top and bottom of 3/16″ 3-ply. Two holes are bored in register for the loud speaker, so that when the set is opened, a through passage is made between the 4,000 ohm earpiece and the trumpet.

The trumpet is made from elm, about 1″ thick, steamed to shape and glued in position.

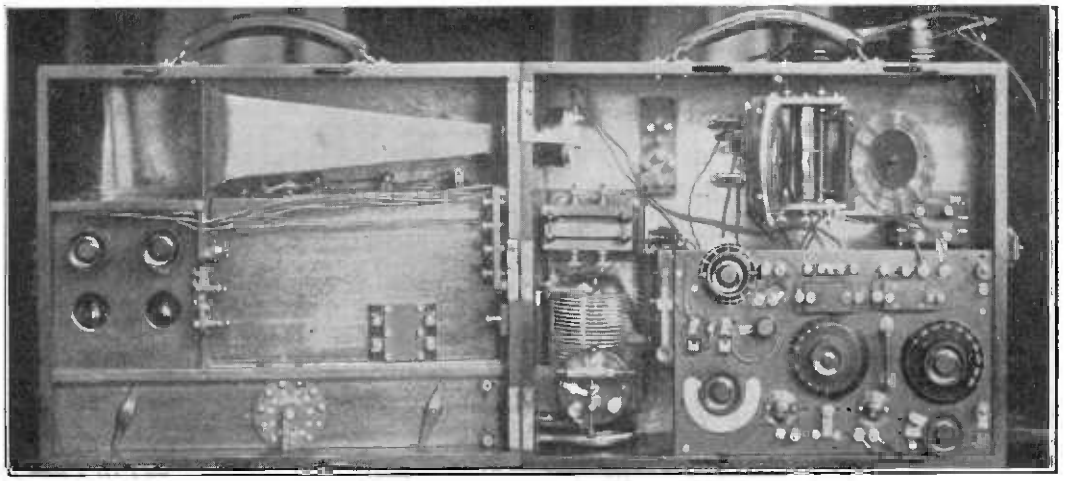
To ensure the joint being proof against sound leakage, indiarubber umbrella rings are sunk into the concentric recesses around each hole. Two " D.E.R." valves, guarded by ½ amp. fuses, are fitted and fed by four dry cells of approximately 30 amp. hour capacity each.

The H.T. supply is composed of 19 4½-volt flash lamp batteries, which are simply placed in a row, and automatically wired in series by clamping down the lid. This wiring is effected by strips of metal suitably disposed on the underside of the lid, each making contact with the + and — tongues of adjacent batteries. Tappings are taken at every 8 volts to the switch shown in the photograph.

The leads from the various condensers, coil holders, valve grids and anodes, etc., are brought out to terminals conveniently placed for wiring up any circuit it is desired to try out.

A two-way multiple contact switch, on the lines of that described in *The Wireless World and Radio Review* dated May 26th, is fitted for instantaneously connecting up either a simple crystal or a Flewelling single-valve circuit. Other switches with internal wiring are :—Tuning condenser series-parallel switch, telephone switch to select one or any of the telephone or loud speaker connections, and crystal switch for double or single crystal.

Four variable condensers of different capacities, variometer coupler, fixed grid, blocking, telephone, and double 0·006 mfd. (Flewelling) condensers, 16-volt tapped battery for grid bias, potentiometer, buzzer and Morse key, variable and fixed grid leaks and anode resistances, and two L.F. transformers complete the set. T. K.



The portable receiver constructed by Mr. Thomas Kamester.

THE AUTOMATIC RECEPTION OF WIRELESS SIGNALS*

By E. R. BATTEN.

THE subject of the recording of wireless signals is one that dates back to the beginning of wireless signalling. As is well known, the first practical wireless receiving apparatus used on a commercial scale employed the coherer acting upon a relay so that the messages were recorded on a Morse inker. Descriptions of this type of apparatus may be found on pages 450 to 465 of Professor Fleming's book, "The Principles of Electric Wave Telegraphy and Telephony." Needless to say, such methods are of little or no use nowadays.

After the introduction of crystals into practical wireless communication work, the recording of signals fell out of use, since such detectors were adapted to the more sensitive reception of signals by telephone. However, crystal receivers are capable of operating some forms of recording apparatus. In this connection an Einthoven galvanometer working in conjunction with a moving strip of sensitive photographic paper may be used to record the incoming signals.

In 1913 one of the members of this Society, Mr. Axel Orling, A.M.I.E.E., obtained some very good records with a crystal receiver working in conjunction with the Orling jet relay. Reference to Mr. Orling's work will be found on page 552 of Professor Fleming's book, "The Principles of Electric Wave Telegraphy and Telephony."

The best known method of recording wireless signals received on a crystal is one involving the use of a dictaphone. Reference to the use of a dictaphone for recording purposes may be found on pages 508 and 541, Vol. 9, *The Wireless World*.

It was in connection with the dictaphone that the first high speed wireless service was rendered practicable. In the early part of 1914 the Post Office authorities placed a contract with the Marconi Company for the erection of a wireless station at Stonehaven, capable of communicating with the Cullercoats wireless station at a speed of 100 words per minute. Tests in connection with this contract were carried out between Chelmsford and Letterfrack, Co. Galway, a distance of 550 miles. The signals were received on a crystal and then amplified by means of Brown telephone relays until the signal could be heard in any part of a large room. These signals were then recorded by a dictaphone. These tests were quite successful, and a maximum speed of 140 words per minute was obtained.

The dictaphone was used until quite recently in America, for the reception of transatlantic traffic.

With the outbreak of the war, experiments in connection with recording had to cease, with the result that very little was accomplished in connection with high-speed wireless recording.

However, during the course of experiments for military purposes, Capt. L. B. Turner discovered the key for the satisfactory automatic recording of wireless signals, in his invention, the oscillatory valve relay. Further information concerning the Turner valve relay may be found in the *Journal I.E.E.*, Vol. 57, Supplement, page 50, and also on page 160, Vol. 8, *The Wireless World*.

In 1919 the Army Signals Experimental Establishment took up the Turner valve relay and experimented with it in connection with high-speed working. Their first attempt at high-speed working with the valve relay was made in July, 1919, when a maximum speed of 50 words per minute was obtained. This also was the first time that signals were recorded on a Wheatstone receiver, hitherto all reception being on the dictaphone.

After a good deal of experimental work, the Signals Establishment produced a modified form of valve relay with the various circuits to suit. In the *Journal I.E.E.*, Vol. 60, page 245, there is a complete record of the experiments and results accomplished by the Signals Establishment.

The results of this experimental work have made it possible to use the Creed

* Paper read before the Streatham Radio Society.

receiver and printer so that wireless signals can be received and printed directly in Roman type up to a speed of 150 words per minute. A description of the Creed receiver and printer (compressed air types) may be found on page 641, Vol. 8, *The Wireless World*.

During the last three years high-speed transmission has become an increasingly important if not vital problem of commercial radiotelegraphy. We now have in this country commercial services working at 80 and 40 words per minute. Other countries are also taking up the high-speed question and are inaugurating high-speed services.

In the first place the requirements of a really satisfactory recording circuit are :—

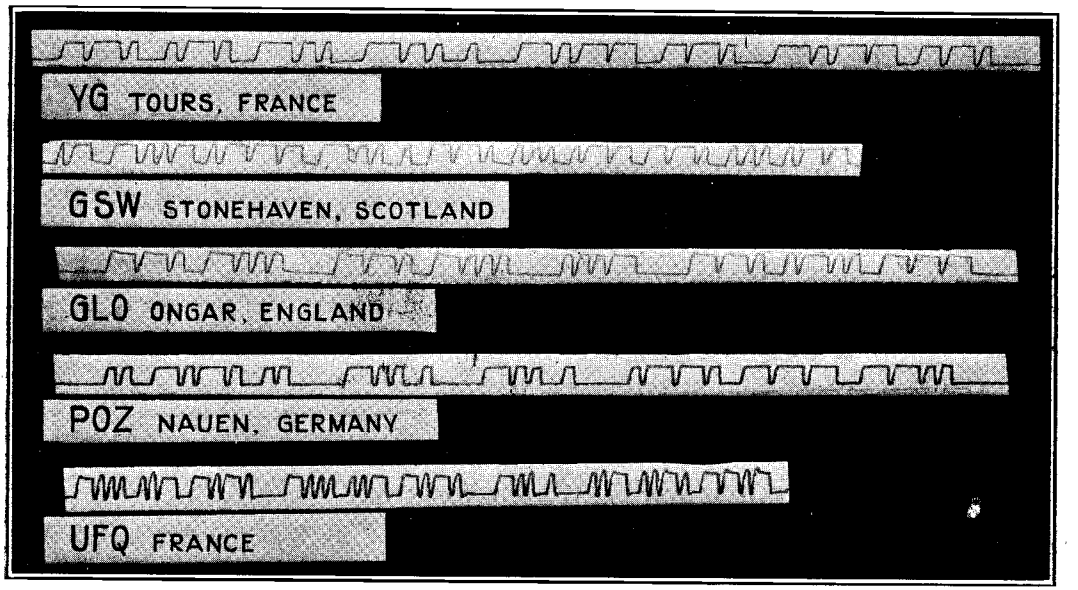
1. It must be of simple design, consistent with efficiency, and with few adjustments.

2. It must be easy to adjust and capable of being put into operation quickly.

3. It must be selective, and as free from disturbance as possible.

4. It must be of robust construction, and capable of maintaining its adjustments.

The circuit and the apparatus connected therewith, which is described below, does, I



Photograph of specimens of tape obtained with the recording circuit of Fig. 3.

Some of the transatlantic services are being worked at 40 words per minute, and even some of our large liners are now being equipped with automatic installations for high-speed working.

So much for a brief survey of the history of recording.

It is not possible to give a detailed account of all the various methods that have been or are capable of being used for the recording of wireless signals, but it may be of interest to draw attention to one of the methods that is applicable at the present day both for experimental and commercial purposes.

think, fulfil the majority of these requirements.

I do not propose to concern myself greatly with the radio circuits to be employed, since these do not present any very special differences from those generally employed for the telephonic method of reception. It is desirable, however, to use radio-frequency amplification in preference to audio-frequency amplification.

There are two principal ways of using relays in valve circuits. They are :—

1. The bridge method.

2. Where the relay winding is inserted in the anode circuit of the last valve.

There are several types of bridge methods, but I do not think them worth the complexity involved in the matter of balancing circuits, etc. The second method is the method I use, and I find it simple, efficient and constant.

I will now deal with the relays that are generally used for recording purposes. The two relays in common use are :—

1. The moving coil type (the Weston relay being of this type).

2. The common magnetic relay, such as the standard Post Office relay, and the Siemens polarised relay.

The moving coil relay, whilst highly sensitive, is, generally speaking, not at all robust mechanically, they do not make firm contact, and are unsuitable for high telegraphic speeds.

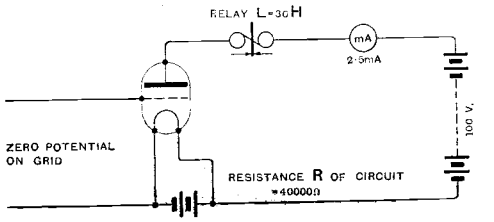


Fig. 1. The relay is shown here connected in the anode circuit of the last valve.

The standard form of Post Office relay is not very sensitive, and necessitates the pushing of amplification to a higher degree than is desirable. For good and constant working I have found a Siemens polarised relay quite satisfactory.

As before stated, the relay is inserted in the anode circuit of the last valve. The grid of this valve is given a negative potential sufficient to reduce the current flowing in the anode circuit to nearly zero. This negative potential has the effect of increasing the internal resistance of the valve. Now the time taken (called the "time constant" of a circuit) for the current in a circuit, containing inductance L, and resistance R, to rise to within $\frac{1}{\epsilon}$ or 0·632 of its maximum value is given in seconds by the expression

$$t = \frac{L}{R}$$

An example will show the effect of a negative grid potential on the time constant of a circuit comprising a valve and relay. A valve has zero potential on the grid. A relay, whose inductance is 30 henrys, is placed in series with the anode circuit (Fig. 1). The high-tension supply is 100 volts and the current flowing in the anode circuit is 2·5 milliamperes. Thus the resistance of the circuit is 40,000 ohms.

Therefore the time constant

$$(t) = \frac{30H}{40{,}000\omega}$$
$$= 0{\cdot}00075 \text{ sec.}$$

If, on the other hand, a certain negative potential is applied to the grid (Fig. 2), a current of 1 milliampere flows in the anode circuit, then the resistance of the circuit is of the order of 100,000 ohms. Then the

$$\text{time constant } (t) = \frac{30H}{100{,}000\omega}$$
$$= 0{\cdot}0003 \text{ sec.}$$

From these few figures it will be seen that by increasing the resistance of the circuit, the time constant of the cir ·it is lowered, and therefore by keeping the grid at a negative potential it is possible to use a relay of high inductance value, and therefore greater current sensitivity than would otherwise be permissible without making the relay sluggish in its action, particularly at high speeds.

It will also be found that most relays of the magnetic type are rendered relatively insensitive by the presence of an appreciable steady current, that is to say, a change of from zero to 0·1 milliampere is far more effective than a change of from say 0·5 to 0·6 milliampere.

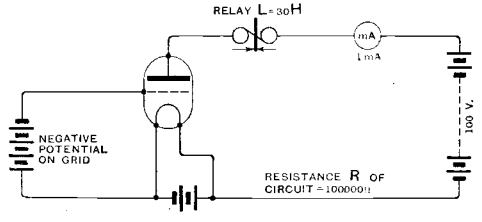


Fig. 2. When a negative potential is applied to the grid, the circuit resistance is high, and the time constant lower.

When using a type E.S.4 valve with an anode potential of 100 volts, a potential of −17 volts is required on the grid in order to reduce the anode current to nearly zero.

In parallel with the relay there is a 0·05 mfd. condenser. The function of this condenser is to by-pass the audio-frequency ripple of the anode current. A suitable

value for this condenser is best found by experiment.

The recorder or undulator in use is a moving coil instrument. There are two types of undulators, they are :—

1. The moving coil type in which a siphon recorder coil carrying the siphon tube is stiffly suspended in a concentrated magnetic field.

2. The electro-magnetic type, a description of which appears on page 479, Vol. 9, *The Wireless World.*

As regards the performance of this circuit and the apparatus belonging thereto, it has been tried at speeds up to and including 80 words per minute, and found to function quite well. Traffic from Stavanger, Nauen and other continental stations is recorded regularly. Time signals can also be recorded and the Paris (**FL**) U.R.S.I. signal consisting of a two minutes dash can be recorded quite well, the dash showing no signs of splitting up.

Fig. 3 is a diagram of the circuit used for recording. The grid condenser and leak method of rectification is used. This circuit does not, I think, call for any explanation, it being one of everyday use.

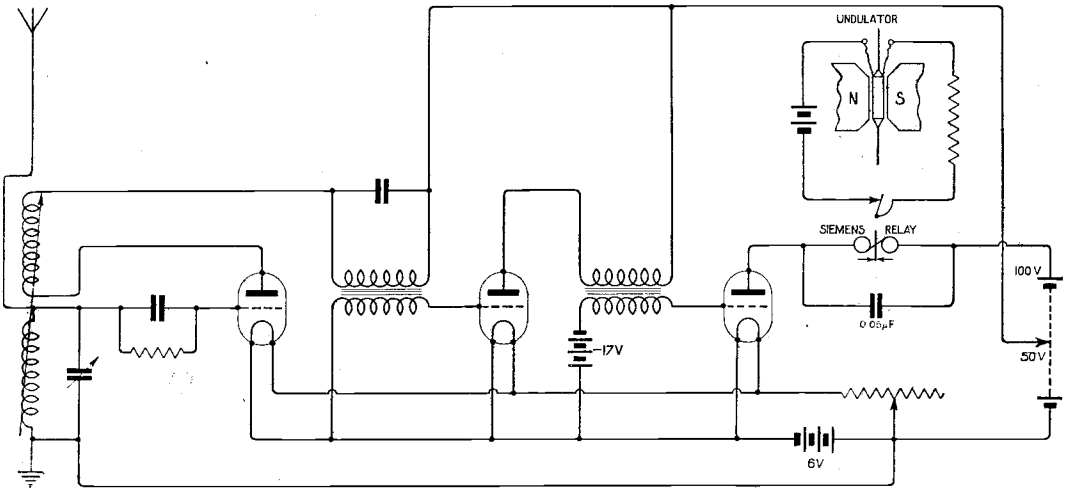
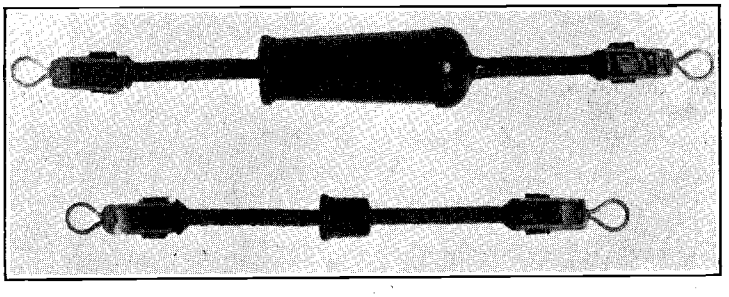


Fig. 3. *Complete diagram of the receiver and recorder.*

Aerial Insulators.

The accompanying illustration shows a new type of insulator manufactured by the Silvertown Co., 106, Cannon St., London. They are constructed of rubber and cotton, with end clips of duralumin. The cup in the centre of the insulators keeps a portion dry even in wet weather, and the leakage surface is long. They are quite light ; at the same time they will withstand, without breaking, a greater pull than No. 18 copper wire.



CORRESPONDENCE

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—There have been many letters in *The Wireless World and Radio Review* describing the difficulty of reception in Bournemouth and other South Coast places.

As I expect to stay here for a few weeks I brought a three-valve set with me, just an orthodox tuned anode receiver with one L.F., using D.E.R. valves with about 30 volts H.T. The following description of reception may be interesting.

My first room was on the second floor of the hotel, and the aerial used was 150 feet ex W.D. insulated steel wire (as advertised at so much a mile). This went two or three times round the dressing table, down to an iron post in the ground, and was taken two or three times round this. No earth was used, and all stations were heard at night, **5IT**, **2ZY** (faintly), and the others all nicely audible without straining.

My room now faces S.E., and my aerial is 7/22 copper, 80 ft. long, about 20 ft. high, single, direction approximately north and south, open end south, screened by house and trees on the north and west. No earth is used at all.

All stations now come in very nicely indeed; **2 LO** fades frequently, **5 IT** fades for long periods, **5 NO**, **5 SC** and **5 WA** are particularly good.

To anyone who has not tried it I would suggest that they get 100 or 150 feet of this ex W.D. wire and lay it on the ground as it is and connect *one* end, not both, to aerial terminals and use no earth. They will be surprised at the possibilities. Using this "ground" aerial, all the B.B.C. stations can be heard on the set referred to from Mossley, 10 miles from Manchester, completely eliminating **2 ZY**.

The same wire used in the same way, but this time with *both* ends fastened to *earth* terminal, makes a more efficient earth than the ordinary copper-plate earth. The wire is very cheap.

E. BOTTOMLEY.

Bournemouth,
September, 1923.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—With reference to your article concerning the reception of **FL** telephony on a crystal, it may interest you to know I regularly receive the transmissions of the Glasgow broadcasting station here at a distance of approximately 310 miles. A variometer tuned crystal set is used with a twin aerial directional for Glasgow, speech being of quite readable strength.

London (50 miles) and Birmingham (80 miles) come in excellently; Newcastle and Manchester are also received intermittently.

C. F. IRONS.

St. Neots, Hunts.
September, 1923.

TRANSATLANTIC AMATEUR RECEPTION.

In addition to the numerous reports that have reached us concerning the reception of American broadcasting stations several cases of the reception of Transatlantic amateurs have been brought to our notice.

The following are the successful efforts recorded within the last few weeks:—

Mr. A. G. Davis (**2 PC**), Timperley, Cheshire.
1 CBM, 1 BCG, 1 BWJ, 1 ANA (Canadian), **1 AR, 3 BY, 3 IW, 2 RB** (?), **4 FB, 4 BNI, 4 FT, 1 ANA** calling **WNP** (MacMillan Expeditionary Ship), **1 ACQ, 3 BFU, 1 ZE, 1 PUS, 1 GV, 1 LLN**(?), **1 BWJ, 1 AW, 1 PA, 1 AR** (Canadian), **1 PW, 1 UH, 1 BCF, 1 CPN, 1 OL, 1 CMX, 1 BSJ**(?). **2 BQH, 2 BSC, 2 BMR, 2 CXL, 3 SU, 3 AB, 3 BDO, 3 BQH, 8 CSJ, 8 BKZ, 8 AIB, 8 CDB.**
(Single-valve self-heterodyne.)

Mr. F. L. Hogg (**2 SH**), Highgate, N.6.
6 BN (San Francisco), **1 CPN, 1 CRW, 2 ARF, 2 AGB, 2 AJF, 8 BXH.** (1 H.F., D.)

Mr. J. A. Partridge (**2 KF**), Colliers Wood, S.W.19.
1 AR, 1 AS, 1 RR, 1 FB, 1 UH, 1 CVS, 1 CSX, 2 AH, 2 DA, 2 FP, 2 EL, 2 RB, 2 RS, 2 YS, 2 YA, 2 ACA, 2 BSC, 2 BQH, 2 CCX, 2 CFB, 2 EAA, 3 BP, 3 CC, 3 NI, 3 XN (Canadian ?), **4 AC, 4 FT, 8 FR, 8 KG, 8 AMM, 9 EBV.** (D., L.F.)

Mr. J. Ridley (**5 NN**), South Norwood.
1 PA, 1 AR, 1 ZAA, 1 CMX, 1 BCW, 1 BWJ, 1 BCS, 1 BQC, 1 AJ, 1 BDT, 1 AW, 1 BD, 1 ABS, 1 CMP, 1 BWF, 1 BCI, 1 BDB, 1 ACU, 1 ARF, 1 BSP, 1 FX, 2 KK, 2 NS, 2 GV, 2 BQS, 2 AGB, 2 CXL, 2 BIY, 2 WA, 2 AH, 2 BMR, 2 BSC, 2 AG, 2 SL, 2 II, 2 WR, 2 CQ, 2 AGS, 2 DK, 2 BY, 3 MO, 3 TJ, 3 GT, 4 FT, 4 QX, 7 BCT, 8 BMV, 8 HV, 8 AIB, 8 BRK, 8 CTP, 8 CD, 8 GZ, 8 CKO, 8 CTP, 8 BQH, 8 YAE, 8 GD, 8 ASL, 8 CEO, 8 GA, 9 AAI, 9 AMA, 3 XN (Canadian).
Burndept Ultra III, one valve.)

Mr. A. L. Austen, Wimbledon, S.W.19.
3 TJ, 9 VM, 3 YO, 2 RW, 1 CSB, 1 DE, 8 AMM, 9 BZI, 8 ZM, 1 BES, 1 CVS, 8 ZO, 4 FT, 1 BWJ, 8 BZ, 2 OEG, 2 AGB, 2 BQH, 9 EGO, 2 DC, 5 CAP, 3 XN, 8 GZ, 8 TT, 2 AH, 8 HV, 2 BQS, 2 EL, 8 BCQ, 2 CUR, 5 RE, 8 AMM, 9 BMI, 8 CTT.
(Detector valve only.)

Mr. A. Richardson, Brixton Hill, S.W.2.
3 BFU, 3 BDI, 3 BEU, 6 MID, 6 AGW, 6 GN, 2 WR, 2 AZ, 1 XP, 1 CUF, 5 RQ, 7 KK.
(H.F., D.)

Notes and News

The Rush for Wireless Licences.

During the fortnight ending Saturday, October 13th, it is estimated that 170,000 wireless licences had been sold. This includes 10,000 10s. licences.

German Listening-in Fees.

According to a Reuter message from Berlin, subscribers to the broadcasting service from Koenigswusterhausen will be required to pay a fee of twenty-five gold marks annually.

Ice Messages from Finland.

We are informed by the Thalassological Institute, Helsingfors, that the Hangö wireless station will, on request, repeat the ice messages transmitted on 1,500 metres from Sandham at 2.58 p.m. (G.M.T.) This repetition is intended for vessels working on 600 metres.

"Radiola" Concerts.

The power of the transmissions from "Radiola," Paris, will probably be very considerably increased, according to a correspondent who has recently visited the station. It is expected that the Government will shortly permit a power of 15 kilowatts to be used, instead of 1½ kilowatts, the power employed at present.

Retirement of Mr. J. I. De Wardt, O.B.E.

After more than forty years in the service of the General Post Office, Mr. J. I. De Wardt, O.B.E., has retired from the position of senior Principal of the Telegraph Branch. During the war Mr. De Wardt was specially associated with the censorship, when many wireless matters came under his survey.

A South London Wireless Attraction.

A "Wireless Annexe" will be a feature of a "Rustic Village Bazaar" to be held at the Wesleyan Central Hall, Broadway, Tooting, on October 24th, 25th and 26th. Broadcast concerts will be received in the annexe, and many types of apparatus will be exhibited. There will also be a display of wireless text-books, copies of which will be on sale.

Long Distance Crystal Reception.

A report of excellent reception with a crystal has reached us from Mr. J. G. Smith, of Harrow. "Being short of filament current on Friday, October 5th," he writes, "I was reduced to experimenting once more with a crystal, and was successful in hearing the B.B.C. stations at Cardiff, Glasgow and Birmingham. I do not think they were re-radiated from a neighbouring aerial, as I kept on tuning them in repeatedly."

We now await reports of the reception of Aberdeen with a crystal in the London area.

Wireless Life-Saving.

Questions affecting the use of wireless as a life-saver were discussed at a meeting of the Wireless Telegraphy Committee of the International Shipping Conference held in London on October 12th.

The value of a wireless automatic alarm signal was emphasised, and it was decided that the Governments of the Maritime States should be invited to give the closest study to the problem of perfecting the automatic device within the next six months.

The following countries were represented on the Committee:—Australia, Belgium, Canada, Denmark, France, Germany, Great Britain, Holland, Japan, Norway, Spain and Sweden.

The South London League of Radio Societies.

The first meeting of a new League of Radio Societies, convened by the Lewisham and Catford Radio Society, was held at the "Greyhound," Sydenham, on Saturday, September 22nd.

Judging from the number of South London Societies represented, the new body should be a strong one. Delegates from the following Societies were present:—

Battersea and District, Brockley Radio Association, Dulwich and District, Honor Oak Park Wireless and Experimental Association, Streatham, Sydenham and Forest Hill, Woolwich, Beckenham and District, Clapham Park, Greenwich, Lewisham and Catford, South Norwood Radio Association, Sutton and Vauxhall Metro.

Mr. Sutton, of the Wireless and Experimental Association, was enthusiastically elected Chairman, a position he filled during the evening. A lengthy discussion followed on the aims of the League, and it was agreed that all Societies in the South Metropolitan area should be eligible to join.

Correspondence concerning the League should be addressed to the temporary Hon. Sec., Mr. F. A. L. Roberts, 43, Adelaide Road, Brockley, S.E.

American Broadcasting Stations.

According to the Government figures the number of "active" broadcasting stations in the United States on July 2nd was 581. As a result of a close survey, however, it has been found that the actual number of stations in working order was 450, a significant fact when it is known that 826 licences have been issued. Financial reasons are given for the closing of 25 per cent. of the discontinued stations; about 16 per cent. were apparently never placed in service; 15 per cent. were discontinued owing to superior competition; and 14 per cent. because the results from the public point of view were unsatisfactory. The radio and electrical companies, which have been the most active in the assembling of broadcasting sets, have discontinued 121 of their 339 stations.

P.M.G. and Empire Wireless.

A statement touching the subject of wireless and the Empire was made by Sir Laming Worthington-Evans, the Postmaster-General, at the afternoon session of the Imperial Economic Conference, held on Tuesday, October 16th.

In the course of his remarks, the Postmaster-General stated that the Government had decided, in the first place, to provide themselves a station which would be owned and operated by them; and,

secondly, to license private companies to conduct services subject to an agreement with the Government as to the division of traffic between the Companies and the Government stations. The Government was proceeding quickly with the erection of a new station; a site had already been chosen at Rugby, and it was anticipated that the station would be completed and ready for work before the end of next year. Unfortunately, delay had been occasioned owing to difficulties regarding a pooling arrangement with the Marconi Company.

It was essential, continued the Postmaster-General, that the Government, in parting with the monopoly it possesses by statute, should secure that a sufficient amount of commercial traffic was reserved for the station to operate. It was hoped that the Canadian and South African Governments would concur with the proposals.

On Wednesday, October 17th, a statement was issued by Mr. Godfrey Isaacs, Managing Director of Marconi's Wireless Telegraph Co., Ltd., who said that the Company was perfectly willing to agree with a pooling arrangement, provided it could secure the commercial management of its own business. The only remaining alternative was a general non-exclusive licence under which they would be enabled to create their world-wide system of wireless telegraphic communications independently of the Post Office.

Czecho-Slovakian President at St. Assise.

Among the engagements of M. Masaryk, President of the Czecho-Slovakian Republic, in Paris on October 17th, was a visit in company with M. Millerand, the French President, to the powerful wireless station at Saint Assise. To mark the occasion M. Millerand radiated a message of greeting to French Allies and friends throughout the world in the following terms :—

> "In visiting, with His Excellency the President of the Czecho-Slovakian Republic, the great wireless centre of Saint Asise, the President of the French Republic is happy to address to all allied nations and friends of France, and in particular to the noble Czecho-Slovakian nation, an expression of the profound sympathy and unshakeable friendship of the French Government and people.
>
> "The wireless centre of Saint Assise places France in direct radiotelegraphic communication with all parts of the world, and the President of the French Republic expresses the hope that the waves radiated by Saint Assise may always be messages of peace and a medium for fraternal collaboration between all peoples."

An Error.

With reference to the illustrated note on page 84 of our last issue, describing a selection of useful coil holders produced by Messrs. H. L. Wood & Son, Ltd., the address of this firm should have been given as 36, Russell Street, Southsea, and not as stated.

Forthcoming Events.

WEDNESDAY, OCTOBER 24th.

The Radio Society of Great Britain. At 6 p.m. (tea at 5.30 p.m.); At the Institution of Electrical Engineers. Lecture: "Distortion in Radio Telephony" (illustrated with lantern slides). By Mr. H. A. Thomas, B.Sc. (of the National Physical Laboratory).

East Ham and District Radio Society. At 7.30 p.m. At the Church Army Social Centre, Barking Road, E.6. Informal Meeting.

Manchester Wireless Society. At 8 p.m. In the Council Chamber, Houldsworth Hall. Lecture: "The Construction of the Cossor Valve." By Mr. Y. W. P. Evans, A.M.I.R.E.

Edinburgh and District Radio Society. Experimental Work in connection with the Society's Transmitter **2TF**. Conducted by Mr. W. Winkler.

THURSDAY, OCTOBER 25th.

Ilford and District Radio Society. Informal meeting.

Luton Wireless Society. At 8 p.m. At the Hitchin Road Boys' School. Experimental Demonstration by Mr. W. Wing.

FRIDAY, OCTOBER 26th.

Sheffield and District Wireless Society. At 7.30 p.m. At the Dept. of Applied Science, St. George's Square. Elementary Class, conducted by Mr. V. G. Jackson, M.Sc.

Wireless Society of Hull and District. Special Public Lecture. By Mr. Atkinson of Igranic Electric Co., Bedford. "Screening of Aerials and the Construction of a Five-Valve Set."

The Wembley Wireless Society. At 8 p.m. At Park Lane School. Lecture: "Batteries and Battery Charging." By Mr. H. W. Gregory, A.M.I.E.E.

The Leeds Radio Society. At 7.30 p.m. At Woodhouse Lane United Methodist Church Schools. Lecture: "The Propagation of Aether Waves." By Mr. W. G. Marshall.

Norwich and District Radio Society. At 8 p.m. At 66, London Street, Norwich. Lecture: "Capacity, Inductance, Oscillation." By Mr. Hayward. Practical Work: Construction of Fixed Condenser.

Radio Society of Highgate. At 7.45 p.m. At the 1919 Club, South Grove. Lecture: "A few Considerations of Ether, Electrons and Material Phenomena." By Mr. E. A. Saunders.

Wireless Society of Hull and District. At 7.30 p.m. At the Lecture Hall, Hymers College. Special Lecture: "The Screening of Aerials and the Construction of a Five-Valve Set." By Mr. Atkinson (of the Igranic Electric Co.).

MONDAY, OCTOBER 29th.

Hornsey and District Wireless Society. Lecture: "Electrical Sound Transmission." By Mr. Johan Skinderviken.

WEDNESDAY, OCTOBER 31st.

East Ham and District Radio Society. At 7.30 p.m. At the Church Army Social Centre, Barking Road, E.6. Lecture: "High Frequency Amplifying."

SAMPLES RECEIVED.

"The Spearpoint Cat-Whisker," consisting of a hammered metal alloy of high conductivity, manufactured by Ernest Bostock, 135, Showell Green Lane, Sparkhill, Birmingham.

Philip's Model of Wireless Receiving Set. An interesting attempt to explain the functioning of a two-valve receiving set by means of a disc rotated behind a circuit diagram. The potential of the grid, the passage of current, etc., are clearly demonstrated in seven different positions. (George Philip & Son, Ltd., 32, Fleet Street, London, E.C.4.)

T. C. Jones & Co., Ltd. (93-95, Wood Lane, W.12.). We have received from this firm a specimen of insulated steel cable which it is stated is suitable for use in wireless aerials. The product being Army surplus material, recommends itself on account of its exceptionally low price.

In the next issue details will appear of a *Wireless World and Radio Review* PRIZE COMPETITION. Be sure you order your copy in advance.

Radio Society of Great Britain.

The All-British Wireless Exhibition.

As previously announced, the Society will have its own stand at the All-British Wireless Exhibition to be held at the White City, Shepherd's Bush, from November 8th to 21st. Maps are to be exhibited at the Society's stand indicating the position of all the Radio Societies in the Metropolis and throughout the country. Visitors will be encouraged to join a society, and forms of application will be available.

Reduced Entrance Fees to Wireless Exhibition.

The Secretary of the Society is glad to be able to announce that arrangements have been made for members of affiliated societies throughout the country to receive tickets for the Exhibition at a reduced rate, viz., 9s. per dozen (the ordinary entrance fee is 1s. 3d.). Hon. Secretaries of Societies should communicate as early as possible with Mr. H. L. McMichael, 32, Quex Road, West Hampstead, N.W.6., who has been authorised to distribute these tickets. It will be necessary to state definitely the number required as no refund can be made on unused tickets. One ticket only can be issued for each member, and Hon. Secretaries will be expected to fill in an application form recognising this condition. The remittance should accompany this form when returned.

Hon. Secretaries of affiliated Societies are reminded to notify promptly any change of address, so that records may be kept up-to-date.

Discussion on "Short-Wave Reception."

An informal meeting of the Radio Society of Great Britain was held at the Institution of Electrical Engineers at 6 p.m. on Wednesday, October 17th, when a discussion was held on "Short-Wave Reception."

Mr. P. R. Coursey, B.Sc., in opening the discussion, confined his remarks to the reception of signals on wavelengths of 150 to 200 metres, which, as far as the amateur is concerned, may be regarded as short wavelengths. It was incredibly more difficult to operate a receiver efficiently on 200 metres than on 300 metres, although a wavelength change of only 50 per cent. was involved. The amateur often found, much to his annoyance, that the strength of a signal remained practically the same when the H.F. valves were switched out of circuit. At the high frequencies involved, the small inter-electrode capacities of the valves formed a path of comparatively low impedance, and great difficulty was experienced in building up a sufficient potential to pass on to the next valve.

An obvious solution of the difficulty was to abandon H.F. amplification and to use a detector valve followed by one or more stages of low frequency amplification. It was possible that when searching for long distance transmissions the simplicity of operation of the latter arrangement would more than compensate for any lack of sensitivity it might possess. The supersonic heterodyne receiver provided a satisfactory solution, since the amplification of a beat frequency equivalent to about 600 metres could be efficiently carried out by standard methods.

A number of members gave their experiences of short wave reception with supersonic heterodyne receivers and with receivers involving the use of devices for neutralising valve capacities. The problem of controlling the tendency of H.F. receivers to break into self-oscillation was also discussed.

The meeting was well attended, and the information available must have proved invaluable to those preparing for the forthcoming transatlantic tests.

Calls Heard.

Heaton Moor, Stockport.
2 AL, 2 AR, 2 AW, 2 AY, 2 AZ, 2 BC, 2 BZ, 2 CW, 2 CZ, 2 DF, 2 DJ, 2 DS, 2 DX, 2 FH, 2 FL, 2 FN, 2 FQ, 2 FZ, 2 GJ, 2 GU, 2 GW, 2 GZ, 2 HF, 2 HM, 2 HV, 2 HW 2 IJ, 2 IN, 2 IQ, 2 JF, 2 JO, 2 JP, 2 KD, 2 KF, 2 KG, 2 KH, 2 KO, 2 KQ, 2 KS, 2 KW, 2 KZ, 2 LA, 2 LG, 2 LW, 2 LZ, 2 MG, 2 MT, 2 NA, 2 NB, 2 ND, 2 NM, 2 NV, 2 OD, 2 OE, 2 OM, 2 ON, 2 PC, 2 PO, 2 PP, 2 PT, 2 QE, 2 QJ, 2 QK, 2 QQ, 2 QV, 2 RB, 2 RD, 2 RM, 2 RP, 2 SF, 2 SP, 2 SR, 2 SZ, 2 TB, 2 TC, 2 TN, 2 TR, 2 TV, 2 TZ, 2 UF, 2 UX, 2 UY, 2 VF 2 VO, 2 WK, 2 WO, 2 WN, 2 YC, 2 YF, 2 ZK, 2 ZS, 2 ZU, 5 AJ, 5 AZ, 5 BH, 5 BV, 5 CR, 5 CU, 5 CX, 5 DC, 5 DN, 5 EW, 5 HA, 5 ID, 5 IK, 5 JX, 5 KC, 5 KO, 5 LC, 5 ML, 5 MS, 5MU, 5 NN, 5 OW, 5 SI, 5 SZ, 5 VK, 5 WC, 5 WY, 5 XJ, 5 XP, 6 AJ, 6 GE, 6 JQ, 6 MU, 6 NI, 6 PL, 6 WC, 7 JS, 8 AW, 8 AB, 8 AQ, 8 AS, 8 BA, 8BM, 8 BN, 8 BV, 8 BW, 8 CC, OAA, OBQ, ODV, OMX, ONY, OYS. (Single Valve.) (H. A. Woodyer, **2 XW.**)

London, N.8.
2 AJ, 2 AM, 2 AN, 2 AQ, 2 AW, 2 AZ, 2 BO, 2 BZ, 2 FN, 2 FQ, 2 FZ, 2 GL, 2 JZ, 2 KZ, 2 KV, 2 KZ, 2 LI, 2 LW, 2 MF, 2 MI, 2 MK, 2 MQ, 2 MT, 2 NM, 2 OD, 2 OM, 2 ON, 2 PA, 2 PY, 2 PZ, 2 QQ, 2 QS, 2 SH, 2 ST, 2 SX, 2 SZ, 2 TA, 2 TI, 2 UC, 2 UV, 2 VW, 2 WP, 2 WJ, 2 WD, 2 WQ, 2 XZ, 2 XB, 2 XO, 2 XL, 2 YH, 2 ZO, 2 ZZ, 5 AQ, 5 BT, 5 CB, 5 CP, 5 DH, 5 DK, 5 HY, 5 IO, 5 LP, 5 MY, 5 OB, 5 PU, 5 SU, 5 VD, 6 HD, 6 IM, 6 KI, 6 LJ, 8 AB, 8 BM. (J. Seiger.)

Books Received.

Electrical Engineering Practice. A Practical Treatise for Electrical, Civil and Mechanical Engineers, with many tables and illustrations. Vol. I. By J. W. Meares, C.I.E., F.R.A.S., etc., etc., and R. E. Neale, B.Sc., Hons.(Lond.), etc., etc. (London: Chapman & Hall, Ltd., 11, Henrietta Street, W.C.2. Fourth edition, Re-written and enlarged. 584 pages. Price 25s. net.)

A New Experimenters' Journal.

A new experimenters' journal has recently appeared under the title of "Experimental Wireless." The first number, dated October, with 56 Editorial pages, contains a number of articles which should make an appeal especially to the experimenter.

The Journal, which is excellently produced and well illustrated, is published monthly by Messrs. Percival Marshall & Company, at the price of 1s.

QUESTIONS AND ANSWERS

"D.W.M.E." (S.W.1) *has an ex-Government 60-watt tuner, which he wishes to modify for general working.*

(1) and (2) The method of adjusting the coils would be quite as efficient as that used in a three-coil holder. A suitable circuit showing "series parallel" and "tune and stand-by" switches is No. 13 of "The Amateurs' Book of Wireless Circuits," by F. H. Haynes. (3) The existing coils rewound as you suggest would give a wavelength range of approximately 200 to 3,000 metres, but we are afraid that it would not be very efficient on the lower wavelengths.

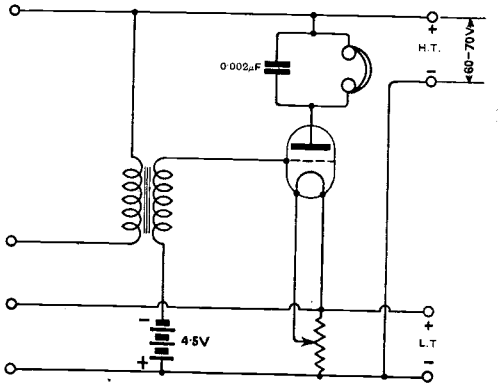


Fig. 1. **"E.W.B." (Highbury).** *Method of applying negative potential to grid of L.F. amplifying valve.*

"E.W.B." (Highbury, N.5) *asks* (1) *Why does the receiver howl when a third stage of L.F. amplification is switched in circuit.* (2) *How many grid cells should be included in the last L.F. stage.* (3) *Is it correct to connect the grid leak to negative L.T.*

(1) The howl is caused by unsuitable design of the components in the last L.F. stage. It will generally be found that sufficient volume of sound is obtainable from two stages of transformer L.F. amplification, and some difficulty may be experienced in obtaining amplification without distortion when using three stages. Try reversing the connections to the transformers, shunting the primary windings with small condensers, and connecting resistances of say 0·5 MΩ across the secondaries. (2) The correct method of joining cells in the grid circuit is shown in Fig. 1. (3) The grid leak generally should be connected to positive L.T.

"H.E." (Hammersmith) *asks* (1) *Will we give a diagram of a three valve receiver employing two H.F. and detector valves, with transformer H.F. coupling and potentiometer control to the grids of the H.F. valves.*

(1) The diagram is given in Fig. 2.

"RADION" (Lympne) *submits a diagram of a five-valve receiver, with which he is unable to receive from any other British broadcast station. He asks* (1) *How may the receptive range of the receiver be increased, and the selectivity improved.*

(1) Provided that your aerial and earth arrangements are satisfactory, you should have no difficulty in receiving several of the British broadcast stations. We suggest you overhaul the complete aerial system. To improve the selectivity, it will be necessary to employ a loose-coupled tuner. It may also be an advantage to employ in addition a rejector circuit to eliminate interference from ship stations. See the article "Prevention of Interference," in the issue of June 23rd.

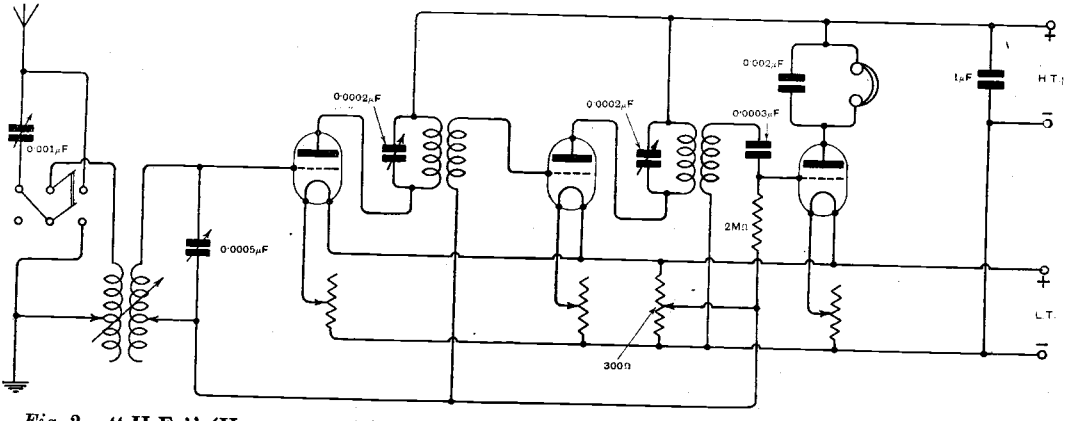


Fig. 2. **"H.E." (Hammersmith).** *Three-valve receiver (2—v—0) with potentiometer grid control.*

"AITCH BEE" (Barry) *asks* (1) *For sizes of basket coils on a* 1½″ *diameter former with* 11 *slots, to tune the "Double Magnification Receiver," described in the issue of July* 21*st, from* 300 *to* 3,000 *metres.* (2) *How best to tune the circuit without the use of a wavemeter.*

(1) A table showing the sizes of coils required is given below :—

Coil.	300-600 m. No. of Turns.	600-1,000 m. No. of Turns.	800-2,000 m. No. of Turns.	1,000-3,000 m. No. of Turns.
19	35	70	105	150
20	85	170	255	350
21	55	110	165	225
22	85	170	255	350
23	85	170	255	350
24	100	200	300	410

(2) Adjust the three tuning condensers, after setting the crystal, until any hissing noises due to atmospherics, etc., are at maximum strength. The tuned circuits in the set will now be in resonance and the setting of the condensers should be varied simultaneously, a little at a time, until the required wavelength is reached, care being taken that the state of resonance is not upset by moving one or other of the condensers more than is required.

"G.E." (East Finchley) *asks for further details regarding the "Double Magnification Receiver," described in the issue of July* 21*st.*

(1) Sizes of coils for longer wavelengths are given in the reply to **"AITCH BEE" (Barry).** The same gauge of wire may be employed for the long wave as for the short wave coils. (2) The pairs of coils you mention are all tightly coupled.

"TAPS" (Leavesden) *asks for sizes of tapping and clearance drills for BA screws between* 2 *BA and* 6 *BA.*

Particulars are given below :—

B.A. No.	CLEAR DRILL.			TAPPING DRILL.		
	Size.	Nearest Fraction.	Morse No.	Size.	Nearest Fraction.	Morse No.
2	·1935″	13/64″ (·2031″)	10	·154″	5/32″ (·1562″)	23
3	·169″	11/64″ (·17188″)	18	·136″	9/64″ (·1406″)	29
4	·1495″	5/32″ (·15625″)	25	·116″	1/8″ (·125″)	32
5	·136″	9/64″ (·14063″)	29	·104″	7/64″ (·1093″)	37
6	·120″	1/8″ (·125′)	31	·089″	3/32″ (·0937″)	43

"H.F.T." (Crewe) *asks* (1) *What is the wavelength of a tuning coil* 4″ *in diameter, wound with* 240 *turns of No.* 28 *D.C.C. wire, when a condenser having a maximum capacity of* 0·0005 *μF is used in parallel with it.* (2) *What is a suitable reaction coil for use with this tuner.* (3) *What are suitable details for a set of basket coils for use with the tuner mentioned, to raise the wavelength to* 12,000 *metres.*

(1) The maximum wavelength to which the coil will tune is approximately 2,500 metres. (2) The reaction coil may consist of 100 turns of No. 30 S.S.C. wire, wound on a former 3½″ in diameter, and arranged to slide inside the tuning coil. (3) Nine coils may be wound with No. 30 S.S.C. wire to a diameter of 6″, using formers 1½″ in diameter. The coils must be joined in series for reception on a wavelength of 12,000 metres.

"TRANSFORMER" (Cambridge) *wishes to construct a telephone transformer for use with* 300 *ohm telephones, and asks* (1) *For length and diameter of iron core; resistance, number of turns and gauge of wire for primary and secondary.* (2) *Whether it would be an advantage to bend over the ends of the iron core and metallically connect them.* (3) *If the iron wires forming the core should be separately insulated from each other.* (4) *The effect on the signal strength received in high resistance telephones which would be produced by the insertion of the above transformer in series with them.*

(1) The iron core should be ½″ in diameter and the length of the windings might be 3″. Wind the primary with 10,000 turns of No. 40 S.S.C., and the secondary with 1,000 turns of No. 34 S.S.C. copper wire. In transformers of this type the resistance of the windings is of secondary importance, provided that the number of turns is correct. (2) The wire may be bent back in the manner indicated, but there should be a gap between the ends of about ¼″. (3) Yes. The iron oxide deposit on the wires serves to a certain extent as insulation, which can, however, be improved by soaking the core in paraffin wax. (4) If the transformer is connected in series with the H.R. telephones and no L.R. telephones are connected across the secondary, the reduction in signal strength will be negligible; on the other hand, if the L.R. telephones are in use there will be a diminution in strength of perhaps 30 per cent.

"W.G.W." (E.9) *has a crystal receiver followed by a two-valve L.F. amplifier, which works best with the aerial and earth connections reversed, and asks for an explanation.*

Check over the connections and see that the crystal detector is connected to the "aerial" side of the variometer.

"D.G.I." (Selby) *asks* (1) *Why a potentiometer that over-heats on a* 6*-volt accumulator should not do so when connected across a* 12*-volt dry battery.* (2) *Why potentiometers are sometimes shunted by fixed condensers.* (3) *Whether it is possible to purchase a complete Morse recording instrument.*

(1) The comparatively high internal resistance of the dry battery prevents the passage on an excessive current. (2) The condensers by-pass any H.F. currents which may be required to pass through the potentiometers. (3) Apparatus of this kind is available, and descriptions of commercial types will be found in the issues of October 29th, November 12th and November 26th, 1921.

"RAW RECRUIT" (W.1) *asks* (1) *For a circuit using three stages of H.F. amplification, followed by crystal rectification with independent switching for each valve.* (2) *If the selectivity of the above set would be sufficient to separate the various broadcasting stations.* (3) *If reaction can be used without causing radiation.*

(1) and (3) See Fig. 3. We do not think that you will be able to tune all three variometers from one spindle as you suggest, since the tuning of the last variometer will be affected by the parallel crystal and telephone circuit. You might, however, couple the first two variometers together. A set of this type will very often oscillate without the use of a reaction coil, and a potentiometer has been included to minimise this tendency. If oscillation cannot be controlled by the potentiometer, try connecting the grid leaks to the positive side of the L.T. supply. (2) Yes, provided that you are not too near to any one of them. In London, for instance, you will have difficulty in getting Cardiff while **2LO** is working.

"C.W." (W.2) *submits a diagram of a special receiver and asks* (1) *and* (2) *For a criticism of the circuit.* (3) *Whether carbon filament lamps could be used as anode resistances, etc., in the amplifier.* (4) *Whether re-radiation is likely to take place, and if so, the best means of preventing this.*

(1), (2) and (3) The circuit will give excellent results in skilled hands, but the values of the resistances are very critical, and for this reason carbon filament lamps, which in any case have too low a resistance, would not be suitable. (4) When the aerial and anode circuits are tuned to the same wavelength the set may oscillate, when re-radiation will take place. The tendency to self oscillation may be minimised by using a potentiometer to control the grid potential of the first valve.

"H.W.C." (Grantham) *asks* (1) *and* (2) *For a circuit diagram of a double amplification receiver using two stages of H.F. crystal rectification, and two stages L.F. magnification.* (3) *If this circuit*

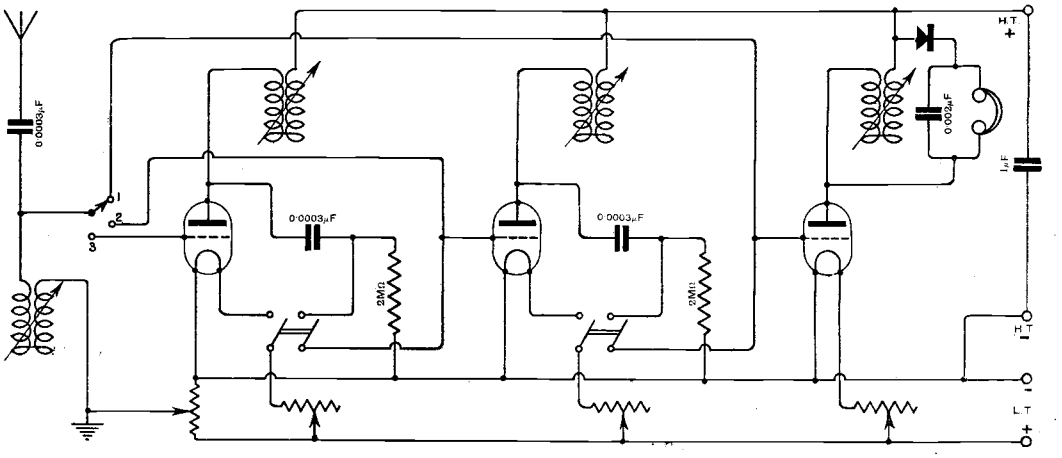


Fig. 3. **"RAW RECRUIT" (W.1).** *Variometer tuned three-valve receiver* (3—*c*—0) *with switches to control the number of H.F. valves in use.*

"F.B." (Bayswater, W.) *referring to the "Neutrodyne" receiver described in "The Wireless World and Radio Review" of April 21st, 1923, asks* (1) *For the direction of wiring of both primary and secondary windings of the H.F. transformers.* (2) *For a diagram of the circuit using double amplification.*

(1) Keep the direction of the primary windings fixed, and try the effect of changing the direction of each secondary winding in turn. In this way the best possible arrangement will be arrived at by three experiments only. The transformers should not be mounted too close together. (2) The theory of the circuit shows that the introduction into parts of the circuit of L.F. transformer windings shunted by condensers would upset the symmetry of design which is an essential feature of the circuit. We do not recommend the use of double amplification in this receiver.

on an ordinary 100 *ft. aerial would give better results than an Armstrong super-regenerative receiver using a frame aerial.*

(1) and (2) See the articles on "A Double Magnification Receiver" in the issues of June 2nd and July 21st, 1923. (3) For general purposes, yes.

"W.D.K." (Netheravon) *refers to Fig.* 6 *of the article on "Double Amplification Circuits" in "The Wireless World and Radio Review," of May* 12*th,* 1923, *and asks* (1) *How to insert a reaction coil to be coupled to the aerial circuit.* (2) *The values of the fixed condensers in the circuit.* (3) *Details of H.F. transformers for wavelengths of* 300 *to* 3,000 *metres.* (4) *Whether the receiver is suitable for general work.*

(1) The reaction coil may be inserted in the plate circuit of V_4. (2) The diagram on p. 280 of the

issue of June 2nd will indicate the values required at various points in a double amplification circuit. (3) If the secondaries are tuned by 0·0003 μF variable condensers, the transformers described on page 199 of *The Wireless World* of June 25th, 1921, will be suitable. (4) If the large number of transformers required to cover the range is not a disadvantage, the receiver should be suitable.

also. (3) Any good make of transformer will do; the ratio required is quite standard, *i.e.*, it may lie between 1 : 2½ and 1 : 4. (4) In the first instance both of the French stations are rated at a higher power than that allowed to the British broadcasting stations; and secondly, it is difficult to arrange for one tuner to be efficient both on broadcast wavelengths and on 2,600 metres.

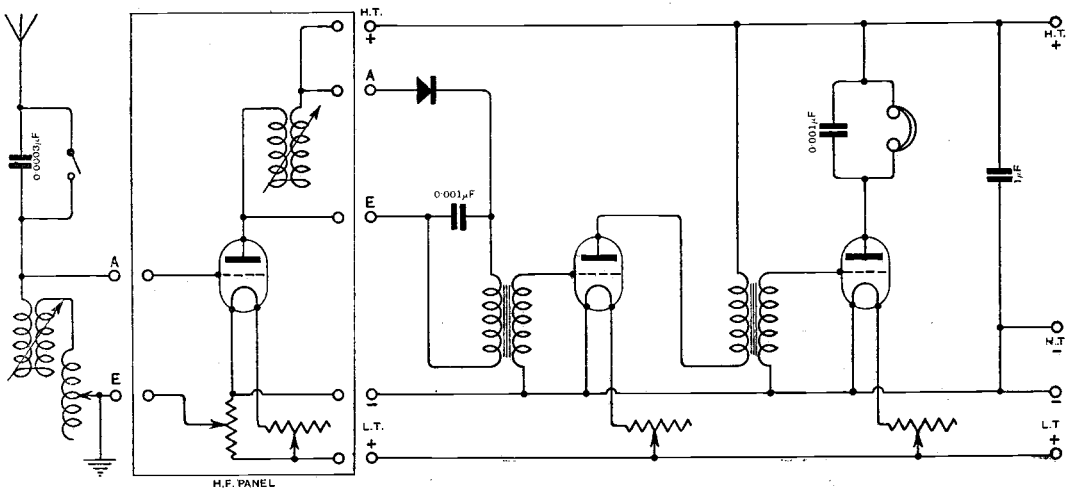


Fig. 4. **"A.L." (W.13).** *Three-valve receiver* (1—c—2). *The H.F. amplifying valve may be disconnected when not required.*

"A.L." (W.13) *submits a diagram of a converted C.W. Mk. III receiver and asks* (1) *and* (3) *For a circuit using crystal rectification with two stages of L.F. amplification, with provision for the insertion of one stage of H.F. amplification.* (2) *If loud-speaker results could be obtained on* **2 LO** *at ten miles, using crystal and two stages of L.F. amplification, and* (4) *at Herne Bay with the addition of the H.F. amplifying valve.*

(1) and (3) See Fig. 4. The zincite-bornite combination should be satisfactory. (2) and (4) Under favourable conditions, yes.

"F.W.S." (N.19) *submits the circuit diagram of a special dual-amplification receiver and asks* (1) *Why a reduction in signal strength results from coupling the receiver directly to the A.T.I. without the use of a series A.T.C. instead of coupling to the tuner secondary.* (2) *If the use of a grid potentiometer would be an advantage in this circuit.* (3) *For the best ratio for the L.F. transformer.* (4) *Why he can get telephony from* **FL** *and* **SFR** *under all conditions, and from* **5 IT** *and* **5 NO** *only on rare occasions, using a loose coupler with dead-end switch on the A.T.I.*

(1) In the position which you find gives least signal strength, you have the least number of turns of inductance between the grid and filament of the valve and consequently the least difference of potential between these two points. (2) A grid potentiometer might be used with advantage, though we would point out that any potential applied to the grid will be applied to the crystal

NOTE.—*This section of the magazine is placed at the disposal of all readers who wish to receive advice and information on matters pertaining to both the technical and non-technical sides of wireless work. Readers should comply with the following rules:*—(1) *Each question should be numbered and written on a separate sheet on one side of the paper, and addressed "Questions and Answers," Editor,* **The Wireless World and Radio Review,** 12/13, *Henrietta Street, London, W.C.2. Queries should be clear and concise.* (2) *Before sending in their questions readers are advised to search recent numbers to see whether the same queries have not been dealt with before.* (3) *All questions will be answered through the post. Those of general interest will also be published.* (4) *Every question, except those under* (5) *below, should be accompanied by a postal order for* 1*s.*, *or* 3*s.* 6*d. for a maximum of four questions, and also the coupon taken from the advertisement pages of the current issue.* (5) *For the benefit of those readers who would rather not pay the charges, a free Questions and Answers Coupon will be placed in the advertisement pages of the first issue of every month. This coupon should accompany the question submitted, together with a stamped addressed envelope. The free coupon is valid for the current week only.* (6) *In view of the fact that a large proportion of the circuits and apparatus described in these answers are covered by patents, readers are advised, before making use of them, to satisfy themselves that they would not be infringing patents.* (7) *Four questions is the maximum which may be sent in at one time.*

Wireless Club Reports.

Tottenham Wireless Society.*

The Society held its annual general meeting on Wednesday, October 3rd. A good attendance enabled the business on the agenda to be carried through expeditiously. Mr. R. A. Barker, the Hon. Vice-President, was in the chair.

The Secretary's report revealed a steady increase in membership. The Committee's report gratefully acknowledged that the progress made was due to the efforts of the Chairman, the Hon. Secretary and the Hon. Treasurer, who were unanimously elected to their previous posts.

On Wednesday, October 10th, Mr. R. G. Ellis gave a talk on "Short Wave Reception," leading up to a general discussion. Following this Mr. Ellis described an absorber circuit which he has in use, which proved sucessful in cutting out unwanted signals.

Mr. Tracy then gave a short talk on a special tuner, used in conjunction with a crystal, members afterwards listening to the good results obtained by this instrument. The Society's membership is steadily increasing, but there is still plenty of room for new members, who will be assured of a hearty welcome.

Hon. Sec., S. J. Glyde, 137, Winchelsea Road, Bruce Grove, Tottenham, N.17.

High Wycombe and District Radio Society.*

The opening meeting of the winter session was held on Tuesday October 2nd, the President occupying the chair. A short time was devoted to general business, the remainder of the evening being given over to ten-minute talks by members on "Experimental Experiences during the Past Summer."

The opinion was expressed that, judging by the number of new aerials springing up in the district, the present membership of 63 could easily be doubled.

The programme for the following weekly meetings includes talks by the President and the Chairman on "Short Cut Calculations" and "A Comparison of Receiving Circuits" respectively, and an evening for the exhibition and demonstration of members' apparatus.

On Tuesday evening, October 9th, Mr. G. Crowson provided an instructive talk on "The Relationship of Electrical Measurements." At the conclusion the members put a number of questions to the speaker on the subject, which were readily answered, and it was felt that a damp (externally) evening had been well spent. Four new members offered themselves for election. Hon. Sec., Alfred C. Yates, 30, High Street, High Wycombe.

Prestwich and District Radio Society.*

Members of the Society paid an interesting visit to the Manchester Broadcasting Station on September 29th. A most enjoyable and instructive time was spent, for which thanks are due to the officials of the station for their kindness and courtesy.

Hon. Sec., H. A. Wood, Spring Bank, Church Lane, Prestwich.

Glasgow and District Radio Society.*

At the annual general meeting of the Society, held at 200, Buchanan Street, on September 26th, the Society's finances, etc., were placed before the members, and a sound state was revealed.

The membership stands at 248.

For the present session a workshop with machinery and tools for the use of members will be opened. A library is also organised, and members are thus able to keep in touch with the latest wireless literature. The Society's meetings will in future be held at the Royal Philosophical Rooms, 207, Bath Street. The workshop is situated at 20, Holland Street.

Intending members may have particulars from Hon. Sec., A. Crawford Todd, Club Rooms, 207, Bath Street, Glasgow.

Barnsley and District Wireless Association.*

The annual general meeting of the Association was held in the new headquarters, Market Street, on October 3rd, the chair being taken by Mr. C. Pickering.

After satisfactory reports from the Secretary and Financial Secretary, the following elections were made:—

President, Major Barker, M.C.; Vice-Presidents, H. H. T. Burbury, Esq., B. Harral, Esq., T. D. Cooke, Esq., F.S.A.(Scot.). Secretary, G. W. Wigglesworth, Esq.; Treasurer, R. Kelly, Esq.; Committee consisting of twelve members.

Hope was expressed that the Postmaster-General would grant to the Association a proper experimental transmission licence. It was estimated that upwards of 70 per cent. of the existing members held experimental receiving licences.

Although few reports have been sent to the wireless periodicals, very valuable work has been done during the past year in theoretical study and practical experiments.

Hon. Sec., G. W. Wigglesworth.

(*Hon. Secretaries are requested to furnish their addresses.—Ed.*)

The Southampton and District Radio Society.*

The first meeting of the winter session was held on October 5th, when the lecturer was Capt. E. J. Hobbs, M.C., A.M.I.R.E. (2 OY).

Capt. Hobbs dealt in a very able and lucid manner with "The Practical Application of Radio Calculations" and "Efficient Reception of Short Wave Telephony and Broadcasting."

During the winter, meetings will be held on every Thursday evening, commencing at 7.30 o'clock.

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

The Stoke-on-Trent Wireless and Experimental Society.*

At the first meeting of the winter session held on Thursday, October 4th, the President, Col. F. E. Wenger gave an address on "The Construction of an Experimental Receiver," demonstrating with an excellent experimental receiver of his own

construction, which he presented to the Society at the conclusion of his address.

Col. Wenger gave to the Society its first piece of apparatus, which is still giving excellent results and is very highly prized. Since then the Society has grown considerably and made great progress.

Programmes for the session and further information can be obtained from the Hon. Sec., F. J. Goodson, B.Sc., Tontine Square, Hanley.

The Thornton Heath Radio Society.*

The Society has been fortunate in obtaining new headquarters at St. Paul's Hall, Norwich Road, Thornton Heath, where a meeting was held on Monday, October 8th, 1923.

A Marconi four-valve set kindly lent by Mr. E. Scratchley was demonstrated, the object being to test the new aerial recently erected by members of the Society and also to test the acoustic properties of the hall. The test was in every way satisfactory. The meeting closed with a general discussion.

Membership is open to all interested in wireless. Full particulars can be obtained at the meetings or from the Hon. Sec., 72, Bensham Manor Road, Thornton Heath.

The Pudsey and District Radio Society.

On October 3rd, after the summer recess, a meeting was held at the Society's clubroom, The Mechanics' Institute. A large attendance and the interest shown in the proceedings indicated renewed enthusiasm.

Several members gave a few minutes' talk on their past and present experiences, and reference was made to the new licensing decision. Rev. Norman Clarke, Vicar of Farsley, a visitor, also made a few remarks upon wireless matters.

Intending members should apply to the Hon. Sec., W. G. A. Daniels, 21, The Wharrels, Lowtown, Pudsey.

The Finchley and District Wireless Society.*

An interesting programme for the present session has been arranged, and includes among the lecturers, Messrs. W. J. Jones, B.Sc., A Hinderlick and C. A. Wilck. A lecture with demonstration is to be given by Messrs. Burndept in the near future. Further particulars will be announced.

Hon. Sec., A. E. Field, 28, Holmwood Gardens, Finchley, N.3.

Paddington Wireless and Scientific Society.*

On Saturday, September 29th, before a well-attended meeting, Mr. A. L. Beak, A.M.I.E.E., read a very interesting paper on "The Construction of Inductances for Radio Receivers, explaining lucidly the various types of inductances of the past and present, and indicating the desirable, as well as the undesirable, features of each type.

The Society is arranging a very attractive programme for the coming season, and those who are interested are requested to get into touch with the Hon. Sec., who will gladly furnish particulars as to membership and meetings.

Hon. Sec., L. Bland Flagg, 61, Burlington Road, Bayswater, London, W.2.

Lewisham and Catford Radio Society.*

On Thursday, September 27th, the Society was honoured with a very instructive talk by Mr. Ivor S. Cocks on "Amplification."

The lecturer dealt both with high and low frequency amplification, explaining the working of different couplings, transformer, resistance capacity and reactance capacity (tuned anode) on the H.F. side, and with transformer, choke coil and resistance on the L.F. side.

The Society has a very attractive winter programme prepared, and the Secretary, Mr. F. A. L. Roberts, would be pleased to hear from any prospective members.

Hon. Sec., F. A. L. Roberts, 43, Adelaide Road, Brockley, S.E.4.

Falkirk and District Radio Society.*

On Thursday, September 27th, the members listened to an interesting lecture on "Induction Coils and High Frequency Currents," by Mr. Symons. The lecturer gave an introductory talk on X-ray work, a subject he intends to discuss further at a later date.

As the winter session has commenced, the Secretary will be pleased to hear from intending members.

Hon. Sec., M. B. Blackadder, Glenmorag, Falkirk.

The Radio Society of Highgate.*

The Society is deeply mourning the loss of one of its keenest members, Mr. John Henry Gregory, who was recently killed by a fall from a tree when endeavouring to fix an aerial.

On Friday, October 5th, the members discussed the Broadcasting Committee's Report, the Secretary reading the report paragraph by paragraph. The general opinion of those present was that, on the whole, the report was satisfactory. Strong objection, however, was taken to the suggestion that experimenters' licences would be granted subject to the condition amongst others, that the applicant signs a declaration to the effect that he will not use the broadcast programmes except for experimental purposes. It was considered that this was a condition which nobody could faithfully comply with, and that it was unreasonable to expect anyone to sign such a declaration with a clear conscience. It was hoped that the Radio Society of Great Britain would take action in this matter.

Hon. Sec., J. F. Stanley, B.Sc., A.C.G.I., 49, Cholmeley Park, Highgate, N.6.

North Middlesex Wireless Club.*

Once or twice a year the members of this Club may be seen arriving at Shaftesbury Hall, Bowes Park, N., laden with suit cases and queerly shaped parcels. Such proceedings happen on the occasions of what are irreverently called by the older members "junk sales." Such a sale was held at the last Club meeting on October 3rd.

All real experimenters know that whatever may be the subject interesting them, every step forward in their experiments is accompanied by the casting aside of some piece of apparatus which no longer satisfies them. Consequently an opportunity such as is afforded by the "junk sale" of turning such articles into cash is not only welcomed by the would-be seller, but yields some real bargains to other less advanced experimenters.

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

The Hackney and District Radio Society.*

Mr. W. J. Jones, B.Sc., A.M.I.E.E., of the Cossor Valve Co., gave a lantern lecture before a large assembly at a recent meeting.

After dealing with early experiments in thermionics he most ably described the construction of the Cossor valve from start to finish, and by means of a screen it was possible to see every operation taking place. Many were surprised at the large number of processes a valve goes through before passing the final test and despatch to suppliers. During assembly all parts are most carefully checked for accuracy, and it is therefore practically impossible for a valve to leave the factory in a defective condition. Many of us who previously considered the present price of valves excessive have now to admit that there is more in them than meets the eye, and that to sacrifice efficiency for cheapness would only lead to disappointing results.

Publicity Sec., 66, Ballance Road, Homerton, E.9.

The Leeds Radio Society.*

"The Armstrong Single-Valve Super-Regenerative Receiver" was the subject of an instructive lecture delivered by the President, Mr. A. M. Bage, on September 28th. Mr. Bage, who has been working for several months with a super-regenerative receiver, exhibited a portable set of this type which aroused much interest.

The first instructional meeting of the session was held on October 5th, the Hon. Secretary speaking upon "The Elementary Theory of the Valve."

Applications for membership are invited and should be addressed to the Hon. Sec., D. E. Pettigrew, 37, Mexborough Avenue, Leeds.

Ilford and District Radio Society.*

On October 4th, Mr. J. N. Nickless, A.M.I.E.E., lectured on "Porcelain Insulators." After describing the various processes of manufacture the lecturer discussed the methods used in testing them, and emphasised the great advances that have been made in recent years in these test methods. Members are reminded that, owing to the kindness of Mr. Weston in placing the basement of his house at Society members' disposal, the Society will shortly be moving to new headquarters.

Hon Sec., L. Vizard, 12, Seymour Gardens, Ilford.

The Kensington Radio Society.*

The October meeting was held at 2, Penywern Road, on Thursday evening, 4th inst.

The President gave a lecture on the Club "Unit" set, and proposed that the experiments, shown in Mr. Maurice Child's articles published in *The Wireless World and Radio Review*, should be carried out, and that some members of the Society should volunteer accordingly.

A general discussion followed on various subjects, chief of which was the programme for the "informal meetings" to be held on the second Thursday of each month. It was decided to hold a buzzer class if sufficient support was forthcoming.

The Hon. Sec., J. Murchie, 33, Elm Bank Gardens, Barnes, will be pleased to forward particulars regarding the Society to anyone desirous of joining. A special appeal is made to ladies to join.

Dulwich and District Wireless and Experimental Association.

On Monday, September 24th, at The Montessori School, Messrs. Bartlett and King gave a report on the meeting of the various South London Societies which took place on the preceding Saturday at the Greyhound Hotel, Sydenham, this meeting having been called in order to discuss a proposed South London League of Radio Societies.

Mr. Sutton then gave us a most interesting lecture on "C.W.," and the evening concluded with the usual class of dot and dash enthusiasts. Prospective members should note that the Association is shortly moving into spacious new headquarters, and further, that a most excellent winter programme is being arranged.

Full particulars of the Association will be gladly forwarded by the Asst. Hon. Sec., at 2, Henslowe Road, East Dulwich, S.E.22.

Hall Green Radio Society.

A goodly number of the members of the Hall Green Radio Society met together on October 3rd to hear a paper on "Reaction," given by the President, Mr. H. M. Whitfield.

Mr. Whitfield deplored the great amount of interference encountered, especially in the finer reception, due to the radio hogs, and urged that Societies should do all in their power to educate the users of the sets which are guilty of the howls and screeches set up through incompetent handling of reaction.

A matter of interest to wireless enthusiasts throughout the district is that the Secretary has been successful in obtaining the services of Mr. Arthur Burrows (Uncle Arthur of the London station) for a lecture on December 5th, when Mr. Percy Edgar of the Birmingham station will occupy the chair. We believe this is the first time Mr. Burrows has accepted an invitation from any Society, and the event is being looked forward to with pleasurable anticipation.

Hon. Sec., F. C. Rushton, 193, Robin Hood Lane, Hall Green, Birmingham.

Barnet and District Radio Society.

On Wednesday evening, October 3rd, Mr. C. Randall, Chairman, gave a brief survey of the report of the Government Committee on Broadcasting, and, for the benefit of the members, explained fully the present position with regard to licences. In a short address, the Society's President, Mr. F. W. Watson Baker, recounted the progress of the Society since its foundation at the beginning of this summer. Mr. R. Cook then spoke on the interesting subject of "Short Wave Reception," and put forward the suggestion that members might well take this subject as one for useful research. For the remainder of the evening the Club set was operated, and several loud speakers, brought by members, were tested.

Hon. Sec., J. Nokes, "Sunnyside," Stapylton Road, Barnet.

Haileybury College Wireless Society.

The Society had a very successful summer term, a feature of which was an expedition to the Ongar Wireless Station, by kind permission of the Marconi Company. The membership stands at 63.

Hon. Sec., H. J. Croot, Haileybury College, Herts.

THE WIRELESS WORLD AND RADIO REVIEW

THE OFFICIAL ORGAN OF THE RADIO SOCIETY OF GREAT BRITAIN

No. 220. (No. 5. Vol. XIII.) OCTOBER 31st, 1923. WEEKLY

CONTENTS

	PAGE
Editorial	130
Design for a Cabinet Receiver. By F. H. Haynes	131
Sulphating in Small Accumulators	135
A Simple Time Indicator. By W. G. W. Mitchell, B.Sc.	138
Loose Couplers—I. By W. James	140
Wireless Sets for Motor Cars. By Richard Twelvetrees	144
The Otophone	147
The All-British Wireless Exhibition	148
The Crystal Set	149
Correspondence	153
Around the Wireless World	154
Questions and Answers	156
With the Societies	159

THE EDITOR will be glad to consider articles and illustrations dealing with subjects within the scope of the Journal. Illustrations should preferably be confined to photographs and rough drawings. The greatest care will be taken to return all illustrations and manuscripts not required for publication if these are accompanied by stamps to pay return postage. All manuscripts and illustrations are sent at the Author's risk and the Editor cannot accept responsibility for their safe custody or return. Contributions should be addressed to the Editor, "The Wireless World and Radio Review," 12 and 13, Henrietta Street, Strand, London, W.C.2.

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THE AMATEUR'S FRANKENSTEIN.

By THE EDITOR.

ONE of the purposes of history is to provide an accurate record of facts, and to enable the evolution of present circumstances to be traced back through the chain of events which have brought them about.

In this article it is proposed to review some past events of amateur activity in this country and see whether the amateur has been fairly rewarded for his past services.

In a recent editorial, reference was made to the new regulations which demanded that applicants for experimental licences should in future make a declaration to the effect that they would not use the broadcast programmes except in connection with their experimental work.

Since that editorial was written, however, the Postmaster-General has authorised the publication of a statement to the effect that by paying 15s. a year instead of 10s., the experimenter may also have the privilege of enjoying the broadcast programmes should he desire to do so. This revised regulation serves to satisfy the immediate situation, but, nevertheless, the experimenter must regard it as very questionable whether he is not being imposed upon in the matter of this additional charge, more especially when one takes into account the debt which broadcasting owes directly to the amateurs of this country.

Reviewing the position historically, we find that on the Agenda of the Second Annual Conference of Amateur Wireless Societies in February, 1921, the following item appears :—

> " The possibility of regular telephone transmission from a high power station
> " to include all matters of interest to amateurs, and to be on different definite
> " wavelengths for calibration purposes."

This proposition received the unanimous support of the Conference, and as a result long negotiations took place between the Radio Society of Great Britain (then the Wireless Society of London), and the Post Office. It was eventually possible to announce at the Third Annual Conference of Wireless Societies, held on January 25th, 1922, that the Postmaster-General had authorised the transmission of calibration waves and telephony, and these transmissions, which it will be remembered were conducted on behalf of the Society by a Marconi Station at Chelmsford, commenced on February 14th, 1922. Whereas the permission for the transmission of telegraph signals and calibration waves was obtained without great difficulty, it was not until a petition had been presented to the Postmaster-General, signed by officials of the parent Society, and by 65 affiliated Societies (representing nearly the total number of Societies at that date), that the permission for the regular broadcasting of telephony and music was granted.

This successful petition brought about the first regular broadcasting of telephony in this country, and it must not be overlooked that it was not until this petition had been pushed forward, so strongly backed by amateur users of wireless throughout the country, that the Post Office Authorities gave way, although, in a previous communication to the amateur organisation, the Authorities, whilst agreeing to the transmission of telephony and calibration waves, had stated :—"It is regretted that it has not been found possible to agree to the inclusion of wireless telephony in the arrangement."

From these references, therefore, it is apparent that regular broadcasting in this country was initiated, not only at the request of, but through the insistence of the experimenting amateurs. It may be mentioned also that this arrangement for amateur broadcasting terminated when broadcasting on a national scale by the Broadcasting Company commenced.

We know that at the present time there are thousands of people who have only taken up wireless since the introduction of broadcasting, and probably as a direct result of their desire to listen to the programmes provided. Those users would, we believe, never suggest that they are unreasonably treated by being requested to contribute a small amount to the expenses of the broadcast service, but the case is not the same with the pre-broadcasting

(*Concluded on p.* 134.)

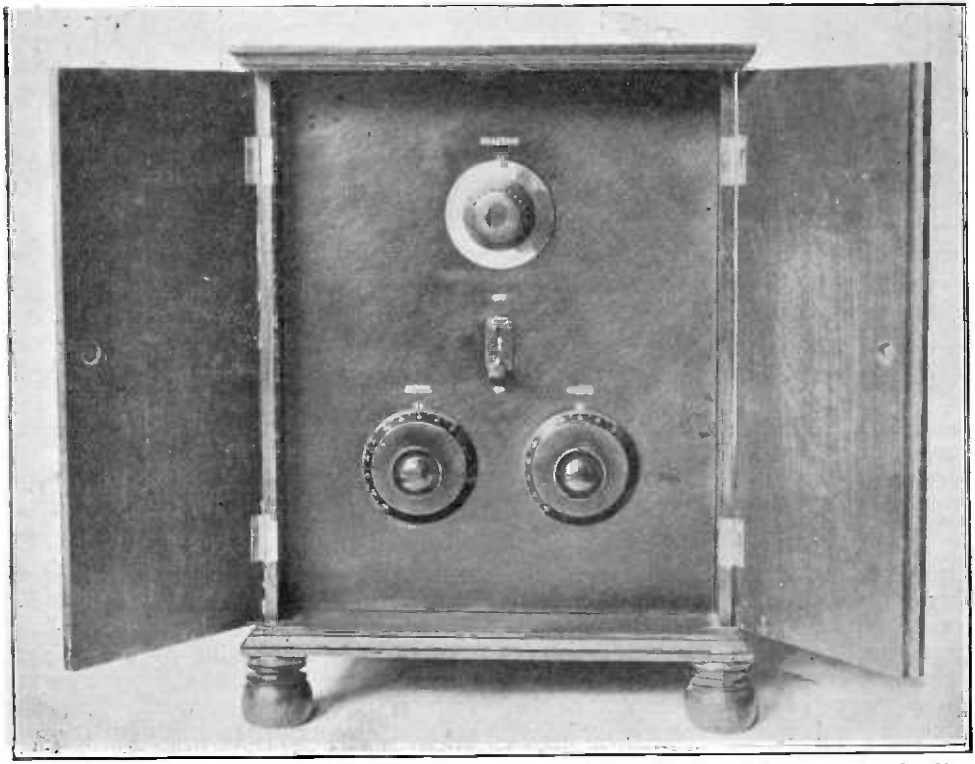
DESIGN FOR A CABINET RECEIVER.

In recent issues of this Journal* a description was given of a somewhat elaborate four-valve receiver designed essentially to be easily portable and therefore as compact as possible. The circuit principle adopted was such that the greatest signal strength could be obtained making the receiver suitable for use out-of-doors, in spite of the introduction, perhaps, of slight distortion. The present article describes a receiver capable of bringing in all the broadcasting stations and of such outward appearance that it can take its place among the furniture of the home.

By F. H. HAYNES.

THE building of wireless receiving sets is quite a simple matter provided finished components are made use of. The construction of well-designed components is, as a rule, far beyond the ability of many readers, as elaborate workshop equipment is needed, together with considerable skill in the use of precision tools, as well as a thorough knowledge of the underlying electrical principles. In this receiver certain standard components are incorporated, and the

*p. 753, Sept. 5th. p. 800, Sept. 12th, 1923.

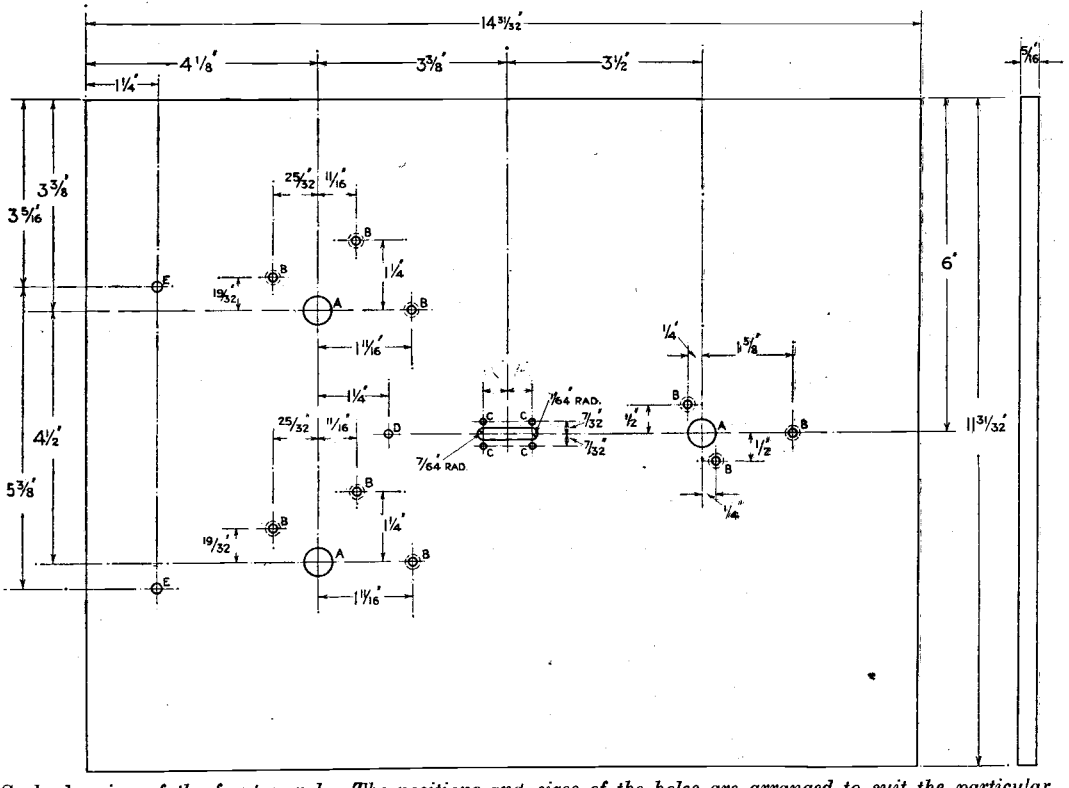


When every attention is given to the good appearance of the cabinet work by symmetry, beading and bevels, it is necessary to give every thought to the arrangement of the manipulating handles on the face of the panel. The crowding of a number of dials, etc., on to a panel presents a very complicated appearance, and for home use the tuning adjustments should be few, and the dials carefully spaced to give a simple aspect to the whole. The screw heads, which can be seen, secure the components to the panel, whilst the slots indicate the settings of the dials.

only tools necessary for assembling the parts and finishing out the receiver are a hacksaw, hand brace and set of drills, various files, several B.A. taps, screwdriver, pliers and soldering iron.

The receiver comprises a single tuned aerial circuit with plug-in coil and variable condenser; one high frequency amplifying circuit arranged on the tuned anode

No provision is made for throwing the note magnifiers in or out of circuit as it is assumed that the receiver will always be connected to a loud speaker, and should reception be weak from a distant station when employing the resistance-capacity L.F. coupling, the switch can be thrown which substitutes transformers. With reception from extreme distances the tuning adjust-



Scale drawing of the front panel. The positions and sizes of the holes are arranged to suit the particular components mentioned. The poles for attaching the switch are 9/16" from the centre line. Sizes of holes: A, ¼". B, 5/32" and countersink on top side for No. 4 BA screws. C, 1/8". D tap 4 BA x 3/16" deep. E, tap 2 BA x 3/16" deep.

principle, and making use of one of the windings of a variometer for its inductance, the other winding providing the necessary reaction coupling; detector valve circuit, and two low frequency amplifiying valves, which by means of a multi-contact switch, transformer and resistance-capacity L.F. inter-valve coupling, can be interchanged. Switches are not introduced into the high frequency circuit owing to the great care which is necessary to avoid losses when wiring up.

ments are usually so critical that it is difficult to avoid the introduction of distortion in the high frequency circuit, and consequently the setting up of any further distortion by the use of iron core transformers is of little moment. Special precautions are taken to minimise these difficulties; firstly, by using condensers having specially shaped plates and fitted with a separately controlled vernier adjustment, (which is practically indispensable for critical telephony reception) and secondly, by

shunting the primary (or secondary) windings of the transformers with resistances. When, however, reception is strong, the switch is thrown to the position which disconnects the transformers and introduces resistance coupling with the consequent elimination of distortion.

The following components are employed†:—

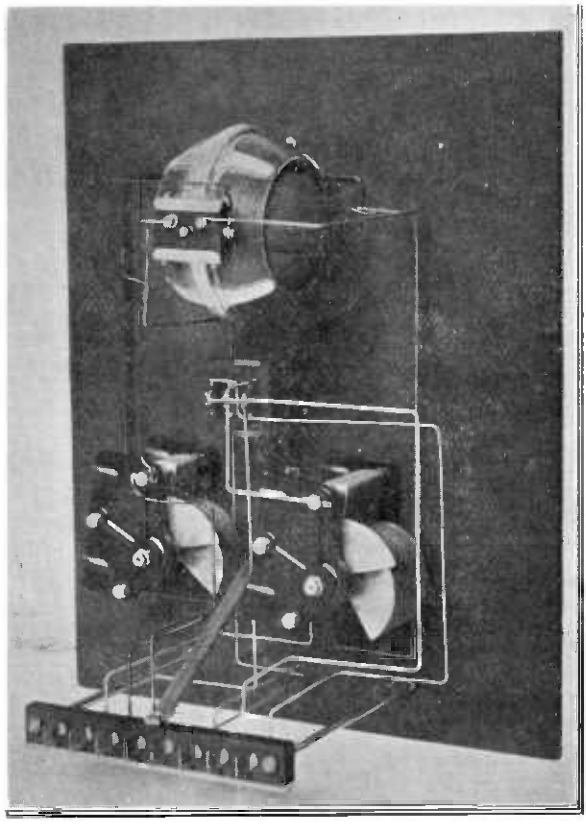
Oak or mahogany cabinet, with doors at front and back measuring 12 × 15 ins. inside and with a total depth of 14 ins. (Messrs. Henry Joseph & Co., 96, Victoria Street, S.W. 1.).

Two ebonite panels, $11\frac{31}{32}$ ins. × $14\frac{31}{32}$ ins. × $\frac{5}{16}$ ins. These should be of the very best quality obtainable, and if desired can be purchased cut precisely to size accurately squared up, and sand blasted to give a good matt finish.

Two "Burndept" switches, 3-pole and 5-pole.

Two variable condensers, with verniers, having specially shaped "square law" plates with values of 0·0005 mfds. and 0·00025 mfds. These are manufactured by the Sterling Telephone and Electric Company, Limited.

Variometer as supplied by the General Radio Company, Ltd. This particular type is specified, for when the inner coil is used in conjunction with the smaller condenser, the broadcasting band of wavelengths is successfully covered, whilst the method of connecting up gives a fairly high degree of capacity coupling between the tuned anode and reaction circuits, and advantage is taken of this to give a smooth reaction adjustment.



Back view of the tuning panel. The specially shaped condensers and vernier adjustments can be seen. The strip of contacts carries the connection to the back panel.

Four filament resistances of any reliable make. The positions given for the holes for attaching the resistances suit those of the Federal type such as may be possessed by the experimenter.

One "Burndept" plug and socket to hold a plug-in coil.

One plug-in inductance coil, a 25, 35, 50 or 75, which will bring the aerial tuning adjustment within the scale of the aerial tuning condenser, and depending upon the size of the user's aerial.

Dubilier fixed value condensers, type 600A. 0·0002 mfds. and 0·001 mfds.

Three condensers from 0·01 to 0·2 mfds. and one 1 mfd. by the Telegraph Condenser Company.

Five 0·5 and one 2 megohm leak with twelve clips.

Three Dubilier resistances, with clips, two of 600,000 ohms and the other of 100,000 ohms.

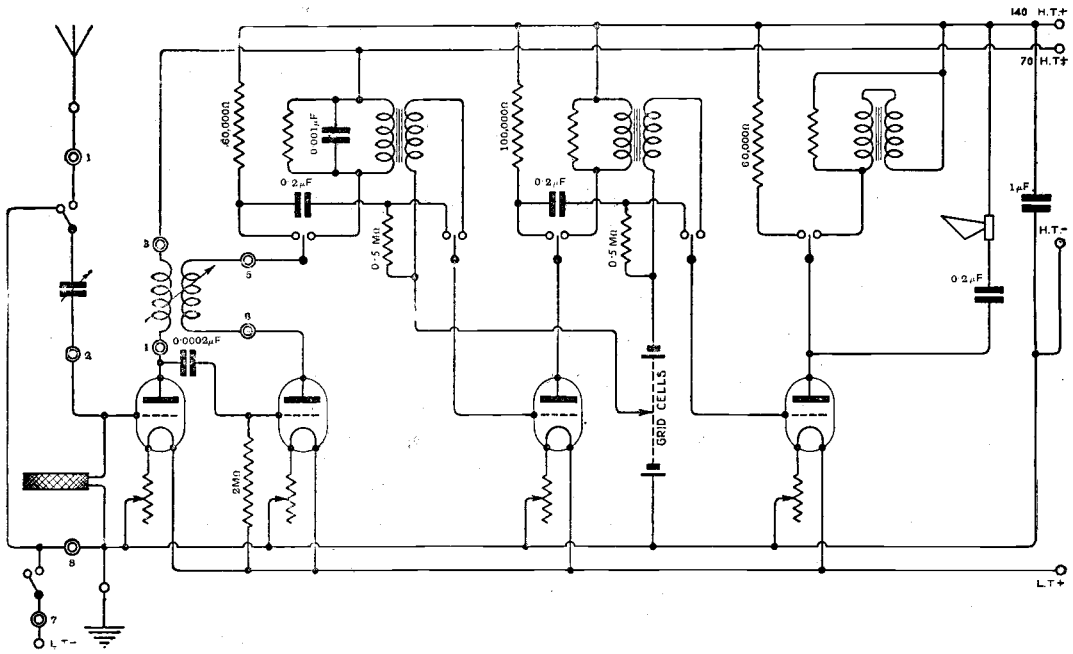
Three intervalve transformers by the Marconi Scientific Instrument Company, Ltd., for it will be found that the spacing between the screws used to hold these transformers is exactly equal to the spacing of screws used to secure the anode resistances, and screw heads, where they appear, can be arranged symmetrically.

Eight good quality terminals.

Sundry BA and wood screws, also brass strip and sheet, which can be procured as required.

In view of the large amount of apparatus to be accommodated, and to avoid the appearance of unnecessary screw heads on the front panel, two supporting panels are employed. The front panel only carries those components which are operated for tuning purposes, and the rear panel has attached to it the valves, filament resistances, and all the apparatus associated with amplifying. Connection is made between the panels by means of a strip of

† For guidance, particular component parts are mentioned, but the skilled and discriminating experimenter may substitute components of his own choice.



Theoretical circuit diagram showing the principles employed. Another diagram will show the practical wiring and the actual points between which leads will be run.

contact blades so that either of the panels may be withdrawn without the necessity of severing permanent connections.

A detailed drawing is given for the drilling of the front panel and the positions for the holes must be carefully set out with the use of steel rule, square and dividers. Working instructions and the design of the back panel will be given in the next issue.

The Amateur's Frankenstein—(*Concluded from p.* 130.)

experimenter who, although he would, of course, value broadcasting at a much higher figure than the additional 5s. demanded, has yet good reason to object on principle. The amateur is the pioneer of regular broadcasting in this country, however certain it is that broadcasting would in any case have been introduced eventually. In addition, whereas special transmissions were originally authorised for the amateur, he has had to give up this advantage as a direct result of the introduction of regular national broadcasting. If it were not so, " two emma toc, Writtle " might still be calling, and we might still hear the cheery voice of Capt. Eckersley, who devoted his untiring energies to the conduct of those weekly amateur programmes.

Broadcasting, on the scale on which we now enjoy it, is a wonderful development of wireless, and probably no one would hesitate to endorse its value and efficiency. Those who have been responsible up to the present for the conduct of the service have shown exceptional ability and initiative in meeting the requirements of the public, but we think that the amateur who is a serious experimenter, and those who were amateurs before broadcasting started, have the right to expect that their work shall not be hampered or interfered with.

The situation at the present time has eased considerably, but not many weeks ago very serious doubts must have existed in the minds of those who were interested, as to whether the risk did not exist of broadcasting becoming the amateur's *Frankenstein*. There is no reason to fear such a disaster for the future if those responsible for broadcasting, as well as the public, will remember the part which the amateur has played in bringing about this development.

SULPHATING IN SMALL ACCUMULATORS

It may be confidently stated that the lead storage cell, so long as it is treated with even the slightest semblance of care and consideration, is one of the least troublesome of all accessories.

THE writer has known of small, sometimes "home-made" accumulator sets, intelligently cared for, which have given every satisfaction—highly efficient service and practically no trouble—for years.

One may not safely treat a battery of lead cells as one treats a set of Leclanche or a set of dry cells; that is by placing them in some out-of-the-way corner and leaving them to look after themselves. A lead storage battery, if it is to be maintained in an efficient and proper working order, must be given a certain amount of active supervision and attention. Where this is not forthcoming, there is almost always sure to be trouble, as lead storage cells are exceedingly liable to a number of more or less serious and sometimes quite irremediable complaints.

How Detected and Caused.

The more important of these, and certainly the most frequently met with, is symptomised by the appearance of a hard, white and insoluble sulphate upon the positive (that is of course the brown) plate. At first this will be manifested and noticeable in only a few isolated spots, but once given a hold, it is surprising with what rapidity the affection will spread itself over the entire area of the plates.

The immediate result of this deleterious sulphating is in the increased resistance which the plates offer to the passage of current in either direction and in the reduction of the cells' effectual ampere-hour capacity. It is found that when on charge the plates begin to "gas" before the usual time, and also that on discharge they become prematurely exhausted. The eventual result where no prompt remedial measures are adopted is in the complete "choking-up" of the affected cell, and as often as not, in its speedy and permanent incapacitation.

Roughly speaking, sulphating is generally attributable to one or more of the following causes:—

(1) Charging or discharging at excessive rates.
(2) Discharging beyond the point at which the voltage begins to fall rapidly, *i.e.*, at about 1·8 volts per individual cell.
(3) Wilful or accidental short-circuiting.
(4) Allowing cells to remain uncharged for any length of time, after having been in use.
(5) Allowing the acid solution to become either too weak or too strong.

Buckling.

An accumulator that has been allowed to sulphate to any extent is also extremely liable to a further disablement known as "buckling." This is readily distinguishable by a warping and distortion and a general increase in the size of the brown plate. Taken by itself, sulphating, if it has not gone *too* far, is usually amenable to a little patient and persuasive treatment, but when this doubly complicated stage has set in, the case becomes a rather hopeless one, and it usually means that the positive plate at least—if not the entire cell itself—will have to be "scrapped." Internal short-circuits are set up, the paste falls out of the grids, and in some instances the containing cases are burst open.

Where buckling has set in to any appreciable degree, it is advocated that the positive plates are at once replaced by others, or else that the affected cell or cells be put out of service altogether. When things have gone so far as this, it is almost always sheer waste of time to endeavour to attempt to do anything. But where sulphating is unaccompanied by buckling or where the buckling is only slight, matters may be somewhat remedied.

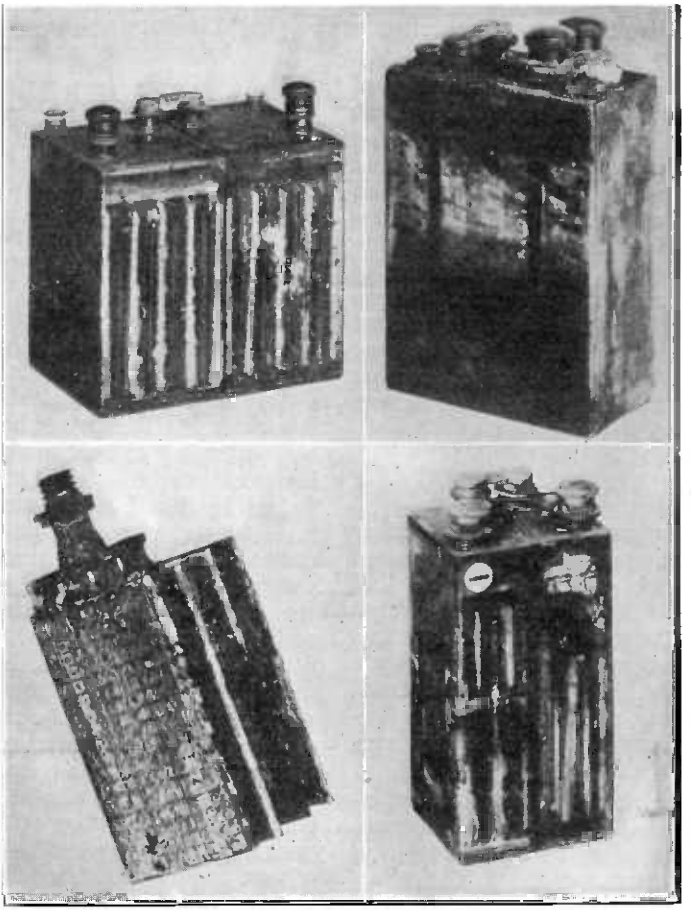
Curative Treatment.

A cell that is suspected of sulphating should be immediately taken out of use.

The acid should be poured off, and it is as well if the containing cases are opened up and the plates lifted out for a thorough inspection and overhaul. It should be noted whether there are any small, dislodged pellets of paste bridging acrosst he plates. If so, these should be removed. In handling the plates, considerable care will be found necessary in order to avoid dislodging more of the paste, all loss of which is of course accompanied by a corresponding decrease in ampere-hour capacity.

The sediment should then be removed from the bottom of the case and a fresh acid mixture prepared. This is done by adding about five parts of pure distilled water to one part of best brimstone sulphuric. (When mixing, always add the acid to the water and not the water to the acid.). The solution, when ready—and it is very essential to keep a small hydrometer by one for this purpose—should be then as near as possible to 1·200 specific gravity. This is important for several reasons. Acid either too weak or too strong is in itself conducive to further sulphating, and it is found, moreover, that this particular specific gravity coincides approximately with the greatest fluid conductivity. That is to say, at 1·200 the acid offers less resistance to the passage of an electric current than at any other specific gravity, either higher or lower.

Immediately the plates have been reinserted in the case and the new acid poured



A neglected battery in which the negative plates are covered with white lead sulphate.

Corroded terminals accompanied with bad sulphating.

Sulphated negative plates with the lead paste falling away.

Another example of sulphating due to inattention to the level of the acid.

in, the cells should be placed on charge. At first this should be *at a very low rate,* owing to the reduced area of active material. A sulphated cell placed on charge at normal rate almost inevitably buckles, so great care should be taken in this respect. Once on charge, the restoration of the cell to a healthy life is then very largely a mere matter of time. It is found that the electrolytic action of the charging current, which may be gradually increased as the treatment proceeds, slowly disintegrates the white, scaly deposit, until at length, after persistent application, it gradually disappears altogether.

On no account should current be drawn from the cell during this time, nor is it wise to stop or interrupt the charging current unless perhaps it is to empty out the old acid once or twice and fill up again with new, of correct specific gravity.

Continual charging then, until every vestige of the noxious white sulphate has been reduced, therein lies our cure.

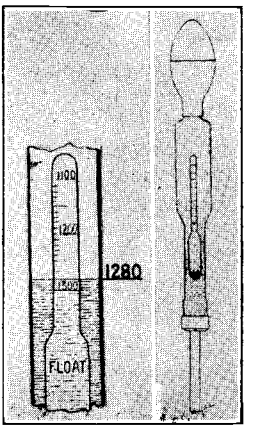
Things To Do and To Avoid.

Once having remedied matters and having got our cell into action again, it is as well to avoid any relapse or repetition of the evil by attending closely to a few simple observances.

In the first instance, always adhere strictly to the directions of the makers as to the rates for charging. These are usually the maximum rates, and therefore should never on any account whatsoever be exceeded. Regarding the *discharge* rate, it may be taken as a good general rule that one should never exceed that rate which would result, if maintained continuously, in the exhaustion of the cell in about ten hours time. That is to say, one should never discharge a 40 ampere-hour accumulato at a higher rate than 4 amperes, and an 80 ampere-hour accumulator at 8 amperes, and so on.

Secondly, never discharge an accumulator down to beyond 1·8 volts per individual cell. When so far discharged, the electrolyte is at a very low specific gravity, and the condition of the plates is such that there is every tendency towards sulphating. At 1·8 volts the cells should be immediately placed on charge.

Thirdly, never wilfully short-circuit a cell. It is necessary here to refer for a moment to the rather prevalent and dangerous practice of laying a short length of wire or cable across the terminals of a cell in order to ascertain whether it has received or still retains a good charge. Nothing could be more deleterious. The effect of the " short " resembles that of an explosion on a small scale. There is first a tremendous rush of current and evolution of gases, secondly a violent expulsion of active material, and thirdly a disastrous warping and distortion of the plates. Cells should always be tested with a small, accurate low-reading voltmeter.



Convenient type of hydrometer for easily testing the gravity.

Fourthly, never allow a cell to remain in an uncharged condition fo any length of time. Recharge as soon as the voltage has fallen to 1·8 v. Even where a cell is not in use, and it is desired to put it by, it must be given a regular charge at least once a month.

Finally, pay strict attention to the specific gravity of the acid. When fully charged this should be about 1·210, and when in a discharged condition, about 1·190. When, owing to evaporation and gassing, the level of the acid falls, make up the deficit by adding pure distilled water only. R. R.

A SIMPLE TIME INDICATOR.

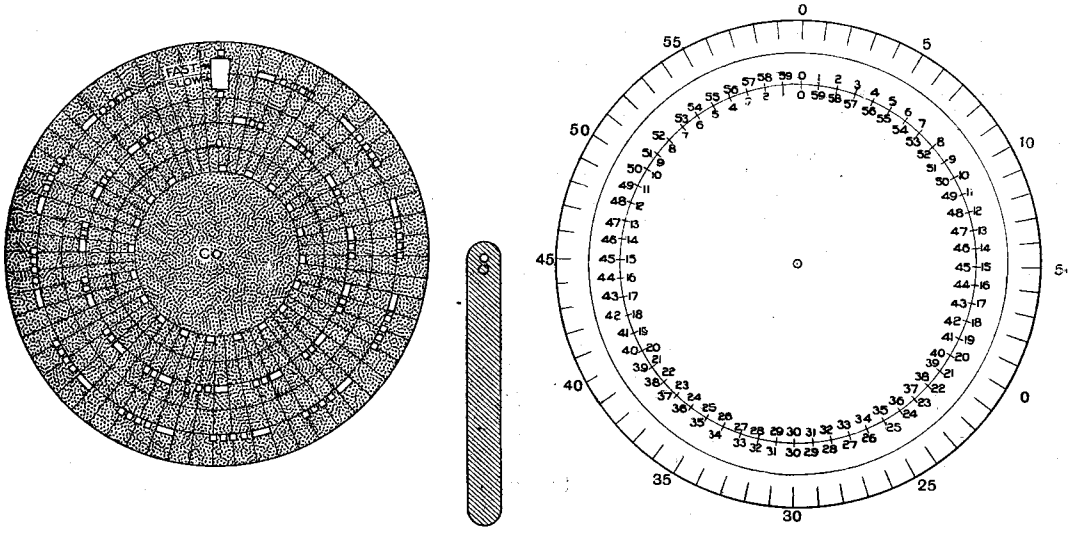
By W. G. W. MITCHELL, B.Sc.

FOR very high accuracy in the comparing of clocks with time signals a recording device is essential. This recorder may very conveniently take the form of a syphon undulator, consisting essentially of a tape (upon which the record is made) moving under the syphon pen at a fairly regular speed, and periodically calibrated by a local circuit operated automatically from the pendulum of the observer's clock. A very high precision in the noting of the exact instant of the time signal may be obtained in this way; probably from one-tenth to one-hundredth of a second.

There are occasions, however, when the experimenter would be satisfied with a time signal accurate to the *nearest second*. Such occasions may arise in connection with the timing of measurements of received signal strength, and the phenomenon known as "fading," or other work of a fundamental nature carried out jointly by several experimenters who wish to compare results on a time basis. The amateur cannot rely on the time services of the broadcasting stations for one second accuracy, and it may not be considered necessary to construct a syphon recorder specially for the purpose of the experiments. In these circumstances the time indicator described below may be found useful.

The time indicator is intended for use with any of the official systems of time signals, and is made from an ordinary "file" as used for filing correspondence.

The revolving disc, which is pivoted centrally to the file with a "push-through" paper fastener, may be ruled up for use with any of the time signals given on page 102 of the Time Signal section of the "Amateurs' Year Book." The fixed dial is divided into 60 equal divisions as shown, while the metal "binder" of the file is utilised as a movable pointer, and pivoted with the revolving disc, but not attached thereto. A small aperture is cut through the revolving disc in an appropriate place through which appear numbers which indicate the amount in seconds by which the local clock is either fast or slow on the time signal. These



The revolving disc and the fixed dial of the time indicator. In constructing the indicator it should be made to a bigger scale than the illustration, to facilitate both the preparation and subsequent reading from the figures. The particular revolving disc illustrated is for use with the Paris time signals.

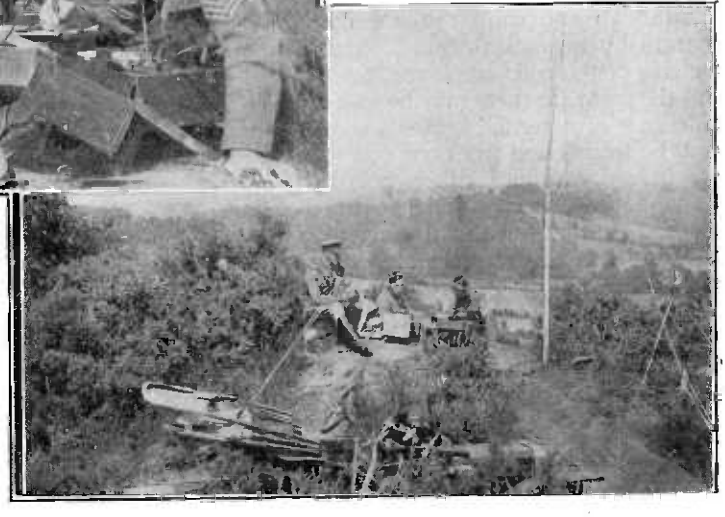
numbers must be written on the fixed dial at equal distances apart and are numbered from 0 to 59, and from 59 to 0, commencing on the radius numbered 0 on the dial.

The procedure in using the indicator is as follows:—Having tuned in the wireless receiver to the particular signals, the observer takes up a position so that he can see the face of his clock. He then waits until he hears the first line of the signals consisting of dashes at two second intervals, and he then places the metal pointer in the position corresponding to 0. When the second hand of his clock reaches 60 or 0, *i.e.* at an exact minute, he begins to move the pointer of the indicator round in a clockwise direction, moving it one division for each swing of the pendulum if the clock is a seconds clock, or one division for every two swings if the clock is a half-seconds clock. This may be done quite easily if the pendulum is kept under observation "with one eye on the dial," or by cutting round the outside circumference of the dial, the indicator may be held in front of the clock face and the pointer moved round in unison with the seconds pointer if the clock has one. The metal pointer is now indicating local time.

Continue to advance the pointer until the instant when the first dot of the time signal (indicating the beginning of the next minute) is heard in the telephones. The pointer is left in this position, and the revolving scale is moved round until the radius on which the three dots appear is above the pointer. As the signals are ticked out in the telephones they are followed on the disc, and the exact setting of the disc is checked by noting the agreement on the second and third dots (*i.e.*, dots at the even minute). In this way a double check is secured. The minute differences between the time signal and the local clock can be noted during the observation, and the amount of the second differences are read off through the small aperture cut in the revolving disc.

School O.T.C. Signal Section.

The accompanying photographs show members of the Charterhouse School O.T.C. Signal Section working wireless and helio from the top of Hindhead to Charterhouse, a distance of 7 miles.



The photographs were taken recently by Capt. Philip C. Fletcher, M.C., O/C of the Signal Section.

LOOSE COUPLERS—I.

Below we consider in detail the operation and construction of various types of couplers.

By W. JAMES.

Couplings and High Frequency Transformers.

(*A*) Magnetically coupled circuits are employed to a considerable extent in wireless receivers and transmitters. Sometimes the apparatus employed to couple circuits is termed a coupler or loose coupler, and sometimes a high frequency transformer.

The name coupler is generally employed when the coupling is variable, and transformer when the coupling is more or less fixed.

In any case, coils are arranged with respect to each other, so that energy may be transferred from one to the other. To secure maximum energy transfer, the coupling is preferably variable.

The aim in designing couplings is to transfer the energy with as little loss as possible. Iron cores, which are used in low-frequency transformers, do not, in general, form part of the high frequency transformer on account of the behaviour of iron at high frequencies, and the losses produced.

(*B*) **Effect of Capacity.**

Although the couplings are designed to operate by magnetic effects, on account of the size of the coils employed, their position, and the fact that there may be an appreciable difference of potential between them, energy may be transferred from one coil to another, or, indeed, to any other near-by object through the capacity which exists between them. This accidental capacity coupling may act to modify appreciably the behaviour of the apparatus.

Consider the case of a cylindrical coil which forms part of one circuit, which is coupled to another circuit by a smaller coil arranged to move inside it (Fig. 1A). Here the two coils are A and B. If the coils were only coupled magnetically, when coil B is turned at right angles to coil A, no energy should be transferred from one to the other.

Actually, however, there is stray capacity coupling between them, represented by the condensers C, in Fig. 1A. Clearly, if there is energy in the circuit in which coil A forms part, some of this energy will be transferred through the capacity coupling to coil B.

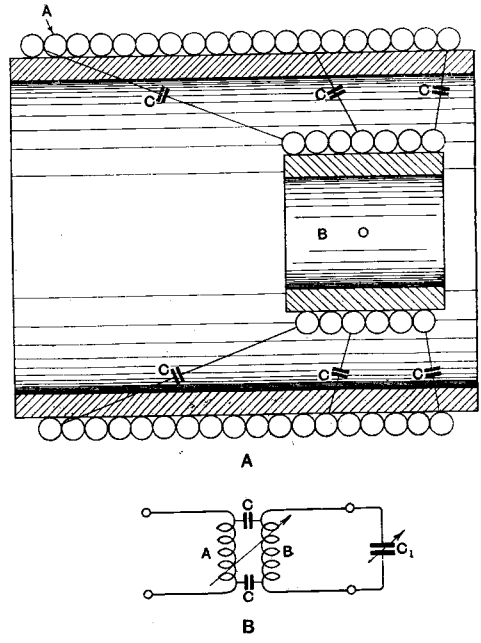


Fig. 1. *Showing the capacity coupling between coils. Winding A represents the primary of a coupling, and B the secondary. Capacity coupling is indicated by the condensers C.*

The energy is transferred ideally, by magnetic effects only, and the amount of energy transferred, varied by altering the coupling.

It will be appreciated that the energy which is passed by the stray coupling capacities may act to increase or decrease the total energy transferred. Further, even if coil B forms part of a selective circuit

which is attached to an amplifier or rectifier, interfering signals which set up voltages in coil A will also send energy through the capacity coupling to the amplifier. Hence interference will be experienced, particularly through short wavelength (high frequency) disturbances.

There is another undesirable effect. The stray capacities C, Fig. 1B, are acting across the tuning condenser C_1, consequently its minimum value is increased. The tuning range is, however, decreased, an increase in the effective minimum capacity of the condenser across the coil being more important than an equal increase in the maximum value so far as tuning range is concerned.

The stray capacity will be larger the closer the turns of wire in coils A and B with each other, the higher the dielectric constant of the separating material, and the greater the surface area of the coils, and the energy transferred will be greater the higher the potential difference between the coils.

(*C*) **Reduction of Capacity Coupling.**

To reduce the stray capacity with objects other than the coils themselves, the coupler may be enclosed in a metal box which is earthed.

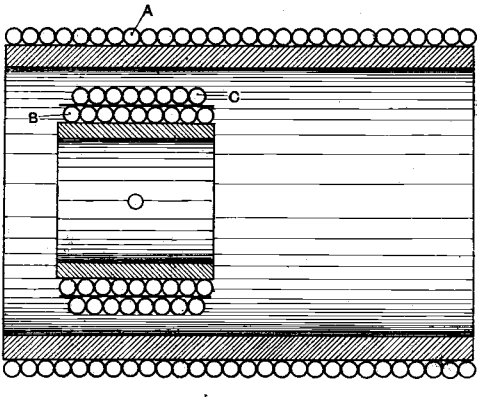


Fig. 2A. Capacity coupling may be neutralised by providing a third winding C, which is wound over the secondary winding B. A sheet of paper or empire cloth separates them.

The coil B should be placed at the end of coil A which is nearest earth potential.

With some couplers and high frequency transformers, it is possible to arrange the windings so that the stray capacity is considerably less than in an arrangement such as Fig. 1A, and these will be described later. It is clear that such points of design as the size of wire, distance between the coils and the material separating them, are factors which should be fully considered.

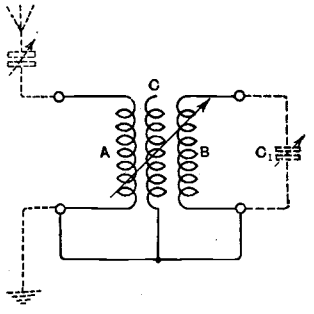


Fig. 2B. The third winding C, which is wound as shown in Fig. 2A, is connected on one side with coil B and earth.

An effective method of screening a coupling coil, Figs. 2A and 2B, consists in providing a third winding C, which is arranged between the movable coupling coil B and the fixed coil A. If coil A forms the primary winding and is, say, in the aerial circuit, and coil B is the coupling coil in the secondary circuit, the correct number of turns for the winding C which is wound on over coil B is easily found by experiment. Tune in a strong signal, and turn the coupling coil B at right angles to coil A. Then vary the number of turns in coil C, until no signal is heard. There is then no coupling at all between coils A and B. Notice one end of coil C is connected to coil B and earth.

Another method of screening to prevent energy transfer through capacity coupling is illustrated in Fig. 3. The winding 1, represents the primary of a high frequency transformer wound upon an ebonite former. Over this is placed a wrapping of insulation such as empire cloth or paper, 2. The outer winding 5 is the secondary winding of the transformer. In between the two windings is placed a very thin layer of copper foil 3, and winding 5 is separated from it by the empire cloth 4. The metal foil has its ends, where it would join, separated with another strip of empire cloth, so that a complete metal circuit is not formed. This reduces

the eddy current loss. The foil is joined to earth. With this arrangement, there can be no energy transferred through stray capacity coupling between the coils.

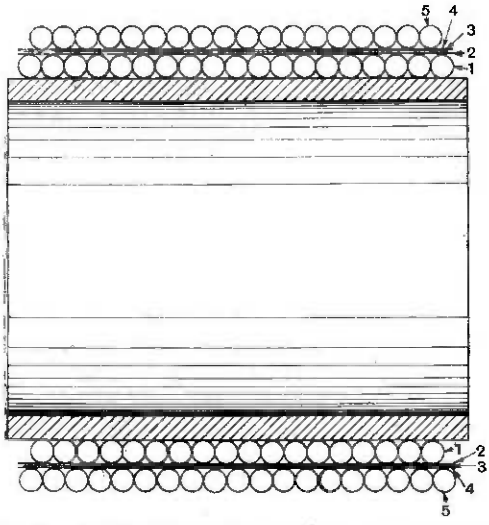


Fig. 3. Another method of shielding the secondary winding. A layer of metal foil is placed between the primary and secondary windings marked 1 and 5.

If it is feared the effective resistance of the coils and therefore the damping of the circuits will be sufficient to produce undesirable effects, a third winding may be wound and coupled with the transformer and joined up as a reaction coil. The damping may then be made negligible at the expense of a little energy from the anode circuit battery.

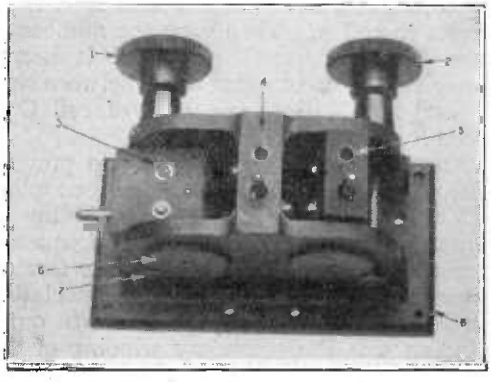


Fig. 4. A three-coil holder, arranged to permit variable coupling between coils of the plug-in type. Knob 1 connects with the gear wheel 7, which turns 6. The holder 3 is fastened to the large wheel 6. The fixed coil is marked 4. The knob 2 controls the position of coil holder 5 through the gear wheels. Connections are taken from the screws on the face of the coil holders. (Burndept, Ltd.)

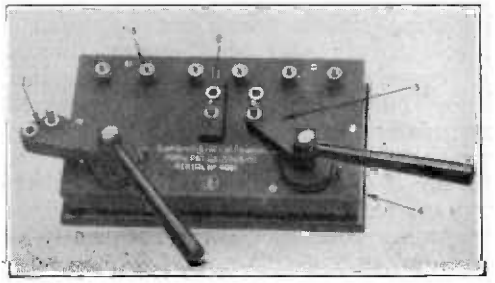


Fig. 5. Another three-coil holder. The moving coils are mounted in the holders 1 and 3. The central holder 2 is fixed. Connections are taken from the terminals 5 mounted on the panel 4. (Gambrell Bros., Ltd.).

Loose Couplers.

Loose couplers in general consist of two portions, a fixed element and a movable element, and are similar in many respects to variometers; but instead of the winding being connected together, one winding is joined to one circuit, and the second winding is connected to the other. The coupling is varied by changing the relative position of the coils.

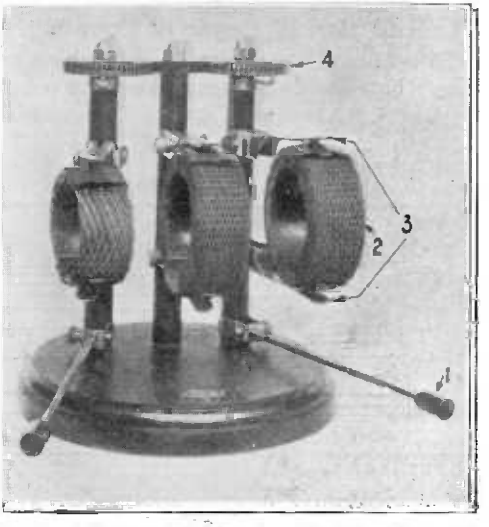


Fig. 6. A three-coil holder for Gimbal coils. The position of the outer coils is varied with the handles 1. The coils are marked 2, coil holding clips 3, and the scales 4.

(*A*) The method of dealing with plug-in type coils is to mount them in coil-stands or holders. Some holders are arranged to

accommodate only two coils, one of which may be moved with respect to the other, while others take three coils. In this case, the central coil is fixed, and the outer ones movable.

In the simplest construction, Fig. 4, the knobs are coupled through gear wheels, and the outer coils may be moved independently to and fro sideways.

A form of micrometer adjustment which permits of a large movement of the knob with only a small movement of the coil is fitted to some types, and is helpful when fine tuning is required. The amount of coupling for best results is often critical, and by employing an arrangement of this description, the correct adjustment is readily made.

Sometimes it is desirable to provide a looser coupling than is possible when using the above arrangements, and the coil holder of Fig. 5 is then found to be of great assistance.

From the figure it will be noticed the central holder is fixed, while the position of the outer coils is easily varied by moving the handles. The coils may be moved more than 90 degrees with this arrangement; this is useful, because on account of stray capacity couplings, when almost zero coupling is required, it may be necessary to turn the coil more than 90 degrees from the fixed coil.

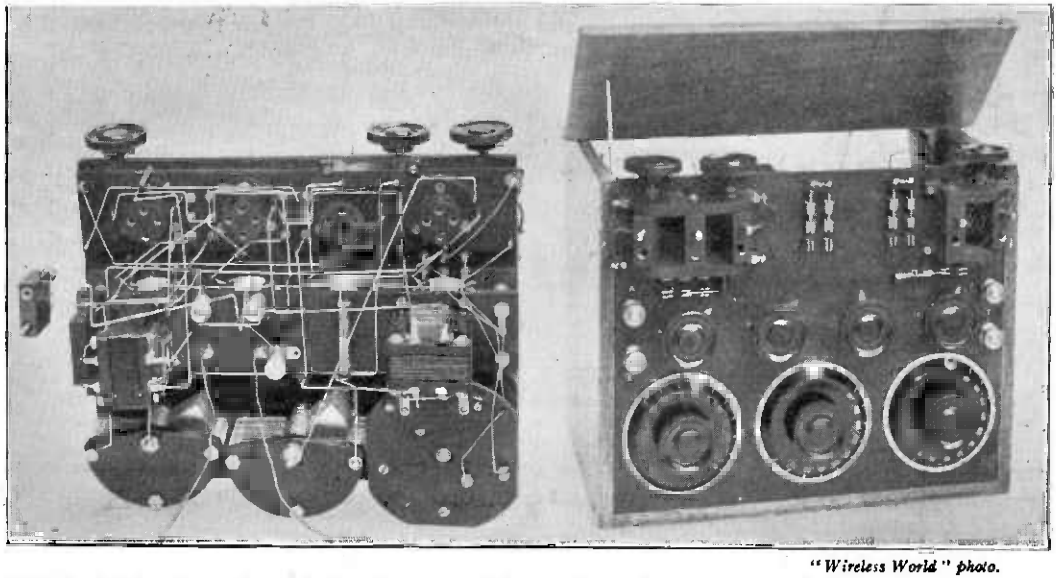
The special mounting for Gimbal type coils is illustrated in Fig. 6. Here the coils are held between clips, which also serve to make electrical connection with the ends of the coils. The clips are connected with the terminal seen at the back of the coil stand.

To vary the coupling between the coils, the outer ones may be moved by shifting the handles. Another variation is obtained by turning them in their holders.

To accommodate different diameter coils, the clips of the holders are movable.

Compact Four-Valve Receiver.

Many difficulties present themselves when an attempt is made to build a multi-valve receiver into limited space. The arrangement of the many components on the panel, and the wiring layout must be given careful thought in order to result in a good appearance, and to ensure that there is no loss of efficiency. The receiver shown in the accompanying photograph, from which many unique constructional details can be gleaned, was built by Mr. A. H. Ninnis, and readers are reminded that compact and easily portable sets have a distinct field.



"Wireless World" photo.

WIRELESS SETS FOR MOTOR CARS

How Portable Receivers Add to the Pleasure of the Car User.

Since the earliest attempts made some years ago to develop wireless reception from motor vehicles, remarkable advances have taken place in connection with the instruments used for this class of work. From the results secured in recent experiments, it seems safe to predict that in the near future wireless sets will become almost as widely standardised on cars as are electric lighting and starting appliances, for the modern motorist belongs to a class of the public that is always on the alert for the latest scientific development applicable to the car.

By RICHARD TWELVETREES, A.M.I.Mech.E.

IN certain quarters there is an objection to wireless sets as applied to motor cars, based on the erroneous supposition that the vehicle must be disfigured by the addition of an aerial, or that elaborate arrangements have to be made to fix up temporary wires in order to receive signals from a broadcasting station.

Though such was the case with the earliest experiments conducted, the modern receiving set can be relied upon to work quite satisfactorily without any such accessory.

During last summer the writer carried out a number of experiments with a portable outfit, which was entirely enclosed in an ordinary suit case, and messages were picked up with great clearness when travelling at fairly high speeds at a distance of forty miles or so from the broadcasting station.

How an easily portable wireless receiver, carried in the car, can add to the pleasures of picnicing.

One of the great advantages of a portable set of this description lies in the fact that it can be used for such a variety of purposes. For example, one can enjoy the evening

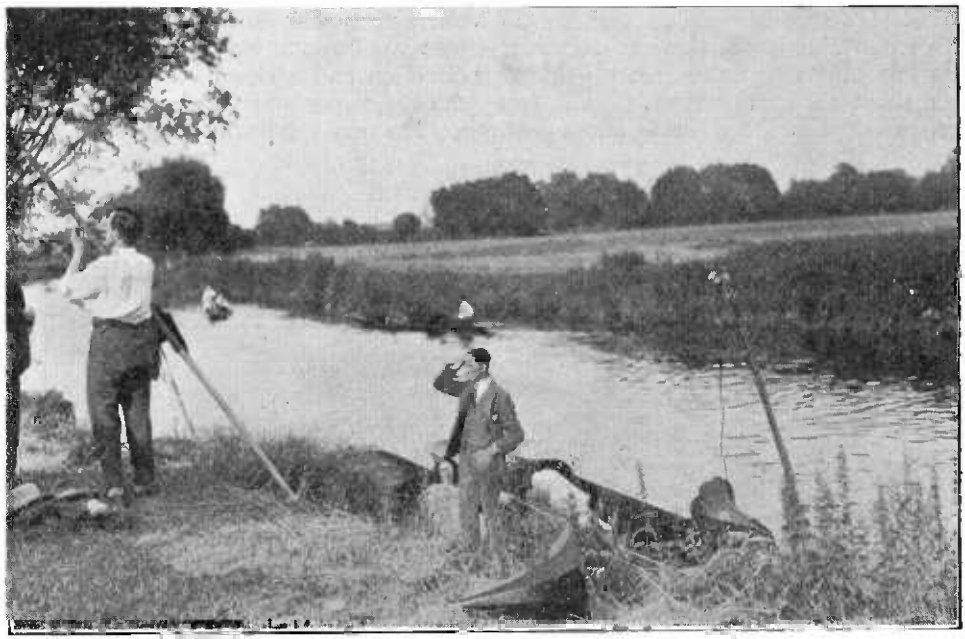
concert round the fireside, carry music on the car when visiting friends, add to the enjoyment of outdoor picnics or river trips by providing an entertainment from the car, and those who find pleasure in relieving the monotony of our disabled heroes in hospitals may do worse than take their sets to such places when out on pleasure bent. No more appreciative audience can be found than a gathering of men in hospital blue, and the motorist with a portable set is always sure of a warm welcome.

In considering the advantages of the fully portable set from the point of view of the motorist, one must recollect the remarkable facilities provided in the modern motor car for obtaining an unfailing supply of electric current, for by tapping a circuit from the electric lighting batteries, the charging difficulty is entirely overcome.

Those who have had annoying experiences from Morse signals and other electrical disturbances in the atmosphere are apt to imagine that the magnetos on motor cars set up a great deal of interference, but at no time during his numerous experiments with sets on moving cars has the writer found any trouble in this respect. The only exception that may be remarked is in certain vehicles of transatlantic origin in which the ignition is provided by a flywheel dynamo and high tension coil, but even on these machines it is possible to insulate the instrument by a copper band connected by an earth wire to some part of the frame.

In installing a set on the car it is always advisable to provide suitable cupboard space for the reception of the valves, coils, telephone receivers and other parts liable to suffer from damage by vibration when travelling fast over rough roads, and indeed it will be a great advantage when sets are built into the cars instead of being regarded as mere additional fittings.

Motorists will appreciate this point when they recollect the objections found in early cars when lighting sets and other parts of the car equipment were added as afterthoughts.



Erecting the riverside aerial.

In some respects the reception of a broadcast programme from a car in motion may be looked upon as a rather unnecessary luxury, for most motorists look upon their

cars as a means of getting to a destination, and whilst on the journey have already too much to occupy their attention to wish to indulge in knob-turning, a fact that tends to the simplification of design for sets used for the purpose. After carrying out various tests with sets provided with frame aerials, the writer has come to the conclusion that the most convenient form of aerial to employ, consists of a length of rubber-covered flexible wire, loaded at one end and carried in the car in a kind of glorified fishing reel.

The weight at the end of the wire enables one to throw the aerial over a tree or other suitable object, and if so desired an earth can be used in the shape of a mat of copper gauze, laid on the ground near the car.

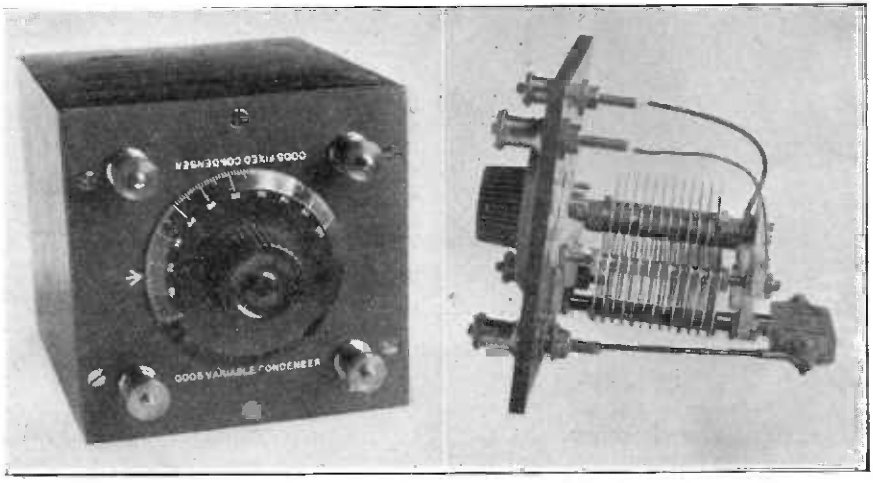
Though so much has been done in connection with wireless on motor cars, there is still a very wide field open for improvement, for up to the present the closest interests of the wireless constructor and the motorist have not been combined to the fullest possible extent. It is one thing to construct a very fine set for wireless reception and another thing to arrange it so that it can be conveniently installed in a motor car, where the matter of space and accessibility is of paramount importance.

Unless the wireless constructor is a keen and experienced motorist, his set will possess drawbacks that will only be discovered when put into constant use. Compactness is the greatest feature for a set to be used on the car, and it is sad to have to remark that many constructors appear to revel in masses of component parts spread over large areas, connected up by a maze of wires.

Whilst there is no doubt that such sets are the most useful for genuine research work, the motorist cannot be expected to submit his car to the tender mercies of the wireless experimenter, who does not fully appreciate the special requirements.

Probably the solution of the motor-car wireless set will come from motorists themselves, who, during the closed season for pleasure motoring, devote the spare evenings in their car workshops and private garages to the construction of sets evolved to suit their own particular requirements. There is plenty of room for developments in this direction and a closer co-operation between the car-owner and wireless amateur should lead to very interesting results.

Increasing the Capacity of a Variable Condenser



A useful condenser arrangement suggested by Mr. J. R. Hoult, in which a small condenser (0·0005 mfds.) is mounted with the variable condenser and brought out to separate terminals. By connecting the fixed condenser in parallel or series with the variable, the capacity range is extended.

THE OTOPHONE—An Aid to the Deaf.

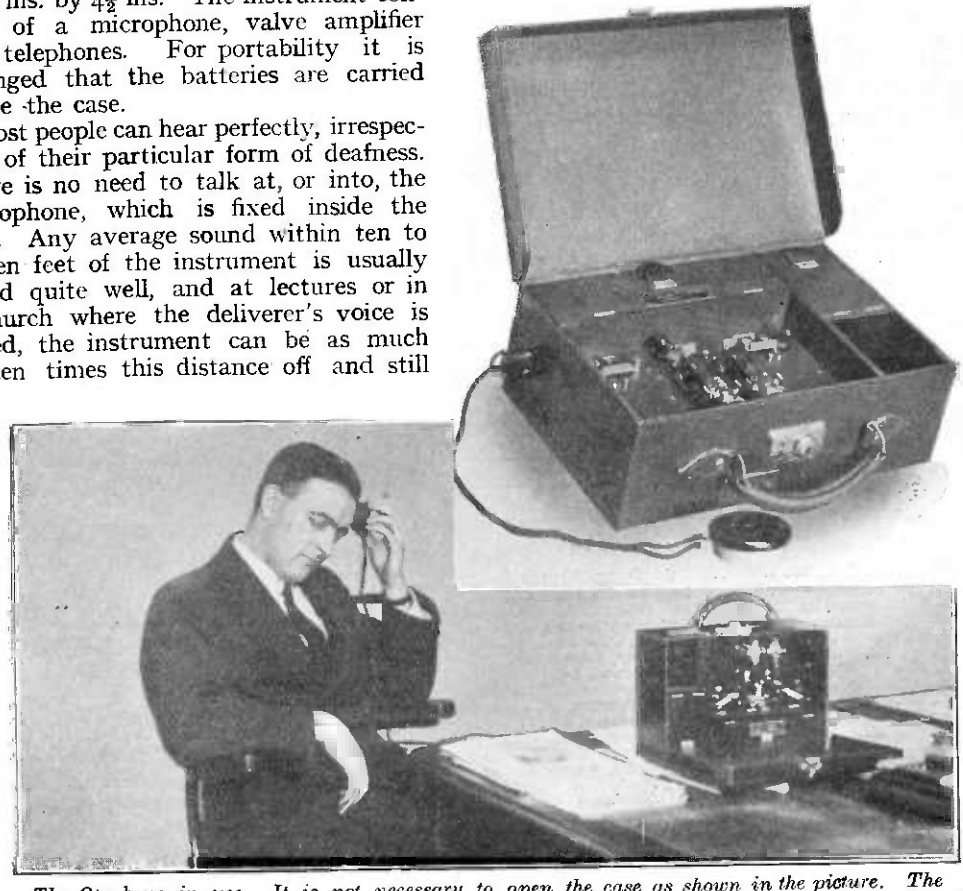
AFTER many years of careful research work some engineers of the Marconi Wireless Telegraph Company have designed an instrument which has meant little less than a new era of life to the deaf. The ordinary magnification of sound by means of the thermionic valve presents little difficulty to the wireless engineer, but the production of an instrument which must not be too conspicuous, gives very fine control of volume, the elimination of extraneous sounds, perfectly simple operation, coupled again with portability, and which has to be marketed at a price within the reach of most, is not so easily arranged.

The Otophone, as our illustration shows, is hardly distinguishable in a good leather attaché case measuring but 12 ins. by 8 ins. by 4½ ins. The instrument consists of a microphone, valve amplifier and telephones. For portability it is arranged that the batteries are carried inside the case.

Most people can hear perfectly, irrespective of their particular form of deafness. There is no need to talk at, or into, the microphone, which is fixed inside the case. Any average sound within ten to fifteen feet of the instrument is usually heard quite well, and at lectures or in a church where the deliverer's voice is raised, the instrument can be as much as ten times this distance off and still give extremely strong audibility. An outstanding advantage is that several deaf people can use the same instrument by the mere addition of extra headpieces.

For cases where the eardrum is destroyed altogether, a Brown's Ossiphone, especially adapted for use with the Otophone, is supplied, which enables people to hear by means of bone conduction—that is, through the teeth or practically any part of the skull.

We understand the Post Office have been approached with a view to allowing the Marconi Company to make a single connection to the ordinary earpiece of the land line telephone, in which case, if the Post Office grant the necessary permission, deaf people will be able to hear on the telephone with ease.



The Otophone in use. It is not necessary to open the case as shown in the picture. The earpiece is put into circuit by means of a plug and socket and when not in use is contained in the compartment on the right.

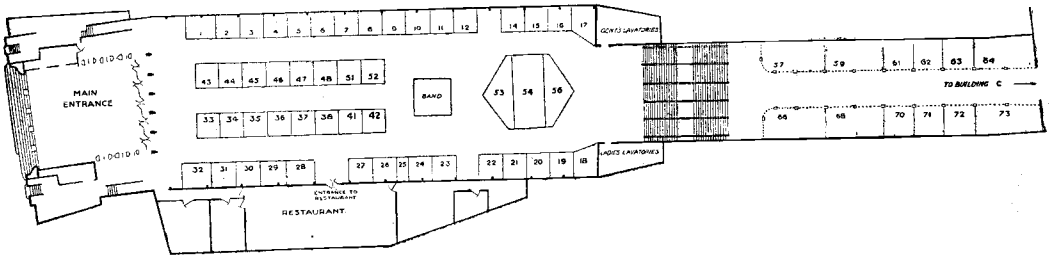
THE ALL-BRITISH WIRELESS EXHIBITION.

As readers will have noticed from the advertisement pages, The All-British Wireless Exhibition is to be held this year at the White City, Shepherd's Bush, W.12, from November 8th to the 21st. Below we give a plan of the Exhibition with a list of Exhibitors.

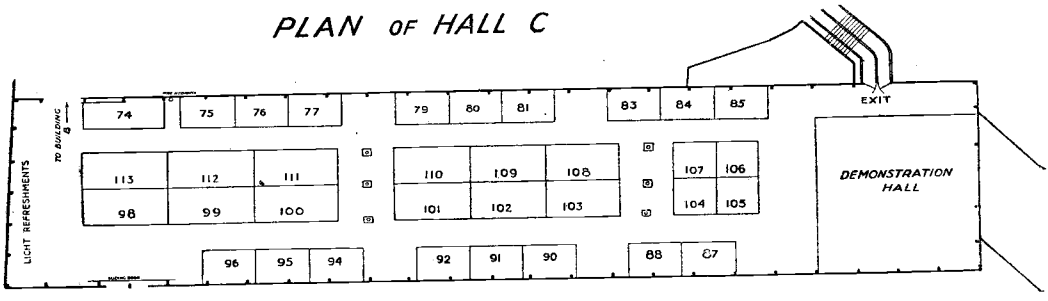
LIST OF STAND NUMBERS OF EXHIBITORS.

	No.
Abbey Industries, Ltd.	85
Amalgamated Press, Ltd.	51
Ashley Wireless Telegraph Co., Ltd.	84
Aucklands Wireless, Ltd.	77
Auto Sundries, Ltd.	41
Autoveyors, Ltd.	16
Belmont Rose	63
Ball, T. C.	23
Beldam Tyre Co., Ltd., The	34
Bowyer-Lowe Co., Ltd., The	6
British Ebonite Co., Ltd.	59
British L.M. Ericsson Mfg. Co., Ltd.	104
British Thomson-Houston Co., Ltd.	99
Brown Bros., Ltd.	12
Brown, S. G., Ltd.	102
Burndept, Ltd.	75
Burndept, Ltd.	112
Burns, J., Ltd.	46
Canadian Brandes, Ltd.	66
Cassell & Co., Ltd.	29
Chambers, L. J., & Co.	48
Chloride Elec. Storage Co., Ltd.	7
Climax Patents, Ltd.	25
Coomes, J. A., Ltd.	91
Cossor Valve Co., Ltd.	56
Darimont	71
Davenport Wireless, Ltd.	35
Day, Bertram & Co., Ltd.	73
Diamond Wireless, Ltd.	9
Dubilier Condenser Co., Ltd.	106
Dubilier Condenser Co., Ltd.	107
Eagle Engineering Co., Ltd.	52
Economic Car Light, Ltd.	10
Edison Swan Electric Co., Ltd.	87
Ever Ready Co., Ltd., The	1
Falk, Stadelmann & Co., Ltd.	79
Fallon Condensor Co., Ltd.	11
Fuller's United Electric Works, Ltd.	27
Gamage, A. W., Ltd.	81
General Electric Co., Ltd.	103
General Radio Co., Ltd.	74
Graham, A., & Co.	113
Great Motor Ballot	21
Hart Accumulator Co., Ltd.	32
Hart, Collins, Ltd.	24
Harwell, Ltd.	44
Haseltine & Neutrodyne	43A
Henderson, W. J., & Co.	2
Hestavox, Ltd.	3
Hough, J. E., Ltd.	36
Igranic Electric Co., Ltd.	43
Jones, Sydney & Co.	19
McClelland, J., & Co., Ltd.	26
McDonald, J., & Co.	28
McMichael, Ltd.	83
Marconi Scientific Instrument Co., Ltd.	57
Marconi's Wireless Telegraph Co., Ltd.	101
Marconi's Wireless Telegraph Co., Ltd.	110
Marshall, Percival & Co.	22
Metropolitan Vickers Co., Ltd.	98
Mullard Radio Valve Co., Ltd.	90
National Wireless & Elec. Co., Ltd.	39
Newnes, Geo., & Co., Ltd.	45
Odhams Press, Ltd.	15
Penton Engineering	69
Peronet	20
Peto Scott Co., Ltd., The	42
Preen, A., & Co.	4
Pye, W. G., & Co.	92
Radiax, Ltd.	8
Radio Acoustics	68
Radio Communication Co.	111
Radio Instruments	105
Radio Press, Ltd.	47
Radio Society of Great Britain	54
Radio Supplies, Ltd.	38
Rawlplug Co., Ltd.	14
Rogers, Foster & Howell, Ltd.	96
Siemens Bros. & Co., Ltd.	76
Solidite Manufacturing Co., Ltd.	37
Sterling Telephone Co., Ltd.	108
Sterling Telephone Co., Ltd.	109
Telephone Manufacturing Co., Ltd.	33
Trader Publishing Co., Ltd.	31
Tudor Radio Co.	70
Vanstone, W., Ltd.	11
Western Electric Co., Ltd.	100
Wilton Wireless, Ltd.	5
Wireless Press, Ltd.	53

PLAN OF A AND B HALLS



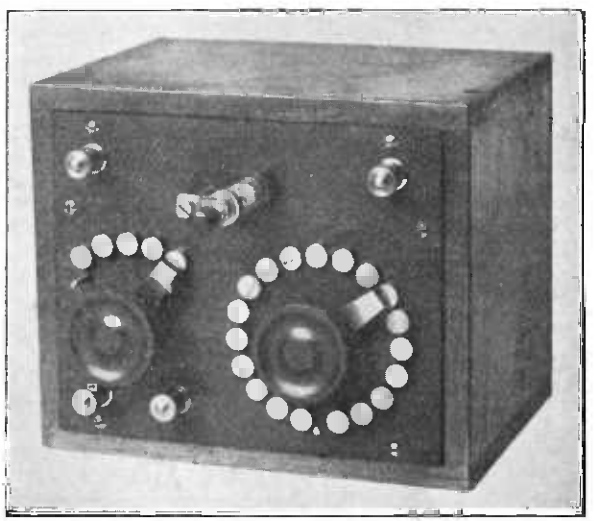
PLAN OF HALL C



THE CRYSTAL SET.

As a crystal receiver consists essentially of a variable inductance, or some means for altering the number of turns of wire in circuit, with telephone receivers and crystal detector joined across it, the actual design can take an infinite number of forms. Even a beginner can with very little consideration design his own crystal receiver and thus it is not thought necessary to describe how to build a set which is the crudest possible arrangement representing a minimum of labour to produce the required results. One would, of course, prefer to possess a crystal set of which he could, in some measure, be proud, and the set illustrated can be made with the most modest workshop equipment and with care and patience a business-like receiver can be built.

IT is better to build the containing box first, and more skill is probably required to make a good box than to build the set which it contains. If instead of soft white wood a piece of mahogany can be obtained between $\frac{1}{4}$ and $\frac{3}{8}$ in. in thickness, the appearance of the set will be much improved. The sides are fixed together by screws which pass through the faces of the longer sides into the ends of the shorter ones, and before finally screwing home are treated with glue or "Seccotine." The inside dimensions should be $5\frac{1}{2}$ in. by $4\frac{1}{2}$ in. and the inside depth $4\frac{1}{2}$ ins. It is impossible to build a good box without the use of a square. By working carefully and accurately less trouble will be experienced and a good job finished in minimum time. The panel is attached to two filets about $\frac{3}{8}$ in. wide, by $\frac{3}{4}$ in. deep, secured to the two longer sides at a distance of about $\frac{1}{8}$ in. from the top so that when the panel which is $\frac{1}{4}$ in. in thickness rests on the filets, it projects $\frac{1}{8}$ in. above the top of the box.



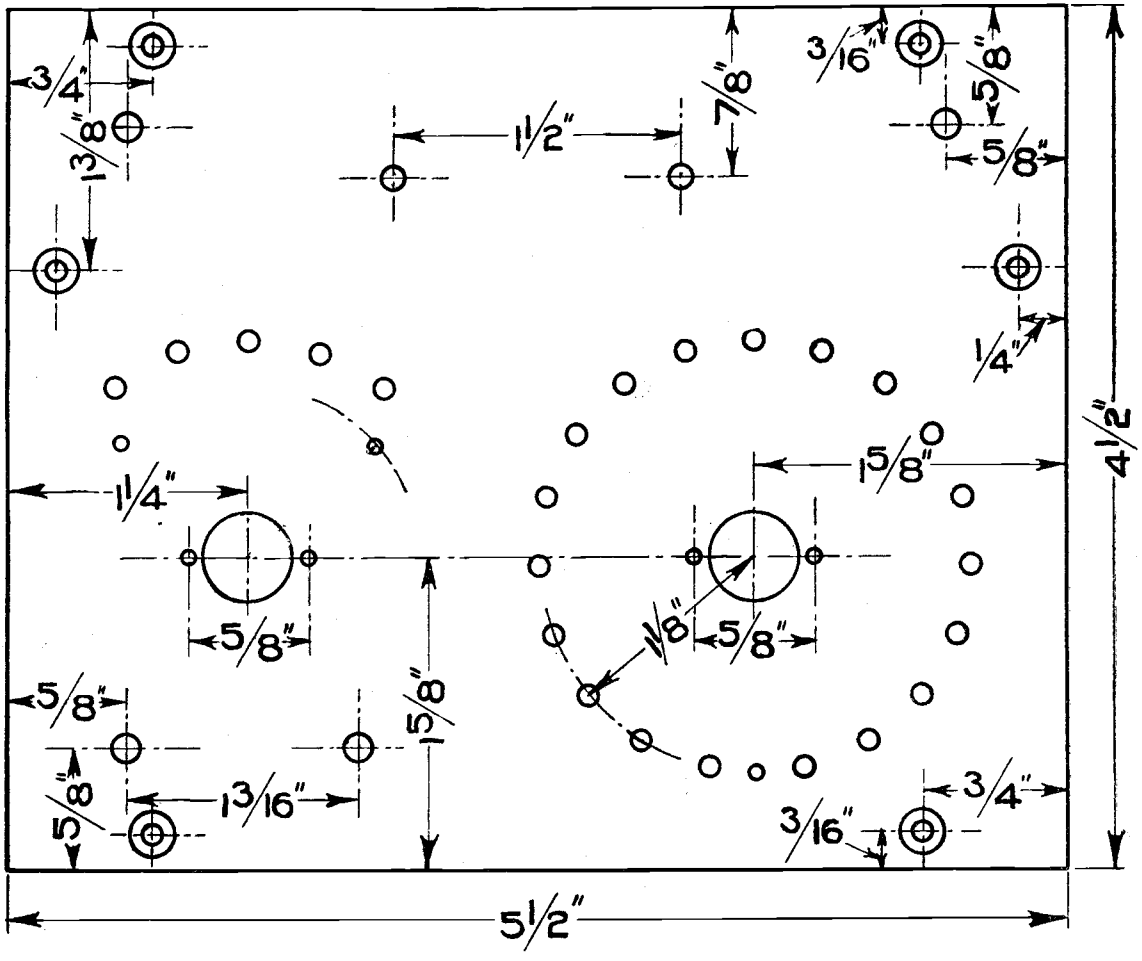
The aerial and earth terminals are at the top, and those for the telephones beneath the five-stud switch. The face of the panel is slightly raised above the edge of the box.

The panel can now be made to fit into the box from a piece of best quality $\frac{1}{4}$ in. polished ebonite, again making good use of the square.

For setting out the positions for studs, switches, terminals and detector a good pair of spring dividers is needed. The sizes of switch arms and studs obtainable are so varied that it may be necessary for the reader to make such modifications as may be necessary with the parts he has to hand. This can easily be done, but one is recommended to make an accurate scale drawing on paper before setting out the positions for the holes on the panel in order to avoid errors. One hole incorrectly located may prove disastrous. The spacing between the pillars of the crystal detector must also be watched. The detector shown in the photograph is a particularly useful pattern, but requires some skill in fixing. When purchased it is fitted with a small base piece carrying a pair of sockets. The latter can best be removed by smashing the ebonite away with a hammer and chisel, and the sockets can then be mounted in the panel by slightly cutting away the tops of the holes on the face of the panel and expanding the

rims of the sockets. The positions for all holes must be accurately and clearly marked with a sharp centre-punch. On the chance that the ebonite may be of a somewhat inferior and brittle quality, it is as well to clamp a piece of scrap ebonite in the vice behind the panel when drilling to avoid fracturing it as the drill passes through.

When emery cloth is used for rubbing down, the emery particles crumble in size as the rubbing proceeds, with the result that polishing occurs and stray large particles produce conspicuous scratches. No oil should be used when using carborundum cloth, and a finish is obtained perhaps only distinguishable from sand blasting by its



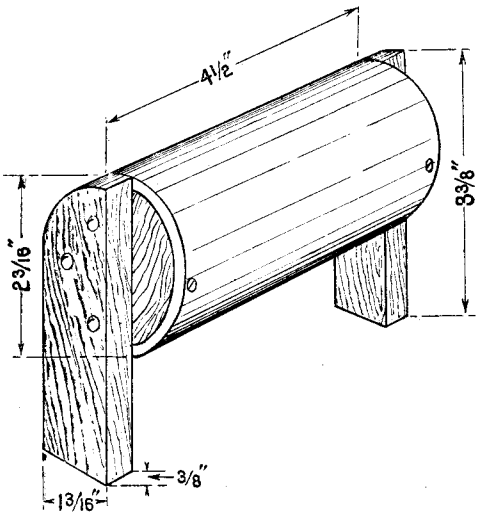
Drawing, exactly full size, showing the setting out of the positions for the holes. Departures from the dimensions given may be necessary to suit the particular components used.

After drilling, the panel should be rubbed down with coarse carborundum cloth which, wrapped round the face of a small block of wood, should be rubbed on the face of the panel with a circular movement. The carborundum powder on the cloth is so hard, that the particles retain their size and there is no tendency for the surface to become partly polished with predominating scratches.

superiority. After a perfect matt surface is obtained, the panel may be rubbed down with a trace of paraffin. Both sides and the four edges should be treated in this manner.

Even the beginner is recommended to lacquer the brass parts, such as the edges of the switch studs, the stop pins, the switch arms and bushes and terminals. All of these must be polished by rotating them in

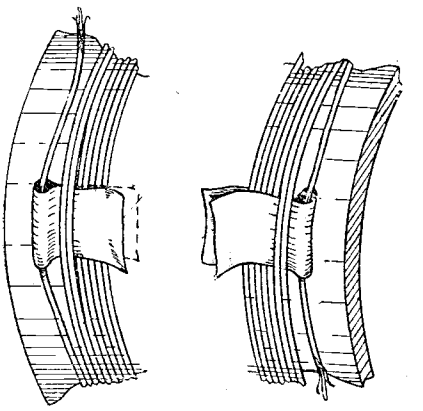
the chuck of the drill and using fine emery paper or cloth. Best pale gold lacquer is



The cardboard former and supporting brackets.

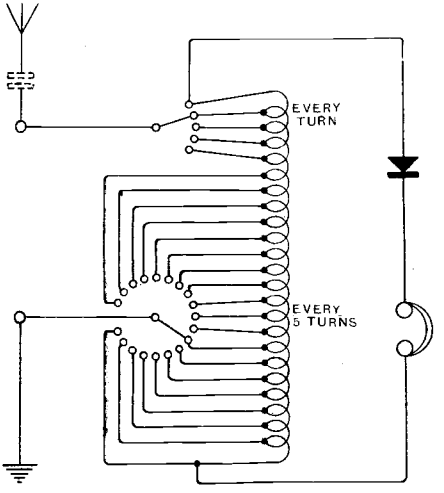
easy to apply with a soft camel-hair brush, revolving the part either between the fingers or in the drill chuck. Holding it in the pliers, it is dried off, and slightly warmed in a clean bunsen or methylated spirit flame, putting it down to cool in a manner so that it does not rest on a lacquered surface.

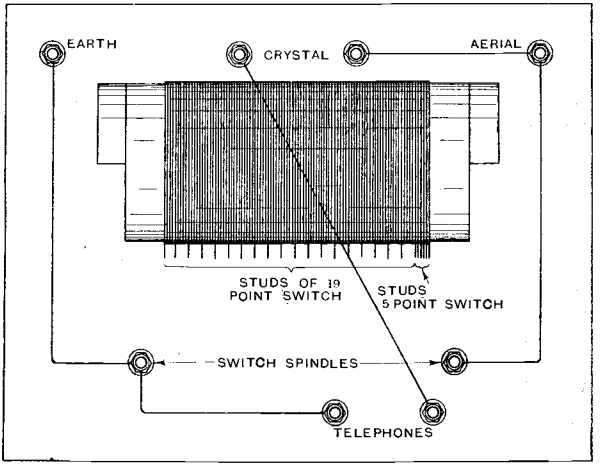
All of the studs should be assembled first and then with the panel suitably held, their faces may be trued up with a fine flat file. It will not be necessary to remove very much metal, and a final truing up may be done by rubbing in various directions with the file wrapped with medium carborundum or emery cloth. Switch arms, detector parts, terminals, and stop pins, the latter just driven in with a slight taper, can now be fitted after lacquering as mentioned above.



Method of securing the ends of the winding by means of tapes.

A cardboard former is probably more efficient than one of ebonite and may be cut from strawboard tube of $2\frac{1}{4}$ in. to $2\frac{3}{4}$ ins. in diameter. It must be dried out in a warm



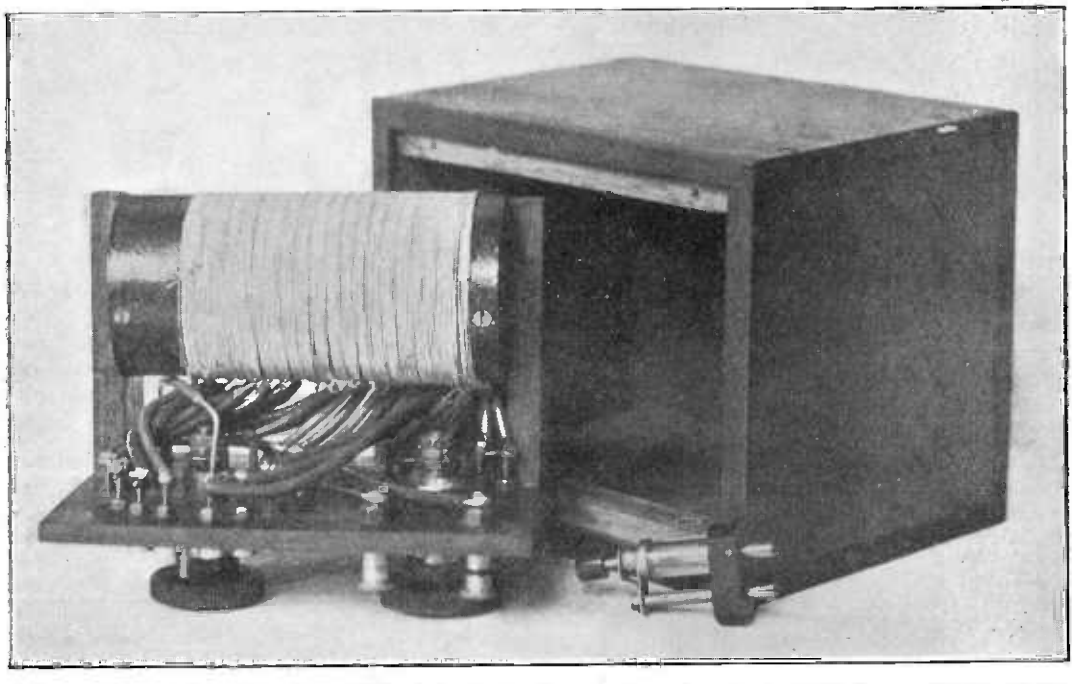


Theoretical and practical wiring diagrams. Should reception from the desired station be obtained with more than half of the coil in circuit, then signal strength can probably be improved by connecting a small fixed condenser (0·0003 mfds.) in the aerial lead and retuning.

oven and treated inside and out with shellac varnish. Wooden discs ⅜ in. in thickness must be carefully filed to shape to plug the ends and are secured in position by means of six small brass wood screws. The former is wound with No. 22 double silk covered wire, terminating the ends as shown in the accompanying diagrams. As each of the first four turns is completed, a 4-inch double loop of wire is brought out, tightly twisted up where near the coil. After reaching the fourth turn, loops are omitted until the ninth turn is reached, and continuing to make loops at every fifth turn, 99 turns are wound on. The loops are then severed at their ends, the wire scraped bare to within ¼ in. of the coil and the twists made tight, taking great care not to cause a break. Wooden brackets can then be built as shown and attached to the ends of the former with brass wood screws.

With a good hot, well tinned iron and "Fluxite" sparingly applied, the ends of the switch studs, terminals, and the switch arm spindles must be carefully and thoroughly tinned. Over-heating of the parts being tinned must be avoided, and this can be accomplished by the novice, by using a really hot (not red hot), well tinned iron which transfers heat quickly and by resting the panel on a piece of wet cloth, which will help to keep the brass parts on the face of the panel cool.

Having secured the former in position by means of screws passing through the panel down into the ends of the brackets, the beginning of the wire and the first four single stud tappings can be attached to the five-stud switch. Small pieces of "Sistoflex" sleeving will prevent the bare portions of the tappings making contact with each other, and it might be mentioned, that when purchasing this sleeving, one should notice that it is of ample size to slide easily over the twisted No. 22 S.W.G. wire. The tappings at every five turns are taken to the studs of the large switch and it will be found easier by counting round to attach



The providing of the tapping loops while winding the coil requires care in order to avoid the possibility of turns becoming loose. The paths taken by the leads must be carefully considered to give a neat arrangement.

the least accessible ones at the back first. The tapping leads may be looped out one over the other as the end of the coil is approached.

The number of turns given is suitable for the reception of broadcasting on a two-wire aerial 100 feet in length. If it is found that the desired signals are obtained with less than half of the coil in circuit, a small fixed condenser of 0.0002 mfds. capacity should be connected between the aerial lead and the aerial terminal.

(The construction of a low frequency amplifying unit to add to this crystal receiver will be described in a subsequent issue.)

CORRESPONDENCE

The Flewelling Circuit.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

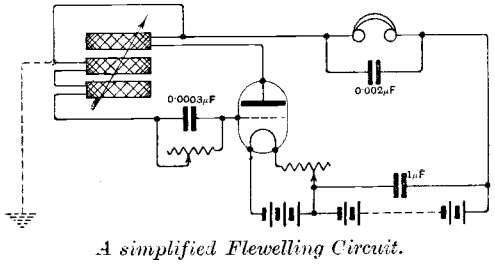
SIR,—In experimenting with the simplified Flewelling circuit without aerial or frame, I have found that a further simplification can be effected by the omission of the coupling condenser in the lower input side of the valve, leaving the circuit open there.

An additional simplification is provided, with improvement in results, if the usual tuning condenser is also omitted and tuning effected by the variometer tuning of two coupled coils. The circuit is shown in the diagram.

A heavy reaction coil of at least 150 turns is needed, and the other components are as in the usual circuits of this nature.

Results are obtained on local broadcasting (12 miles) equal in strength to either the original or the simplified circuit with or without a frame or short aerial (up to 15 feet).

For distance a strong filament current is necessary, but results cannot of course equal those obtained on the normal circuit with a frame.



A simplified Flewelling Circuit.

The omission of the coupling condenser has the advantage of raising the pitch of the whistle, while the circuit is steadied a little by earthing the lower end of the tuning inductance.

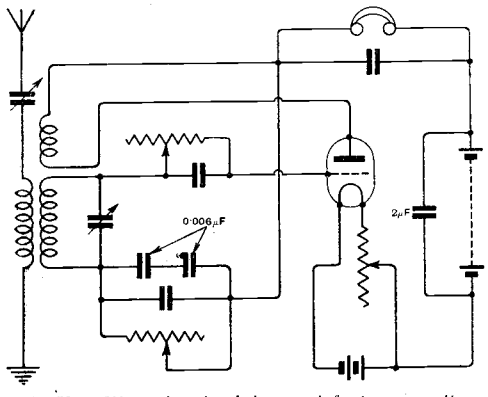
Tuning is not, however, very critical. Many of your readers have doubtless obtained similar results along these lines and I should be glad of an opportunity of exchanging notes.

D. G. DYNE.

Wallington, Surrey.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—With reference to a Flewelling circuit published by you in a recent issue, it might be interesting to your readers to know that, after connecting this circuit up in two or three different ways, I find the above result the most satisfactory. You will notice I have connected a 2 mfd. condenser across the H.T. battery and find it gives a



A Flewelling circuit giving satisfactory results.

fine rich tone to the set. And by using a three-coil tuner, can tune out London and bring in Birmingham and Newcastle at Golder's Green. London is very loud, using only three yards of wire connected to a picture rail in the room. Using outdoor aerial, reactance coil is thrown well back. An L.F. panel can easily be added to this set.

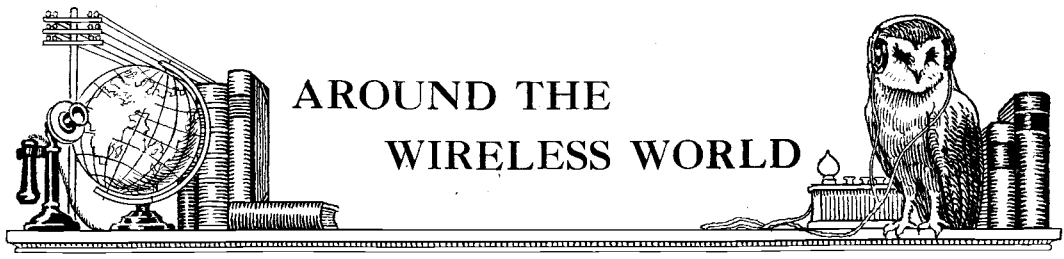
N.W. 11. E. G. EVANS.

WIRELESS DIARIES.

This year, to meet the needs of two classes of wireless enthusiasts, a Wireless Experimenter's Diary and also a Wireless Amateur's Diary are available.

The Experimenter's Diary contains a very complete list of amateur transmitting stations—there are over 800 of them. Altogether, 40 pages are devoted to such interesting matters as Regular Transmissions of European Broadcasting Stations, Design Data of Frame Aerials, Sizes of Fixed and Variable Condensers, Tables for calculation of inductance and capacity, Standard wire gauge data, etc. The Diary is bound in plain brown or maroon morocco-grained leather case, with pocket book loop and pencil and tab marker. The price is 2/6.

The Amateur's Diary provides constructional data of a number of different types of receivers. For example, data is given of Tuners, Crystal Receivers, Valve Receivers, How to add Valves to a Crystal Set, How to Prevent Distortion, Care of Accumulators and Batteries, number of plates required in fixed and variable condensers, etc. The price is 1/-. Both these diaries are published by the Wireless Press, Ltd., 12 and 13, Henrietta Street, W.C.2.



Wireless in Coal Mines.

The United States Department of the Interior is stated to be making extensive preparations at the Government Experimental Coal Mine at Bruceton, Pennsylvania, to continue experiments to determine the value of wireless in mine operation and rescue work, and it is anticipated that some useful results will be obtained. This reminds us that interesting work in the same direction was conducted in this country by various amateurs and wireless societies, notably the Sheffield and District Wireless Society, and some results have been published in past issues of this journal.

Do Loud Speakers Cause a Commotion ?

In the Editorial of our last issue, which deals with some legal points for the wireless amateur, the following reference to loud speakers was made :—"A loud speaker, particularly if afflicted with distortion, may disturb the amenities of life in the adjacent flat, but it is necessary to prove that it causes an unreasonable commotion before the law will interfere." In this connection it is amusing to note that at a town in New Jersey, U.S.A., the law has been called upon to settle a dispute between two neighbours, one of whom complains that the other's loud speaker keeps him awake at night. Defendant called upon several neighbours, who testified that the concerts broadcast to their flats through the loud speaker were soothing and conducive to sleep. The case appears to have attracted a good deal of attention.

Wireless Protection Policies.

Another matter in connection with the legal points raised in our last week's Editorial which may be of interest to those who have had occasion to give attention to these matters, is the issue by certain Insurance Companies, notably the Liverpool Marine and General Insurance Company, Ltd., of special policies to protect the users of wireless against any possible liability to their landlords. The Liverpool Marine policy is known as "The Landlord's Wireless Protection Policy." The advantages of such a policy, as claimed by the company, are that the tenant is relieved entirely of all legal obligations. It enables him to proceed without interference, whilst it gives to the landlord all the protection necessary to cover him in the event of damage to his property.

Indian Wireless Company.

It is reported from Bombay that a new wireless company has been registered in India with the object of obtaining concessions from the Indian Government for the erection of stations. It is further reported that the Marconi Company is being approached with the object of arriving at a working arrangement.

"John Bull" Wireless Answers.

The following "Question and Answer" is taken from a recent issue of *John Bull* :—"Why not publish a supplement occasionally dealing with Wireless ? (*Ans.*) You mean, we take it, a sort of listening-inset ? "

Broadcasting on Armistice Day.

Arrangements have been made by the British Broadcasting Company to broadcast to all stations the service which is to be held at Trafalgar Square on Armistice Day. The broadcasting will include the address of Mr. Baldwin, the Prime Minister.

The Last of the "Interims."

October 31st, the date of the present number of this journal, is the last day on which Interim licences will be available, so that from henceforth (until new arrangements are made) we have only to concern ourselves with the three types—Experimental, Broadcast, and Constructor's. At a recent date it was stated that the revenue due to the British Broadcasting Company under the new licence arrangements had amounted to £200,000, and the Broadcasting Company anticipates that as a result of this addition to their revenue, they will be able to introduce some important improvements in broadcasting in the near future.

A Definition of Atmospherics.

In a recent issue of a daily newspaper the following definition of atmospherics appeared :—"Atmospherics is the wireless term for unnecessary and objectionable interference with wireless transmission."

New Licences.

A recent count of wireless licences issued, shows the following figures :—

Interim	200,000
Broadcast	128;000
Experimenters ..	59,000
Constructors.. ..	27,000

Wireless Lecture for Schools.

An interesting lecture on "Wireless in Schools" was given recently by Mr. R. J. Hibberd, Headmaster of Grayswood School, and Hon. Secretary of the Schools Radio Society, to the Surrey Teachers at Guildford.

In the early part of his lecture Mr. Hibberd described the events which led up to the necessity for the formation of a Schools Radio Society. He set forth the aims and objects of the Society,

and those present showed keen appreciation of the work which was being done.

Later, Mr. Hibberd described how wireless came to be introduced into his own school, and finally gave a demonstration of reception of broadcasting.

Radio Society of Great Britain.

An ordinary meeting of the Society was held at the Institution of Electrical Engineers at 6 p.m. on Wednesday, October 24th. Following the reading and confirmation of the minutes of the previous meeting, Mr. H. A. Thomas, M.Sc., delivered a lecture on "Distortion in Radio Telephony."

At the conclusion of the discussion the following were elected to membership of the Society :

Membership.—J. L. Cannon, R. G. Styles, C. Rodgers, G. Sutton, T. Sloper, W. L. Avery, C. Braybrook, C. Fink, H. Littley.

Transfer to Full Membership.—E. A. Duitz.

Associate Membership.—G. Houghton.

Transfer to Associate Membership.—P. Harris.

The following Societies were accepted for affiliation :—St. Pancras Radio Society; Burnham, Highbridge and District Wireless Society; Finsbury Technical College Wireless Society.

FORTHCOMING EVENTS.

THURSDAY, NOVEMBER 1st.

Radio Association of South Norwood and District. Lecture and Demonstration, "Neon Tubes." By Mr. S. O. Pearson, B.Sc., A.M.I.E.E.

Manchester Wireless Society. At 7 p.m. In the Council Chamber, Houldsworth Hall. Annual General Meeting.

The Derby Wireless Club. At 7.30 p.m. Lecture: "The Armstrong Circuit." By Mr. E. V. R. Martin.

Ilford and District Radio Society. Lecture by A. L. M. Douglas.

Plymouth Wireless Scientific. At 8 p.m. At the Y.M.C.A. Building, Old Town Street. General Discussion and Questions.

Luton Wireless Society. At 8 p.m. At Hitchin Road Boys' School. Lecture and Demonstration, "Armstrong Circuit." By Mr. E. Plator.

Stoke-on-Trent Wireless and Experimental Society. At the Y.M.C.A., Marsh Street. Discussion Night.

FRIDAY, NOVEMBER 2nd.

South Shields and District Radio Club. Lecture by Mr. R. J. Oliver, on "Testing W/T Apparatus."

The Wembley Wireless Society. At 8 p.m. At the Park Lane School. Lecture: "Coils and Coil Winding." By Mr. W. H. Perry.

Sheffield and District Wireless Society. At 7.30 p.m. At the Dept. of Applied Science, St. George's Square. Lecture: "Wireless in North Borneo." By Mr. C. F. Newton Wade, A.M.I.R.E.

Leeds Radio Society. At 7.30 p.m. At the Woodhouse Lane United Methodist Church Schools, Leeds. Lecture: "The Radiotelephone and How it Works." By Mr. D. E. Pettigrew, Hon. Secretary.

Radio Society of Highgate. At 7.45 p.m. At the 1919 Club, South Grove, N.6. Lecture by Mr. F. L. Hogg.

Norwich and District Radio Society. At 8 p.m. at 66, London Street. Lecture: "Adding a H.F. Valve to a Short Wave Tuner." By Mr. Medows White.

SATURDAY, NOVEMBER 3rd.

Mount Pleasant Radio Research Society. At the Lecture Hall, 2IA, John Street, W.C. Lecture: "Dual Amplification." By Mr. G. V. Dowding, A.C.G.I.

MONDAY, NOVEMBER 5th.

The Thornton Heath Radio Society. At 8 p.m. At St. Paul's Hall, Norfolk Road. Lecture: "Winding of Honeycomb Coils, Screening of Aerials and the Construction of a 4-Valve Set."

The Institution of Electrical Engineers. At 7 p.m. At Savoy Place. Discussion on "Engineering Training." Opened by Dr. A. Russell, M.A., D.Sc. (President).

Hornsey and District Wireless Society. At Queen's Hotel, Broadway, Crouch End. Lecture and Demonstration: "A Simple Interference Eliminator." By Mr. J. A. Price.

TUESDAY, NOVEMBER 6th.

Plymouth Wireless and Scientific Society. At 8 p.m. At the Y.M.C.A. Building. Lecture: "The Neutrodyne Receiver." By Mr. P. M. Fowler.

WEDNESDAY, NOVEMBER 7th.

B.T.H. Radio Society. At 7.30 p.m. Musical Evening at Caldercott Girls School, Church Street, Rugby.

The Institution of Electrical Engineers (Wireless Section). At 6 p.m. Address by Mr. E. H. Shaughnessy, O.B.E. (Chairman).

East Ham and District Radio Society. At 7.30 p.m. at the Church Army Social Centre, Barking Road. Informal Meeting.

Stockport Wireless Society. At 7.30 p.m. At Mersey Chambers, King Street East. Lecture: "Wireless Calculation." By Mr. S. G. Leigh.

Edinburgh and District Radio Society. At 117, George Street. Business Meeting and Informal Meeting.

Clapham Park Wireless and Scientific Society. At 8 p.m. at 67, Balham High Road. Lecture: "Short Wave Reception." By Capt. H. S. Walker.

Calls Heard.

Feltham, Middlesex.

2 AH, 2 AJ, 2 AO, 2 AY, 2 BZ, 2 DF, 2 DS, 2 DX, 2 FF, 2 FN, 2 FP, 2 FQ, 2 FU, 2 FX, 2 GG, 2 GN, 2 GV, 2 HF, 2 HH, 2 IJ, 2 IN, 2 IO, 2 IP, 2 JF, 2 JO, 2 JZ, 2 KF, 2 KS, 2 KT, 2 KV, 2 KX, 2 KZ, 2 LI, 2 LM, 2 LT, 2 LW, 2 MF, 2 MI, 2 MK, 2 MO, 2 MT, 2 NA, 2 NM, 2 NN, 2 NO, 2 NQ, 2 OD, 2 OG, 2 OM, 2 ON, 2 OX, 2 PJ, 2 PX, 2 PZ, 2 QQ, 2 QS, 2 RS, 2 SC, 2 SF, 2 SH, 2 SX, 2 SZ, 2 TA, 2 TB, 2 TI, 2 TP, 2 TV, 2 TX, 2 UG, 2 UV, 2 VH, 2 VJ, 2 VK, 2 VR, 2 VT, 2 VW, 2 WJ, 2 XD, 2 XI, 2 XO, 2 XR, 2 XZ, 2 YH, 2 YJ, 2 YQ, 2 YR, 2 YT, 2 ZA, 2 ZK, 2 ZM, 2 ZO, 2 ZS, 2 ZT, 2 ZY, 2 ZZ, 5 AC, 5 AO, 5 AQ, 5 AR, 5 AT, 5 BV, 5 BW, 5 CB, 5 CP, 5 CV, 5 DK, 5 DH, 5 DN, 5 DO, 5 DP, 5 DT, 5 EV, 5 FZ, 5 GF, 5 GP, 5 GS, 5 HI, 5 HS, 5 HW, 5 HY, 5 IC, 5 ID, 5 IO, 5 IP, 5 JT, 5 KE, 5 KO, 5 LP, 5 LT, 5 MA, 5 MS, 5 NN, 5 NO, 5 ON, 5 OP, 5 OX, 5 PU, 5 PR, 5 RB, 5 RZ, 5 SU, 5 TM, 5 TR, 5 TY, 5 UC, 5 VD, 5 VI, 5 VM, 5 VP, 5 VR, 5 WN, 5 WR, 5 XC, 5 XR, 5 XY, 5 YM, 5 YR, 5 ZJ, 5 ZV, 6 AA, 6 BV, 6 HD, 6 HJ, 6 HR, 6 IM, 6 IY, 6 KI, 6 MP, 6 NI, 6 OY, 7 FP, 7 KF, 8 AA, 8 AB, 8 AN, 8 AQ, 8 AW, 8 BA, 8 BF, 8 BM, 8 BN, 8 BU, 8 BV, 8 CS, 8 CZ, 8 GF, 8 XB, 0 AA, 0 DV, O MX, O NY, 0 SA, 0 QN, 0 XP, 0 YS. (Det.—L.F.). (F. Walker.)

London, N.W.1.

2 BZ, 2 DF, 2 DW, 2 DY, 2 DZ, 2 HB, 2 ID, 2 IR, 2 KT, 2 LT, 2 MN, 2 MS, 2 OM, 2 PU, 2 PX, 2 QQ, 2 SF, 2 SU, 2 SZ, 2 VJ, 2 VU, 2 VW, 2 WJ, 2 XF, 2 XZ, 2 XO, 2 ZR, 5 AW, 5 CB, 5 CP, 5 HR, 5 HW, 5 HY, 5 IO, 5 LF, 5 LP, 5 PD, 5 PU, 5 RP, 5 SF, 5 SU, 5 SW, 5 TR, 5 VD, 5 VR, 5 VU, 6 IM. (W. Nicholson.)

West Norwood, S.E.27.

2 AH, 2 AO, 2 BO, 2 BS, 2 CT, 2 DX, 2 FK, 2 FN, 2 GG, 2 GW, 2 HF, 2 ID, 2 IJ, 2 JF, 2 JL, 2 JP, 2 JX, 2 KV, 2 KW, 2 KX, 2 KZ, 2 MP, 2 MU, 2 NA, 2 NM, 2 NS, 2 OD, 2 OS, 2 QV, 2 QX, 2 RB, 2 RG, 2 RS, 2 SF, 2 SZ, 2 TB, 2 TF, 2 TO, 2 TV, 2 UI, 2 VB, 2 VN, 2 VO, 2 WA, 2 WD, 2 WG, 2 WK, 2 WJ, 2 XD, 2 XO, 2 XP, 2 XS, 2 YD, 2 YR, 2 YT, 2 ZG, 2 ZK, 2 ZZ, 5 AR, 5 BM, 5 CN, 5 CO, 5 CV, 5 CX, 5 DI, 5 DJ, 5 DN, 5 FS, 5 FS. 5 FR, 5 GS, 5 HK, 5 HV, 5 IK, 5 IM, 5 JS, 5 JT, 5 KM, 5 KO, 5 KS, 5 LC, 5 MJ, 5 MQ, 5 MU, 5 OB, 5 OC, 5 OS, 5 QJ, 5 QM, 5 RB, 5 RQ, 5 SQ, 5 SU, 5 TB, 5 TR, 5 UC, 5 VO, 5 VJ, 5 VP, 5 WO, 5 WR, 5 XA, 5 XC, 5 XS, 5 ZB, 6 AY, 6 BL, 6 DD, 6 FB, 6 IY, 6 JX, 6 MZ, 6 NB, 6 OM, 6 OY, 6 QM, 6 RJ, 6 RM, 8 AA, 8 AB, 8 AS, 8 AQ, 8 AW, 8 BA, 8 BF, 8 BM, 8 BN, 8 BV, 8 BX, 8 CM, 8 CS, 8 CZ, 0 AA, 0 BS, 0 BQ, 0 MX, 0 YS, 0 VB, 0 LA, 0 XO, 0 XR, 0 DV, 0 NY, 7 JS, 7 FP, 4 IC, 9 AN, 9 CZ. (Single-valve Reinartz). (L. H. Thomas.)

Wandsworth Common, S.W.18.

2 AJ, 2 AQ, 2 AL, 2 BZ, 2 DF, 2 FQ, 2 FU, 2 HL, 2 HR, 2 ID, 2 KF, 2 KZ, 2 MF, 2 NM, 2 OD, 2 OM, 2 QQ, 2 QS, 2 SX, 2 SZ, 2 TI, 2 VK, 2 VM, 2 WJ, 2 XL, 2 XO, 2 XZ, 2 ZO, 5 AC, 5 BD, 5 BT, 5 BV, 5 BW, 5 CB, 5 CP, 5 DK, 5 DT, 5 IO, 5 IS, 5 LF, 5 LP, 5 LZ, 5 MA, 5 OX, 5 PU, 5 SU, 5 UO, 5 VD, 5 VM, 5 VP, 5 VR, 5 XM, 6 HD, 6 NF, 6 IM. (Various circuits.). (Edw. M. Knight.)

North Shields.

2 AO, 2 AS, 2 AZ, 2 DF, 2 FN, 2 FP, 2 FU, 2 GG, 2 GM, 2 GR, 2 GZ, 2 HF, 2 II, 2 IJ, 2 IN, 2 JF, 2 JO, 2 JP, 2 KF, 2 KJ, 2 KS, 2 KW, 2 KX, 2 LG, 2 LZ, 2 MO, 2 NA, 2 NM, 2 OA, 2 OD, 2 OM, 2 ON, 2 OR, 2 PP, 2 PX, 2 QH, 2 SE, 2 SQ, 2 SZ, 2 TA, 2 TP, 2 TR, 2 VO, 2 VT, 2 VX, 2 WA, 2 WJ, 2 WK, 2 XG, 2 ZG, 2 ZK, 2 ZO, 2 ZU, 5 BA, 5 BG, 5 BV, 5 CU, 5 CX, 5 DN, 5 EO, 5 FS, 5 GL, 5 GS, 5 HD, 5 HI, 5 ID, 5 IK, 5 IP, 5 IS, 5 JN, 5 KO, 5 LC, 5 LL, 5 LT, 5 MU, 5 NN, 5 OL, 5 OX, 5 PU, 5 QM, 5 SI, 5 ZV, 6 BV, 6 GO, 6 NF, 6 NI, 7 ZM, 8 AA, 8 AB, 8 AG, 8 AQ, 8 AS, 8 AW, 8 BA, 8 BF, 8 BM, 8 BN, 8 BV, 8 BW, 8 CF, 8 CM, 8 CZ, 8 XG, 0 AA, 0 DV, 0 MX, 0 NY, 0 RD, 1 ACF, 1 AJP, WJZ. (D. G. Scott.)

Questions & Answers
Solutions of Readers' Difficulties

"A.B.C." (Midlands) *asks* (1) *For a convenient method of deciding which of two circuits is giving loudest signals when some time has elapsed between the tests.* (2) *For information about the plate current of receiving valves.* (3) *How to determine the potential applied to the grid of a valve by a potentiometer with the aid of a Weston Volt Ammeter.* (4) *Why a single filament rheostat will not reduce the voltage per valve of four valves connected in parallel, below 4·5 volts.*

(1) You might conveniently use the well-known "shunted telephone" method. A variable resistance is placed in parallel with the telephones and adjusted until signals are just inaudible; the greater the signal strength, the less will be the resistance in the shunt when this point is reached. A "metre bridge" wire makes an excellent shunt for this purpose. (2) The steady anode current is of the order of 1 to 2 milliamps, and does not increase from valve to valve in the way you suggest. (3) Connect the voltmeter between the grid and the centre tap on the potentiometer. The reading indicated will be a few per cent. less than that actually applied to the grid. (4) The filament resistance should reduce the voltage per valve below 4·5 volts. It is not good practice, however, to light four valves through one resistance, and in all probability your resistance has been overheated and is short-circuited in places.

"R.A.G." (Broxton) *asks* (1) *For a diagram of a "Flewelling" circuit using two H.F. and two L.F. stages of amplification.* (2) *For particulars of a frame aerial for use with the "Armstrong" and "Flewelling" circuits.* (3) *The best method of screening an eight-valve Armstrong super-regenerative receiver from capacity effects due to the hand of the operator.*

(1) See Fig. 1. (2) A frame 3 ft. square wound with eight turns of No. 18 S.W.G. copper wire, the turns spaced ½" apart, should give good results. If a smaller size of frame is desired, the number of turns must be increased proportionately. (3) To eliminate this effect, fit extension handles on all tuning condensers, etc.

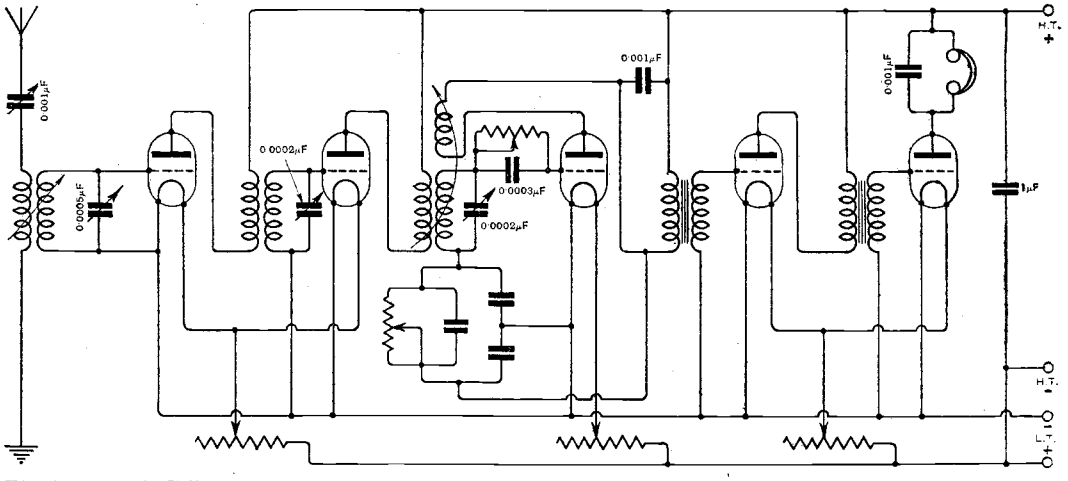


Fig. 1. **"R.A.G." (Broxton).** *A suggested method of adding two stages of high frequency amplification and two note magnifiers to a Flewelling receiver. It may be necessary to omit the condenser in the anode circuit of the rectifier.*

"ENQUIRER" (Ipswich) *asks for details of a chemical rectifier suitable for rectifying the output from a 1,000-volt. T.V.T. unit.*

We do not recommend chemical rectifiers where valve rectifiers can be used, but you might experiment on the lines suggested in the article on "Chemical Rectifiers for Plate Voltage Supply," in the issue of December 30th, 1922.

"A.E.J." (E.9) *asks questions about fixed and variable condensers.*

(1) The air dielectric condenser if variable can be used as an additional tuning condenser. (2) The small spark which occurs when a 2μF condenser

is connected across the H.T. is due to the momentary rush of current when the condenser takes its charge. To roughly test the insulation resistance, disconnect condenser from H.T. battery and short-circuit tags, after an interval of a minute, by means of, say, a penknife blade. If a spark occurs, the condenser is in good condition. In the second experiment which you mention, the spark was due to the short-circuiting of the H.T. battery.

"J.B.K." (Huddersfield) *asks for an accurate method of measuring the voltage applied to the plate of small transmitting valves.*

As you suggest, the most accurate method is to connect an electrostatic voltmeter across the plate filament circuit of the valve under load. If you are able to measure the current when the valves are loaded, you could connect up the voltmeter, and then to allow for the current which passes through the voltmeter slightly alter the oscillation adjustments so that the total current when the reading is being taken is about the same as the normal load current.

"H.C." (N.19) *submits a diagram of a double magnification receiver for criticism.*

There are many points in the circuit submitted that would render it unsuitable for short-wave work. We recommend the use of transformer H.F. coupling in circuits of this type, and would refer you to articles on the subject in the issues of June 2nd and July 21st, 1923.

"K.A.C." (N.W.10) *submits diagrams of two single valve and crystal receivers, and asks* (1) *and* (3) *If the diagrams are correct.* (2) *If the reaction coil in the first circuit must be tuned.* (4) *For the sizes of D.L. coils for use in the second circuit to tune to a wavelength of* 2,600 *metres.*

(1) and (3) Your first diagram is quite correct. In the second, however, it would be better to connect the 0·0002 μF tuning condenser across both L_2 and L_3. If you use some form of vernier adjustment on your coil holder, the circuit may be simplified by combining L_2 and L_3 in one coil.

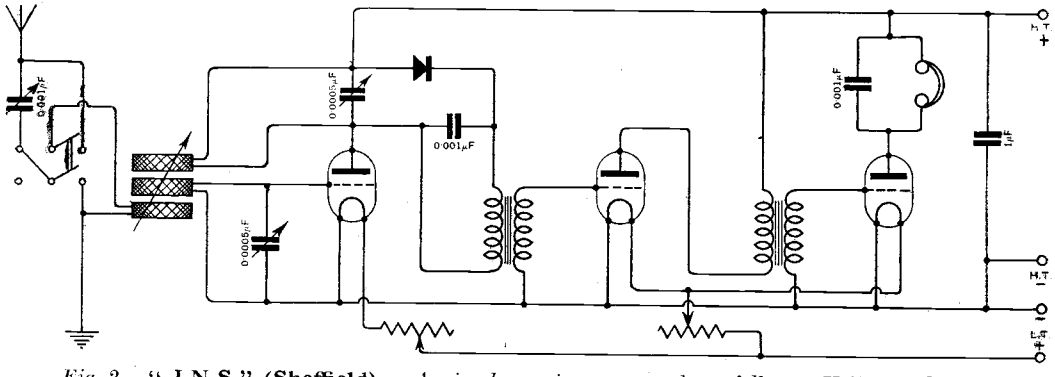


Fig. 2. **"J.N.S." (Sheffield).** *A simple receiver arranged as follows: H.F. amplifier, crystal rectifier, and two note magnifiers.*

"J.N.S." (Sheffield) *gives a list of parts with which he wishes to construct a receiver for broadcasting, The Hague, Croydon and Paris, and asks for a circuit.*

We recommend a circuit of the type given in Fig. 2. For the sizes of plug-in coils required for each wavelength, see curves on page 624 of the issue of August 8th, 1923.

"C.W.R." (Kent) *asks* (1) *For the sizes of basket coils to correspond with standard duolateral coils.* (2) *If a fault is indicated by the fact that signals are still audible when the anode tuning coil is removed from a three-valve receiver (one H.F., one rectifier, one L.F.).* (3) *Particulars of sizes for certain fixed condensers.* (4) *If the plate voltage indicated in the diagram of page* 597 *of the issue of August* 1*st is excessive.*

(1) Wind the basket coils with the same number of turns as the duolateral coil, and select a wire which gives a coil with a mean diameter equal to that of the duolateral coil. (2) This effect is quite common, and is due to stray capacities between wires, etc. (3) The information you require is given on page 479 of the issue of January 6th, 1923. (4) This voltage is not excessive if "R" valves are used.

"A.C." (Boscombe) *asks* (1) *For a diagram of a five-valve receiver, using certain components.* (2) *If this receiver would be thoroughly reliable and efficient for British and continental telephony.* (3) *What alterations would be necessary to use this set with a frame aerial.* (4) *The range of the set for telephony, using the frame aerial.*

(1) and (2) If you require an efficient receiver over the whole of the wavelength range mentioned, it will be necessary to tune the anode circuits of the H.F. valves. We suggest that you adopt a circuit of the type of No. 61 in "The Amateurs' Book of Wireless Circuits." (3) A change-over switch should be arranged so that the frame may be used in place of the secondary tuning circuit. The reaction coil should be coupled to one of the anode tuning coils. (4) The range will depend largely upon the skill with which the set is adjusted, and should be between 50 and 100 miles.

(2) The reaction coil is also the "tuned anode" coil of the H.F. valve, and must therefore be tuned to the wavelength received. (4) For L_1 use a No. 300, for L_2 a No. 100, and for L_3 a No. 300 duolateral or honeycomb coil.

"D.L.J." (Llandyssul) *asks* (1) *For an explanation of the black deposit on the glass walls of receiving valves.* (2) *Whether it is better to connect the filament resistance in the positive or in the negative L.T. lead.*

(1) The blackening is due to the deposition, during manufacture, of a film of finely divided metal which is given off from the hot electrodes. If the blackening is local it in no way affects the working of the valve. (2) The filament resistance should be connected in such a way that it is not traversed by H.F. currents.

"L.T." (Scarborough) *asks* (1) *How dual amplification may be introduced into the last two valves of a three-valve "tuned anode" H.F. receiver.* (2) *For the number of turns required to wind basket coils to receive The Hague and Paris.*

(1) Referring to Fig. 8 on page 212 of the May 19th issue, the first anode tuning coil would be connected directly to +H.T. instead of through the choke CH_1, while the connections from the secondary of T_1 would go to CH_2. (2) On the formers mentioned wind 400 turns for the anode tuning coils and 250 turns for the A.T.I.

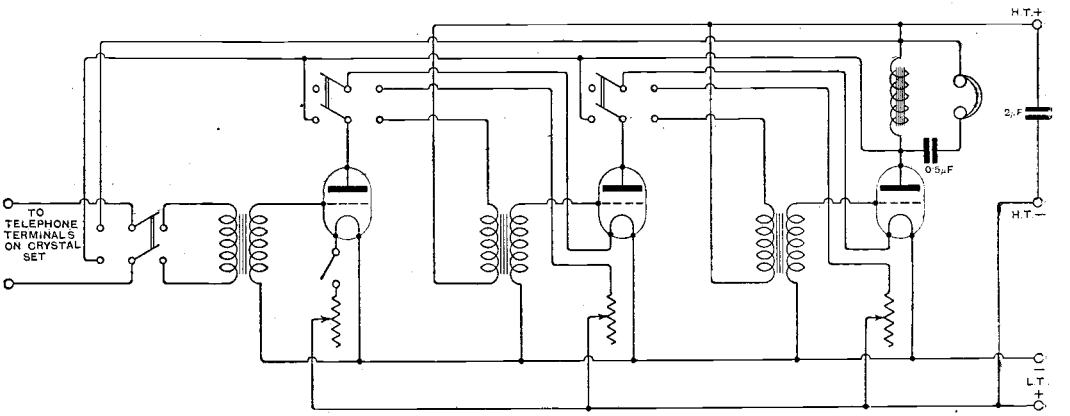


Fig. 3. **"A.F.B." (Crumpsall).** *A three-valve note magnifier suitable for connecting to a crystal receiver.*

"L.H.G." (Liverpool) *sends a diagram of a five-valve receiver (two H.F., rectifier, two L.F.) and asks* (1) *For a diagram with switches to control the number of valves in use.* (2) *If the use of a potentiometer is a necessity.* (3) *A comparison of the efficiency of an indoor aerial (sketched) with that of a standard outdoor aerial.*

(1) Circuit No. 56 of "The Amateurs' Book of Wireless Circuits," shows the method of switching H.F. and L.F. valves. (2) You will find the potentiometer an advantage if the set shows a tendency to oscillate without the use of reaction. (3) The indoor aerial will give about half the signal strength of a good outdoor aerial.

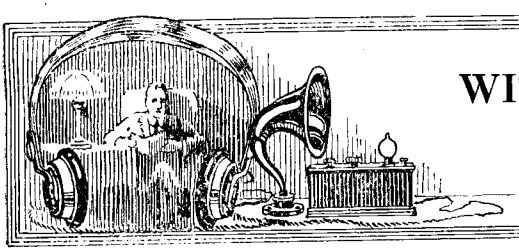
"A.F.B." (Crumpsall) *asks for a diagram of a three-valve L.F. amplifier for use after a crystal receiver, and so arranged that the number of valves in use may be varied, and that the telephones will not be liable to be burnt out.*

The diagram is given in Fig. 3. It is assumed that high-resistance telephones are available. Constructional details of the telephone choke coil and condenser were given on page 438 of the issue of July 7th.

"R.C." (Slough) *asks for constructional details of a variometer tuned valve and crystal set.*

We would refer you to the description of a "Combined High and Low Frequency Amplifier" in the issue of August 1st. If it is desired to omit the L.F. amplifying valve, the telephones should be connected at T.

NOTE.—*This section of the magazine is placed at the disposal of all readers who wish to receive advice and information on matters pertaining to both the technical and non-technical sides of wireless work. Readers should comply with the following rules:*—(1) *Each question should be numbered and written on a separate sheet on one side of the paper, and addressed "Questions and Answers," Editor,* **The Wireless World and Radio Review,** 12/13, *Henrietta Street, London, W.C.2. Queries should be clear and concise.* (2) *Before sending in their questions readers are advised to search recent numbers to see whether the same queries have not been dealt with before.* (3) *All questions will be answered through the post. Those of general interest will also be published.* (4) *Every question, except those under* (5) *below, should be accompanied by a postal order for* 1*s.*, *or* 3*s.* 6*d. for a maximum of four questions, and also the coupon taken from the advertisement pages of the current issue.* (5) *For the benefit of those readers who would rather not pay the charges, a free Questions and Answers Coupon will be placed in the advertisement pages of the first issue of every month. This coupon should accompany the question submitted, together with a stamped addressed envelope. The free coupon is valid for the current week only.* (6) *In view of the fact that a large proportion of the circuits and apparatus described in these answers are covered by patents, readers are advised, before making use of them, to satisfy themselves that they would not be infringing patents.* (7) *Four questions is the maximum which may be sent in at one time.*



WITH THE SOCIETIES

Particulars of Membership of any Society can be obtained on application to the Secretary. Societies marked with an asterisk are affiliated to the Radio Society of Great Britain.

Newcastle-on-Tyne Radio Society.*

The first meeting of the Society since the annual general meeting was held on October 1st. Mr. W. G. Dixon gave some very interesting details of the characteristics and functions of various makes of valves. On October 8th, Mr. Dixon gave details of the "Neutrodyne" circuit, and the Armstrong super-sonic receiver was also described. Mr. Hartley gave particulars of Mr. L. M. Cockaday's circuit, by which all the broadcasting stations can be brought in on this one-valve set.

Hon. Sec., Colin Bain, 51, Grainger Street, Newcastle-on-Tyne.

Lewisham and Catford Radio Society.*

On Thursday, October 5th, the above Society heard a very interesting and highly instructive lecture on "Loud Speakers," given by Mr. Ricketts.

The lecturer described and explained the principles of varied kinds of loud speakers.

The Society are indebted to Mr. Ricketts for this lecture, and also to Messrs. Alfred Graham, Ltd., who lent a very great deal of apparatus, including the amplifier and over a dozen loud speakers.

On October 12th, Mr. Smith gave a lecture on "An Experimenter's Experience with Dual Circuits." 2 LO was received nicely on a single valve and a Junior Amplion, being audible throughout a large hall.

Hon. Sec., F. A. L. Roberts, 43, Adelaide Road, S.E.4.

Manchester Wireless Society.*

On Friday, October 5th, Dr. Stanley Hodgson gave the first of a series of lectures on "Elementary Electricity as applied to Wireless." These lectures are given in the laboratory at Pendleton.

On Monday, October 8th, a very interesting lecture was given by Mr. F. Charnley, B.Sc., on "Distortion and its Elimination."

Luton Wireless Society.*

At the fourth annual general meeting on Thursday, September 20th, Mr. E. A. Mander, A.C.I.S., took the chair. Election of officers and Committee resulted in the re-election of Messrs. H. S. Barber, R. Cox, G. Chandler, F. Halstead, F. Bonner and E. Mander, with Messrs. W. Pipe, Hon. Secretary of the Shefko Wireless Club, affiliated with the Society, and A Weatherell as Committee. Mr. E. Porter as Hon. Librarian, Mr. W. Wing as Hon. Treasurer and Mr. W. Neal as Hon. Secretary. The Vice-Presidents were re-elected, and Mr. J. W. Tomlinson, A.M.I.C.E., is President.

On Wednesday, October 3rd, a most interesting and instructive lecture on "How to Design a Two-Valve Receiver," and demonstration was given by Mr. C. S. Dunham, of Brixton.

Battersea and District Radio Society.*

Owing to the difficulty of obtaining a regular weekly meeting night, the above Society have had to seek new headquarters, and are now comfortably installed in the Clapham Social Club, 374, Wandsworth Road, S.W.

The first meeting in the new headquarters was held on Wednesday, October 10, when some interesting experimental work with an indoor aerial was carried out.

In future, meetings will be held every Thursday evening, commencing at 7.30 p.m.

Hon. Sec., 31, Holden Street, Lavender Hill, S.W.11.

The Grimsby and District Radio Society.*

In conjunction with the Grimsby Literary and Debating Society, the above Society obtained the valuable services of Mr. L. F. Fogarty, A.M.I.E.E., Hon. Treasurer, Radio Society of Great Britain, for a lantern lecture on "Wireless," in the lecture room of the George Street Chapel, Grimsby; about 200 members attended.

Hon. Sec., M. M. Bennett, Radio Club Room, Wellowgate, Grimsby.

Bradford Wireless Society.*

At the first meeting of the winter session which was held on Friday, October 5th, the chief topic under discussion was the purchase of apparatus for the use of members.

Mr. W. C. Ramshaw gave a brief description of the new "Wecovalve."

In future, meetings will be held on Thursday evenings, owing to the many technical classes in the city on Fridays, and the lectures will be preceded by a Morse practice class at 7.15 p.m.

Hon. Sec., John Bever, 85, Emm Lane, Heaton, Bradford.

Edinburgh and District Radio Society.*

An opening meeting of this Society was held in the Royal Scottish Society of Arts Hall on Wednesday, October 3rd, when Mr. J. S. Smith delivered his address on the history of the Telephone.

Hon. Sec., W. Winkler, 9, Ettrick Rd., Edinburgh.

Bournville Radio Society.

The Board of Cadbury Bros., Ltd., have shown their appreciative interest in the welfare of the Bournville Radio Society by a generous grant of £50 for special preliminary expenses of the Society in the acquirement of wireless apparatus and books relative to the science of wireless telegraphy and wireless telephony.

A workshop also is being erected and equipped for the use of the Society on special nights. Members will there receive practical instruction and assistance in the construction of their own sets.

A very successful opening meeting of the session 1923/24, was held on Tuesday, September 25th, at Bournville Works.

Mr. W. Forbes-Boyd, of the British Thomson-Houston Company, Ltd., Rugby, gave a most interesting and instructive lecture on "The Design and Construction of Broadcast Receivers."

On Saturday, September 22nd, fifty members of the Society, by kind permission of the City Electrical Engineer, visited the City of Birmingham Electric Generating Station, Nechells, recently opened by H.R.H. The Prince of Wales.

Hon. Sec., A. P. Hutchinson, Bournville Radio Society, c/o Cadbury Bros., Ltd., Bournville, Birmingham.

St. Pancras Radio Society.

A very interesting and well attended meeting was held on October 5th at the Working Men's College, Crowndale Road, when Major W. I. G. Page gave a discourse on a power amplifier of his own design, which he demonstrated.

The Society met on Thursday, October 11th, at the Working Men's College, Camden Town, when Mr. F. H. Haynes gave a most instructive and interesting practical lecture on "Different Types of Coils and How to Make Them." He followed this up by explaining the method of calibrating condensers and assisted those present by measuring their condensers by a standard instrument. The Society is now much appreciated locally, and any enthusiasts who care to know more about its work are invited to come along any Thursday at 8 o'clock to the Employment Bureau, Park Street, Camden Town.

Hon. Sec., R. M. Atkins, 7, Eton Villas, Haverstock Hill, N.W.3.

Radio Association of South Norwood and District.

At the first meeting of the winter session, held on October 4th, the Association was fortunate in having as lecturer Mr. J. F. Stanley, B.Sc., whose subject was "Interference Eliminators." After giving a résumé of the difficulties encountered in selective tuning, Mr. Stanley detailed the various forms of eliminator that could be employed and the measure of success that might be expected with each.

Hon. Sec., C. H. P. Nutter (5 DB), 243a, Selhurst Road, Norwood Junction, S.E.25.

Sydenham and Forest Hill Radio Society.

At the Society's meeting held on October 1st, an interesting lecture was delivered by Mr. A. C. Huskinson on "Condensers." The lecturer exhibited some beautifully made and finished specimens of fixed mica condensers of his own construction, and variable condensers having air and ebonite dielectrics. The latter had been constructed on a new and patented principle, resulting in a very compact instrument, light in weight and having an exceptionally low zero capacity.

Headquarters, "The Greyhound Hotel," Sydenham. Hon. Sec., M. E. Hampshire, 139, Sydenham Road, S.E.26.

South Woodford Radio Society.

The annual general meeting of the Society was held at the Paris Hall, on Monday, October 1st, the President, Mr. J. E. Nickless, being in the chair.

The Hon. Secretary, Mr. L. R. Garwood, read an interesting account of the history of the Society. In 1921, five of the present members obtained permission to erect and use a shed in the yard of a local garage. Here a crystal set was erected, and the Eiffel Tower time signals were received. Now, he was pleased to state, the membership stood at 48, with six applications pending.

The election of officers for the ensuing year was next proceeded with, and Mr. Nickless was re-elected as President. Numerous other positions were filled, and a committee of six was appointed.

Hon. Sec., L. R. Gaywood, Hermon Hill, South Woodford, E.18.

Widnes and District Radio and Scientific Society.

The first meeting of the winter session was held at the Society's headquarters, 2, Deacon Road, Widnes, on Wednesday, October 3rd.

A highly interesting programme has been arranged for the ensuing quarter. The Hon. Secretary will be pleased to give full particulars of the meetings, together with conditions of membership of the Society to any lady or gentleman in the district who is at all interested in wireless.

Hon. Sec., B. W. Henderson, 28, Alder Avenue, Widnes.

Radio Association of Ireland.

A general meeting of the Association was held in the Wireless Department, Technical Institute, Kevin Street, Dublin, on October 2nd. Professor W. J. Lyons was unanimously elected President, and delivered a very interesting discourse on matters pertaining to Radio communication, and the value such an Association would be to the country.

A resolution was passed that the Association be developed on broad lines embracing all interests. It is hoped that all interested will make application for membership to the Hon. Sec. at the above address. It is deplored that the removal of the present restrictions on private wireless apparatus is being delayed so long.

Norwich and District Radio Society.

The commencement of the winter session coincided with the opening of the Society's spacious and comfortable new headquarters, situated in the centre of the City. The large and enthusiastic gathering augurs well for the future.

The President, Capt. H. J. B. Hampson, in opening, lucidly explained the object and aims of the Society, and took for his first lecture of the session the appropriate subject, "Short Wave Reception and H.F. Amplification." The evening concluded with a demonstration of the Flewelling circuit.

Hon. Sec., J. G. Hayward, 42, Surrey Street, Norwich.